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FOREWORD

The Agency, in 1994, identified the availability of reliable and up to date data as one of the keys to assisting improved management of wastes in Ireland. This project was initiated to compile national statistics for 1995 and to create a new National Waste Database. The database developed as part of this project will be updated on a regular basis by the Agency with the assistance of local authorities, industry, contractors and others involved in the production, recovery and disposal of wastes.

The database includes information on municipal (household and commercial) wastes, hazardous and non-hazardous industrial wastes, priority and other waste streams, as well as geographically referenced information on the locations of waste recovery, recycling and disposal facilities throughout the country.

The project has been undertaken under the Environmental Monitoring, R&D, sub-programme of the Operational Programme for Environmental Services, 1994-1999 and has been part financed by the European Union through the European Regional Development Fund. The sub-programme is administered on behalf of the Department of the Environment by the Environmental Protection Agency, which has the statutory function of coordinating and promoting environmental research.

The collection of the substantial quantities of information contained in the database would not have been possible without the generous assistance offered by those who received and completed questionnaires. In particular, the assistance of County and City Engineers, liaison Engineers nominated by the local authorities, industries, waste contractors and recycling organisations, and their associations allowed us to complete this project on time.

The publication of this database is timely following enactment of the Waste Management Act in May and the proposed introduction of a new integrated licensing system for waste recovery and disposal facilities later this year.

Waste was identified as one of our primary environmental concerns in the State of the Environment Report. These concerns related to the unsustainable waste management practices which have traditionally been followed in this country and which are now being replaced by a pro-active approach to waste prevention and minimisation. The adoption of a systematic management approach to our wastes should minimise the quantity of waste generated, assist in the identification of recovery options and result in an improvement in the standards of operation of recovery and disposal facilities.

The identification of trends and the selection of indicators was an important part of the project. It is clear that the quantity of waste generated is continuing to increase, while the rates of recovery are significantly below the targets set by the Department of the Environment for 1999. Indicators are proposed for tracking muncipal and industrial waste management practices.

The database will be a dynamic system which will be updated on a regular basis to provide us with the information needed to identify and address waste management issues.

The conclusions of the project are that waste management will need to be assigned a much higher priority if national and EU targets are to be achieved. One area which will require particular attention is the provision of recycling infrastructure and markets for recycled materials, as the current recovery rates are well below those necessary to meet current targets. Our dependence on landfill disposal will only be reduced where alternatives are put in place. While industry has made substantial progress in this area, there is scope for development of alternatives for municipal wastes.

ACKNOWLEDGEMENTS

This project was part-financed by the European Regional Development Fund through the Operational Programme for Environmental Services 1994-1999. M C O'Sullivan & Co. Ltd (MCOS) Consulting Engineers Dublin were Project Co-ordinators responsible to the EPA for its implementation. Associated with MCOS were the Faculty of Engineering and Architecture, University College Dublin and COWI Consulting Engineers and Planners, Copenhagen. The project was monitored by a Technical Steering Group comprising representatives of the EPA, the Department of the Environment, the County and City Engineers and MCOS (membership below), established by the EPA. Two post-graduate fellowships were funded as part of the project. The generous assistance of all local authorities is gratefully acknowledged particularly the County and City Engineers and their nominated Liaison Engineers for database purposes. Additional co-ordination was facilitated through the County and City Engineers Association.

Detailed questionnaires were issued to large/medium sized industries, waste contractors and recycling organisations throughout the State. The assistance of those who returned completed questionnaires is gratefully acknowledged.

The main organisation representing large waste contractors in Dublin/Cork, the Industrial Waste Management Association (IWMA) represented by Mr. Gerald Byrne, Chairman was most helpful. The organisation representing smaller contractors, 'Waste Management Association of Ireland (WMAI)', also co-operated with the study.

IBEC through its Environment Executive, Dr Mary Kelly, assisted the study and publicised it in the November 1995 IBEC Newsletter.

The following local authorities carried out waste characterisation studies under MCOS direction to whom the EPA and MCOS are most grateful:

Wicklow County Council; Meath County Council (via Thornton and Kerrigan, Waste Contractors); Offaly County Council; Longford County Council (via Anthony Mulleady, Waste Contractor); Limerick County Council; Louth County Council; Kildare County Council; Sligo County Council; Kerry County Council; Westmeath County Council; Kilkenny County Council

Other local authorities carried out surveys under the direction of their own staff or the assistance of consulting engineers responsible for preparation of county or regional waste management strategies.

The following organisations/companies gave particular assistance to the study:

Department of the Environment; Department of Health; Teagasc; Radiological Protection Institute of Ireland; IBEC; Dublin Corporation; Kerbside Dublin; Rehab Recycling Partnership; Central Waste Paper Ltd; National Waste Ltd; Irish Cement Ltd; Roadstone Provinces Ltd; Hammond Lane Ltd; Semperit Ltd; Siemens Ireland Ltd; College Meats Ltd; Atlas Oil Ltd.

Members of the Technical Steering Group were (in alphabetical order):

Mr. G. Carty, Manager, Environmental Management and Planning Division, EPA;
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Mr. E. Markey, Senior Adviser (Environment), Department of the Environment;
Mr. J. O'Flynn, Chairman, County and City Engineers Association and Waterford County Engineer; and
Mr. P.J. Rudden, Project Co-ordinator, M C O'Sullivan, Consulting Engineers.

Other Members of the Project Team were: Mr. Peter Carey, M C O'Sullivan, Consulting Engineers, Ms. Joyanne Manning, University College, Dublin and Mr. Brian Murphy, University College, Dublin.

LIST OF ABBREVIATIONS

ADEME	Agence de l'Environment et de la Maitrise de l'Energie
AFF	An Foras Forbartha
ALV	Adjusted Low Volume
AP	Adjusted Percentage
Bq	Becquerels
CFC	Chlorofluorocarbon
CSF	Community Support Framework
CSO	Central Statistics Office
DOE	Department of the Environment
EC	European Community
EEA	European Environment Agency
EEC	European Economic Community
EEE	Electrical and Electronic Equipment
ERU	Environmental Research Unit
HWL	Hazardous Waste List
EEA	European Environment Agency
EMI	Environmental Management Ireland
EPA	Environmental Protection Agency
ERL	Environmental Research Limited
ERRA	European Resource and Recovery Association
EU	European Union
EWC	European Waste Catalogue
FEII	Federation of Electronic and Informatic Industries
Gbq	Gigabecquerels
GIS	Geographic Information System
HV	High volume
HMSO	Her Majesty's Stationery Office
IBEC	Irish Business and Employers' Confederation
ICER	Industry Council for Electronic and Electrical Equipment Recycling
IDA	Industrial Development Authority
IIRS	Institute for Industrial Research and Standards
IQR	Interquartile Range
IT	Information Technology
IWMA	Industrial Waste Management Association
LV	Low Volume
LVE	Low Waste Volume Producing Employees
MCOS	M.C.O'Sullivan & Co. Ltd.
MFSU	Manufacture, Formulation, Supply and Use.
NACE	General Industrial Classification of Economic Activities in the European Community
NWD	National Waste Database
PC	Personal Computer
PCB	Polychlorinated Biphenyl
PCT	Polychlorinated Terphenyl
PE	Polyethylene
PET	Polyethylene Tetraphthalate
REPS	Rural Environmental Protection Scheme
SI	Statutory Instrument
SIC	Standard Industrial Classification
SIMI	Society of the Irish Motor Industry
TDS	Tonnes Dry Solids
UCD	University College Dublin
WMAI	Waste Management Association of Ireland

1. INTRODUCTION

Comprehensive reporting on the production and disposal of waste in Ireland is hampered by the relative scarcity of complete and reliable data. It is generally acknowledged amongst all those involved in the waste sector that a uniform methodology for compiling waste statistics needs to be developed and applied so that a more accurate picture of waste management in Ireland can be obtained. It is also acknowledged that a national system for collecting and collating data on the waste sector should, if possible, be compatible with international systems, in particular those under development in the European Union (EU).

In response to this, the EPA has developed a new National Waste Database (NWD). This report, which is the first to be generated from the NWD, presents national waste statistics for the year 1995 along with an inventory of waste disposal and recovery facilities throughout the State. It needs to be stressed that this is the start of a process which, it is hoped, will lead to the development of complete and reliable statistics over the next decade. The NWD has been designed specifically to allow it to be updated by the major participants in the waste sector, these being local authorities, industries, private waste contractors and recycling/recovery organisations. The Agency is of the opinion that responsibility for compiling and reporting information on waste rests with those responsible for its production and management. The establishment of a National Waste Database should make this task easier for all concerned.

This project has been undertaken under the Environmental Monitoring, R&D Sub-programme of the Operational Programme for Environmental Services, 1994-99 and has been part financed by the European Union through the European Regional Development Fund. The Sub-programme is administered on behalf of the Department of the Environment by the Environmental Protection Agency, which has the statutory function of co-ordinating and promoting environmental research.

THE NEED FOR A NATIONAL WASTE DATABASE

The first comprehensive attempt at quantifying waste production and disposal practices in Ireland was undertaken by An Foras Forbartha (AFF) with the publication of the National Database on Waste in 1986. The only category for which it was considered that complete and reasonably accurate returns were received was household and commercial waste collected by the local authorities. In areas outside the direct control of local authorities, such as waste disposal by private firms and hazardous waste arisings, the data were considered incomplete and less reliable. Since publication, the National Database on Waste has only been partially updated, the toxic and dangerous waste survey, which formed a part of the National Database on Waste, being repeated both in 1988 and 1992 by the Department of the Environment. Further surveys of waste arisings have since been conducted by and on behalf of the Department of the Environment (ERL, 1993; MCOS, 1994; Department of the Environment, 1994). Surveys on the generation and disposal of industrial waste have also been conducted by Forbairt, formerly EOLAS (AFF, 1986, ERU, 1993).

The recently published State of the Environment Report (Environmental Protection Agency, 1996) summarised existing knowledge about waste arisings and disposal practices in Ireland. It is clear from this report that the quality of information on the waste sector in Ireland is generally poor, which reflects the relatively low priority given to waste in the past. However, the recent enactment of the Waste Management Act, 1996 is indicative of a move towards a more rigorous and sustainable approach to waste management in Ireland. There is a strong emphasis in the Waste Management Act on waste planning with local authorities required to prepare waste management plans either individually or jointly and the EPA required to prepare a national hazardous waste management plan. A basic requirement of waste management planning is reliable information which, by and large, has not been available. The development of a National Waste Database which can be updated at both local and national level is therefore timely and, provided the co-operation of relevant parties is obtained, it will provide the information needed for proper planning to be conducted. Furthermore, recycling/recovery targets at national and European level reinforce the need for regular updating of waste statistics so that reliable recycling/recovery rates can be obtained.

DESCRIPTION OF THE DATABASE AND REPORTING RELATIONSHIPS

The An Foras Forbartha database referred to above was a mainframe based system. In recent years there has been a shift towards PC based systems in addition to a proliferation of geographical information systems or GIS which allows geographically-referenced data to be linked to databases. The NWD was developed in this context using Microsoft 'Access', a PC based database. It is linked to a GIS called 'MapInfo' which is the GIS system recommended by the Local Government Computer Services Board for use by Local Authorities.

The NWD consists of a number of customised sub-databases which hold the different data sets involved. These are:

- Local Authority/Municipal Database
- Industry Database
- Waste Contractors and Recycling Organisations Database
- Agricultural Wastes Database
- Healthcare Wastes Database
- Radioactive Wastes Database

Data for the Local Authority/Municipal Waste database will in future be gathered in each local authority area by local authority personnel. These data will then be transferred to the EPA for input into the NWD and the production of national waste statistics and trends following verification of the data by the EPA. While the overall management of the NWD will be the responsibility of the EPA and the EPA will be the custodian of the NWD at national level, each local authority will be provided with its own sub-set of the NWD in electronic form which it can use for its own waste management planning purposes. The reporting relationships are illustrated in Figure 1.1.

The Industry Database will be updated periodically by the Agency which will circulate questionnaires either in electronic form or paper form to targeted industries. The co-operation of industry and trade associations will be sought in this regard. Realistically, it will take some time before a comprehensive and wholly reliable dataset on industrial waste is available. The remaining databases will be maintained and updated by the EPA in co-operation with the relevant parties from whom information is being sought.

EUROPEAN WASTE CATALOGUE AND HAZARDOUS WASTE LIST

The EPA has adopted the European Waste Catalogue and Hazardous Waste List system of waste classification for the NWD. The European Waste Catalogue (94/3/EC) has its origins in the European Directive 75/442/EEC on waste also known as the Framework Directive which was amended in 1991 (91/156/EC). Article 1 required the Commission to draw up a list of wastes belonging to general categories set out in Annex 1 of the directive. This list of wastes has become known as the European Waste Catalogue (EWC) and applies to all wastes, irrespective of whether they are destined for recovery or disposal.

The EWC is a harmonised non-exhaustive list of wastes which means that it will be periodically reviewed and if necessary revised in accordance with EU Committee Procedures. It is a reference nomenclature providing a common terminology throughout the European Union in order to improve the efficiency of waste management activities and providing a basis of reference for the compilation of waste statistics.

In general, the EWC consists of a six digit code which defines wastes according to their origin as opposed to definition based on chemical composition. There are twenty separate categories covering wastes from different activities such as mining and quarrying, agricultural and related activities, various industrial processes as well as municipal wastes etc. The first two digits of the code describe the general origin of the waste, the next two digits assign the waste to a more specific process and the last two digits describe a specific item or waste type. Municipal and similar commercial/industrial wastes for example have the general code 20 00 00 while the more specific code 20 01 00 represents 'separately collected fractions' and 20 01 01 is the specific code for paper and cardboard.

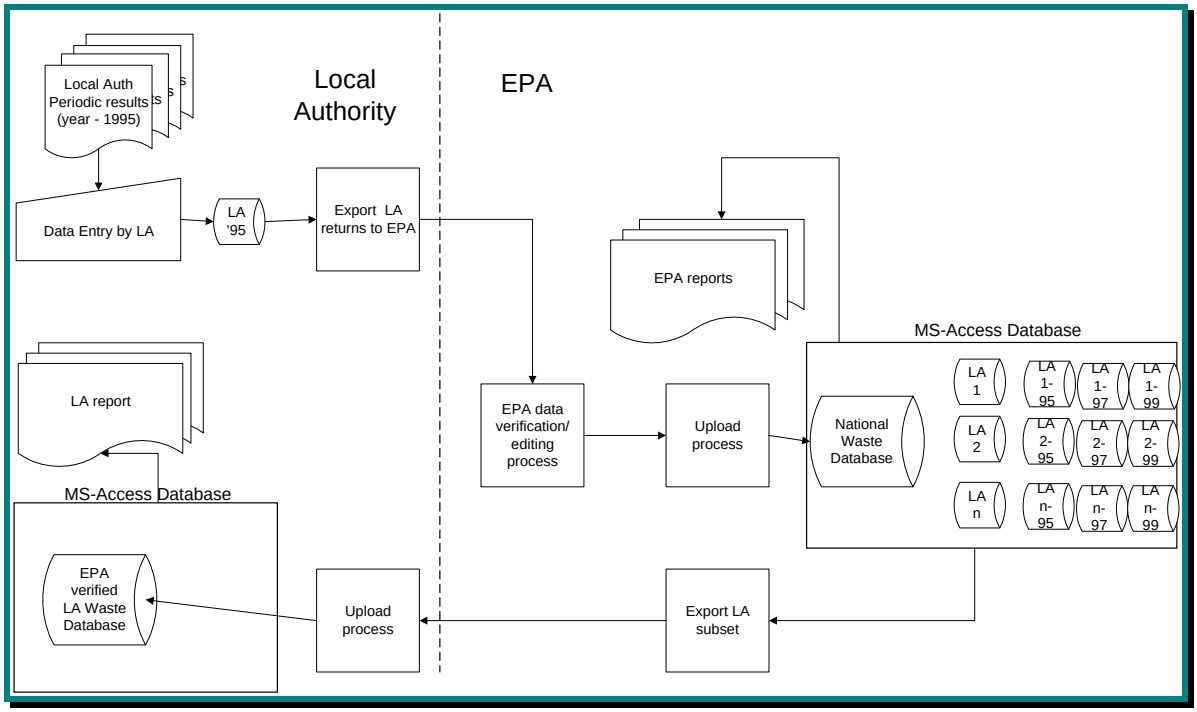

Figure 1.1: Mechanism for Updating the Local Authority Subset of the National Waste Database

The European Hazardous Waste List (HWL) 94/904/EC is a subset of the EWC containing the wastes considered to be hazardous or harmful. The HWL was established pursuant to Article 1(4) of the Council Directive 91/689/EEC on hazardous waste. The properties which render a waste hazardous are set out in Annex III of the Directive 91/689/EC.

In parallel with this publication, the Agency is publishing a document which presents the EWC and HWL as one combined list entitled 'Waste Catalogue and Hazardous Waste List, Environmental Protection Agency, 1996'.

LITERATURE SURVEY

A comprehensive literature search was undertaken on specific aspects of the project such as methodologies for waste characterisation, hazardous waste classification, legislation and disposal/treatment technologies. Aspects of the literature survey are commented upon where relevant.

CONSULTATIVE FRAMEWORK

In view of the importance of the study and the number of organisations whose co-operation was required in terms of sources of information, a Technical Steering Group was established to facilitate this process. It consisted of representatives of the Environmental Protection Agency, the Department of the Environment, the County and City Engineers' Association and the consultants who conducted the study, M.C. O'Sullivan & Co. Ltd.. The Group met with and secured the co-operation of other interested parties, in particular, IBEC (Irish Business and Employers Confederation) and the various Waste Contractors' Associations.

2. METHODOLOGY

INTRODUCTION

This chapter sets out the various methodologies that were used to collect and collate information on waste arisings and disposal/recovery practices. Data collection was achieved through a combination of *input* and *output* methods. *Input* methods use statistics such as the number of employees, floor area of buildings etc. to estimate waste arisings. *Output* methods on the other hand measure the waste arisings in terms of volume and weight from disposal outlets, waste collection contractors or recycling facilities.

MUNICIPAL WASTE

DEFINITION

Municipal waste means household waste as well as commercial and other waste, which because of its nature and composition is similar to household waste. It can be considered to consist primarily of household waste, commercial waste and street cleaning waste, as defined below.

> Household waste is defined as waste produced within the curtilage of a building or self-contained part of a building used for the purposes of living accommodation. It comprises a major component of municipal waste.
>
> Commercial waste is defined as waste derived from premises used wholly or mainly for the purposes of a trade or business or for the purposes of sport, recreation, education or entertainment but does not include household, agricultural or industrial waste.

A distinction needs to be made between municipal waste, as defined above, and waste collected by or on behalf of a local authority. Local authorities collect and dispose of, or have collected and disposed of on their behalf, other wastes such as abandoned vehicles, wastewater treatment sludges, dredge spoils and non-hazardous industrial waste. While these wastes do not fall within the definition of municipal waste provided above, they are handled by municipalities which can lead to some confusion. This is compounded by the fact that many local authorities use the general term 'trade waste' which includes commercial waste as defined above together with non-hazardous industrial waste. A Glossary of Terms, based principally on definitions given in the Waste Management Act, 1996, is provided in Appendix A.

DETERMINATION OF AMOUNTS ARISING AND DISPOSAL/RECOVERY ROUTES

The principal method of obtaining data on municipal waste was through a questionnaire circulated to all local authorities. This questionnaire was designed to collect information available to local authorities on municipal, industrial and other waste, in addition to the location of all public and private waste disposal and recovery facilities. Information was also sought on closed landfills. Prior to issue, the questionnaire was reviewed by a number of senior Local Authority Engineers. Information on municipal waste arisings was also obtained from waste contractors and recycling organisations and from waste composition surveys of both household and commercial waste.

All local authorities completed the questionnaire. In general, the quality of the information contained in the returned questionnaires was good although it must be stressed that most of the information on waste quantities was based on estimates only as few local authority landfills are equipped with weighbridges. The data on recycling was variable as some local authorities did not have a breakdown of the materials collected at individual recycling units. Further information was gained by a separate questionnaire to all recycling organisations.

Establishing the accuracy of commercial waste arisings data is further complicated by the fact that many of the local authorities do not differentiate between commercial and non-hazardous industrial waste and use the more general term 'trade waste'.

COMPOSITION ANALYSIS

HOUSEHOLD WASTE

Local authorities were asked to conduct a waste composition survey to augment the data obtained through the questionnaire. Additional data were required in order to obtain the tonnage's of the different materials in the waste stream such as glass, paper, metals etc. to enable recycling rates to be calculated for these materials.

A detailed procedure was developed for waste composition surveys in the absence of national or EU procedures. This procedure was circulated to all local authorities with the local authority questionnaire. The procedure was based on the ERRA (European Resource and Recovery Association) procedure (ERRA, 1993) and differs primarily from it in the approach to sample selection and coding of waste categories. A procedure for municipal waste characterisation is being published in parallel with this report which draws on the experience gained in this study.

A number of household waste composition surveys were conducted specifically for this project. Additional information was obtained from local authorities from earlier surveys. Counties without survey results were paired with counties similar in terms of urban/rural population and waste generation. The results from these surveys were used to analyse the urban and rural composition of the household waste stream in each county and the country as a whole by weighting them against the household waste arisings data obtained from the local authority questionnaire. This yielded local and national figures for each material in the waste stream including glass, paper, metals, plastics, textiles and organics.

COMMERCIAL WASTE

A commercial waste composition survey was conducted using a procedure developed specifically for this study. The results of the survey were used to obtain national figures for different materials in the commercial waste stream.

DATA VALIDATION

HOUSEHOLD WASTE

The literature survey revealed limited data concerning the methodologies employed to obtain waste statistics. The available information indicates that the questionnaire approach is the most common method of obtaining information on waste arisings in the household, commercial and industrial sectors. In recent years the increase in recycling initiatives world-wide coupled with the difficulties of disposing of municipal waste has led to an increased need for information on the composition of municipal waste. The premise behind household waste composition surveys was defined by Musa and Ho, 1981 who stated that:

> 'Because of the non-homogenous nature of domestic refuse and the differing amounts generated by householders, it is necessary to conduct a survey based on a limited number of samples, to obtain the average generation rate and the average composition which can be used to arrive at the overall picture. Limitations on resources (money, time and labour) dictate that only the minimum number of samples may be analysed, consistent with obtaining results with a predetermined degree of accuracy.'

The main mechanism for determining the nature and make up of household waste is the conduct of composition surveys. Composition surveys generally take two forms:

- sampling at landfills, or
- source sampling approach.

In the USA the landfill sampling method has always been favoured (ADEME, 1994; Klee, 1993; Britton, 1972.) This method involves assessing the contents of a refuse vehicle when it enters a landfill and choosing random samples from its load for waste characterisation. The vehicle chosen is assumed to have only household waste in its load but this cannot be guaranteed in such a landfill study. The only information on the waste producers comes from knowledge of the vehicle routes. Therefore precise characteristic breakdown of the population sample cannot be determined. The advantages of this type of survey is that it is

easier to organise as it does not involve a lot of preplanning or the need for a separate collection of the waste sample.

The second method of waste characterisation in common usage is source sampling (ERRA, 1993; Schall et al, 1993; Musa et al, 1981.) The main advantage of source sampling is that it correlates waste generation with the actual generators, and therefore permits the effective implementation of recycling programmes, and permits the assessment of the socio-economic effect on waste. Source sampling involves households being chosen randomly for a waste survey, without the prior knowledge of the householder, and then the chosen households' waste is collected on the usual day of waste collection to form the waste sample. The sample collected is transferred to a central collection station for weighing and an aliquot of the sample is then taken for manual sorting. The disadvantage with this sort of survey is that it takes more time and is expensive to organise. It also requires the co-operation of the waste contractor or the waste disposal operator in the area being sampled, and preferably the normal waste disposal operator should be used to collect the sample as this reduces the risk of householders becoming aware of the survey and changing their disposal habits.

The ideal sample size has received a lot of attention over the past sixty years. Work by Klee, 1993 suggests that for municipal solid waste, sampling precision does not increase significantly with cluster size (the sample weight). For municipal solid waste, the sample weight region where the sampling precision does not increase significantly, has been found to be approximately 100-150 kgs. In the sampling procedure used for this study sample size was determined by the number of households in the sample area, and then reduced down through a coning and quartering method to approximately 150 kg.

COMMERCIAL WASTE

The literature survey revealed that the available data on commercial waste was limited and mainly based on estimates as commercial waste composition surveys have not been carried out to the same extent as household waste surveys. Three previous studies were sourced, two in England (Avon (1988) and Sheffield (1990)), and one in Canada (Jacob, (1991). The Canadian study concentrated on supermarket waste while the two English studies were carried out on the entire commercial sector.

The survey methodologies used essentially involve a combination of questionnaires and site visits. In the present study data was obtained using a questionnaire coupled with a composition survey at a shopping centre. The approach adopted for the composition survey was based on that used by Midland Environment Limited (MEL, 1989, 1990) and can be summarised as follows:

- a number of commercial premises is chosen;
- the quantities and type of waste produced by the chosen premises are estimated;
- the amount of waste produced per employee is determined;
- the average waste arising per employee is calculated; and
- the average is multiplied by the total number of employees.

INDUSTRIAL WASTE

DEFINITION

Industrial waste includes waste produced or arising from manufacturing or industrial activities or processes. There is no simple way of defining hazardous waste. Indeed, any waste can become hazardous, in the widest sense of it being potentially harmful to either human health or the environment, if not treated and disposed of properly. The most recent definition available is that provided in Directive 91/689/EEC and adopted in the Waste Management Act, 1996, which describes physical, chemical and biological properties which render a waste hazardous. Hazardous waste was defined in this study as all wastes listed in the European Hazardous Waste List.

DETERMINATION OF AMOUNTS ARISING AND DISPOSAL/RECOVERY ROUTES

INDUSTRY QUESTIONNAIRE

The principal means of obtaining information on this sector was through a questionnaire. The focus in the industrial sector was on both hazardous waste and non-hazardous waste. All industries employing twenty people or more in the industrial manufacturing sector were targeted, representing some 2300 companies or 90% of the manufacturing workforce. The industries were sourced through Kompass, a leading supplier of industrial databases. This database was the most up-to-date commercial database available and it was cross-referenced with the NACE[1] industrial coding system.

A database listing all industries employing twenty people or more in the manufacturing sectors (excluding manufacturing services) as well as the following areas of activity was obtained for the study:

- forestry,
- coal and peat,
- crude petroleum and natural gas,
- quarrying,
- minerals,
- public works,
- building contractors and auxiliary services,
- building service contractors,
- public utility services (e.g. Telecom Eireann etc.),
- companies and authorities involved in land, sea and air transportation (e.g. CIE, Ports, etc.).

The questionnaire classified waste according to The European Waste Catalogue (EWC) and the Hazardous Waste List (HWL). The wastes listed in the HWL are those wastes that appear in the EWC which have been deemed to be hazardous. Additional codes were incorporated as required to deal with wastes not covered in sufficient detail by the European Waste Catalogue.

As many companies were being introduced to the European Waste Catalogue and Hazardous Waste List for the first time, edited versions of the EWC appropriate to each industry sector were prepared. Each company surveyed was sent the appropriate edited version to simplify the task of completing the questionnaire.

SCALE-UP METHODOLOGY

A questionnaire-based survey will never obtain a 100% response rate. It is necessary therefore to use numerical and statistical methods to extrapolate the data obtained from the questionnaire responses to project national waste quantities. The response rate obtained from this study of approximately 16% based on the number of industry returns or 22.9% based on employee numbers is typical of questionnaire based studies of this type.

Waste per employee figures were calculated for each sector based upon the returned questionnaires. Following this, scale-up factors were calculated to enable a projection of the total waste generation to be made. In their simplest form, the scale-up factors are calculated by dividing the total number of employees per sector by the number of employees in that sector for whom completed questionnaires have been received. The approach used in this study, which was based on experience in other countries, allowed for the inclusion of employees involved in non-production activities such as administrative staff (P. Riemann, personal communication).

Statistical Technique

It was decided that to apply the unadjusted scale-up factor, as described above, to an entire industry sector would be to discount the fact that certain firms within that sector may produce atypically high or low quantities of waste. Such firms should be excluded from the main scale-up procedure and be added in

[1] Commission Regulation (EEC) 761/93 established a community-wide classification system for economic activities, commonly referred to as the NACE classification system.

afterwards, applying a factor of 1.0, an approach used in the IIRS Hazardous Waste Survey (McMahon, Hopkins & Malone 1980). Statistical methods are required in order to determine such anomalies.

Firms with atypical quantities of waste were determined by using the statistical technique of *box-plots* for each industry sector based upon the waste/employee of *each* firm in that sector for which a completed questionnaire has been received. Outlying data points are calculated as follows.

1. The interquartile range (IQR) is determined. The IQR is the numerical difference between the data points at the first and third quartiles of the data series i.e. the middle 50% of data points.

2. Upper and lower fences are set at a numerical distance of 1.5 times the IQR below the data point at the first quartile and 1.5 times the IQR above the data point at the third quartile.

3. Any point which lies outside the upper and lower fences determined in Step (2) is an outlier and the waste generated by that firm will not be scaled-up in accordance with the scale-up factors described earlier.

Modification to Statistical Technique

Although the above information describes the basic procedure involved in scaling-up waste data, a number of minor modifications are required in light of the following facts.

- A number of questionnaires were returned for which an industry sector could not be applied due to insufficient completion of the questionnaire. Since these questionnaires could have arisen from any industry sector, the waste quantities and employee data contained therein were added to those obtained from the fully completed questionnaires across the industry sectors in a ratio determined by the overall percentage of those employees surveyed who work in each sector. The bulk pharmaceutical sector and the sector which includes petroleum refining were exempted from this process, since a 100% response rate was obtained from these sectors.

- Since the industrial survey only included manufacturing firms employing twenty or more a national figure of approximately 35,000 was obtained for the total number of people employed in small firms (less than 20 people) in manufacturing and similar activities in the sectors given earlier. This figure was distributed between the sectors in the manner described above, with the figure being added to the total number of people surveyed. This is done since those employed in firms with fewer than twenty employees must be taken into account, their presence serving to raise the scale-up factor applied to the waste data obtained from the completed questionnaires. Once again, the bulk pharmaceutical sector and petroleum refining sectors were exempted since no firm in this sector employs less than twenty people.

- Having removed the atypical waste producers from the scale-up calculations, a revised factor is calculated using the remaining data and the provisions given above.

DATA VALIDATION

The methodologies used for industrial waste surveys internationally and in previous Irish surveys were reviewed when devising the methodology used in this study. The United Kingdom Department of the Environment (1993) Waste Management Paper No. 2/3 suggests the following methodology for performing industrial waste surveys.

- A statistically sound sample of waste-producing firms should be selected and interviewed to determine their waste production. Two possible proxy-measures available for the extrapolation of data are the number of persons employed and the rateable values, with the general opinion being that the number of employees gives a better measure of the waste produced.

- A list of industrial firms should be drawn up for the area, there being a variety of sources from which this information may be obtained. These companies should then be classified as far as possible by industrial activity using the Standard Industrial Classification (SIC 92).

- A telephone call should be made to establish an appropriate contact and obtain information on the number of persons employed. Following this a letter should be sent, outlining the purpose of the survey and the positive aspects of co-operation by participating firms.

- In selecting a sample of these firms for interview, all firms employing more than one hundred people should be included as well as all known high volume waste producers.

- The interview should be carried out by trained staff who, in addition to obtaining information for the purposes of the management functions of the Agency concerned, will also be able to impart knowledge to the participating firms regarding their waste generation and management practices.

Cheshire County Council (1995) in its waste management plan devised a methodology for industrial surveys based on that suggested by the United Kingdom Department of the Environment Waste Management Paper described above with some minor modifications. This is summarised below.

- The firms to be interviewed were selected from the Cheshire Business Directory which, although it covers only 7% of firms operating in Cheshire, constitutes a representative sample of the distribution of industry within the county.

- Owing to the expense involved in carrying out the number of surveys required in Waste Management Paper No. 2/3, a sample of firms was selected for interview, concentrating on those firms with high volume or complex and difficult waste streams. In total, one hundred firms were interviewed.

- Questionnaires were circulated to the remaining firms; following reminders a response rate of 45% was obtained. Validation interviews were then conducted on a 1.5% sample of the companies surveyed by post.

- The survey responses obtained represent 3.4 % of companies operating in Cheshire and 16% of Cheshire's workforce.

- In order to develop scale-up factors, data were converted in order that they be compatible with the Census of Employment data for Cheshire.

The present study has attempted to use the common aspects of the above surveys to obtain an accurate picture as regards industrial waste management and disposal. The information for the Industrial Waste Database was collected via questionnaires circulated directly to industry. Information on employee numbers and the area of industrial activity was obtained from Kompass Ireland. Industries are classified by Kompass according to a system which closely approximates to the Standard Industrial Classification. For the purposes of this survey, these codes were converted to one or two letter NACE categories as set out in Commission Regulation (EEC) No. 761/93.

On the basis of the completed questionnaires, waste per employee factors were developed for 17 NACE groups.

Surveys such as that of the IIRS and Cheshire County Council have attempted to take into consideration the fact that firms which generate large quantities of waste compared to other firms in the same industrial group will tend to have too great an influence on the waste-per-employee figures for the sector as a whole. In these studies, such firms were excluded from the scale-up procedure. In the current study, an attempt has been made to base this process on statistical methods and to this end box-plots have been constructed to represent the returns from each NACE sector. Any firm whose waste per employee figure results in its presence as an outlier on the box-plot for its NACE sector is excluded from the scale-up procedure, with scale-up factors being calculated based on the waste generated by the remaining respondents in that sector. It is

acknowledged that no formal procedure exists to enable the influence of high volume waste producers to be taken into account, although it is clear that if the waste per employee method is applied without adjustment, an overestimate of the total quantity of waste is an inevitable consequence.

This study has applied the principle of scale-up factors based upon the waste per employee per industrial sector to develop a national picture of the patterns of waste generation and disposal. It has attempted to adopt a statistically consistent approach to methodologies that have yet to be standardised at international level, and at all times has classified its findings according to the available systems i.e. EWC, HWL and NACE.

PRIORITY WASTES

The European Council Directive Resolution adopted in Dublin on 7 May 1990 on Waste Policy Management (OJ 1990, C122/2) considered it desirable to establish programmes for particular types of waste and invited the Commission to present proposals for action at community level.

In 1991 the Commission initiated its programme on Priority Waste Streams. Project Groups were established to determine solutions for the following waste streams; Used Car Tyres, End of Life Vehicles, Construction and Demolition Waste, Waste from Electric and Electronic Equipment, Healthcare Waste, and Chlorinated Solvents. Each group comprised representatives of all member states and industrial sectors as well as EU personnel. The European Council also adopted a number of Directives to deal with the environmental effects of certain products when they become waste. These include packaging and packaging waste, batteries and accumulators, PCBs, and waste oils.

The data collection procedures for gathering information on priority wastes focused on a review of the existing information by contacting relevant agencies and on information obtained from the local authority questionnaire.

OTHER WASTES

A review of existing information was conducted on agricultural, healthcare and radioactive wastes. Information on agricultural wastes was obtained from Teagasc, healthcare wastes from the Department of Health and radioactive wastes from the Radiological Protection Institute.

INVENTORY OF DISPOSAL AND RECOVERY FACILITIES

Information on disposal and recovery facilities throughout the State was abstracted from the local authority and recycling organisation surveys. Facilities listed include active landfills, transfer stations, civic amenity sites, recycling bring banks, recycling bring schemes and home compost schemes. As the NWD is being linked to a geographic information system, those surveyed were requested to provide the national grid reference for each facility.

3. NATIONAL WASTE ARISINGS

OVERVIEW

National waste arisings for 1995 were estimated to be 42,260,757 tonnes (see Table 3.1 and Figures 3.1 and 3.2). Of this, approximately 31,000,000 tonnes originated from agricultural sources, mainly animal manure's. The municipal and industrial sectors are therefore estimated to have produced over eleven million tonnes of waste in 1995.

Table 3.1: Total Non-Agricultural Waste Arisings in Ireland

Waste Category	Quantities Arising	
	tonnes/annum	(%)
Municipal (including recycled materials)	1,848,232	16.4
Other Wastes collected by or on behalf of local authorities	953,189	8.5
Industrial (non-hazardous)	7,410,982	65.8
Industrial (hazardous)	243,754	2.2
Healthcare Wastes	20,000	0.2
Dredge Spoils	784,600	7.0
TOTAL	**11,260,757**	**100**

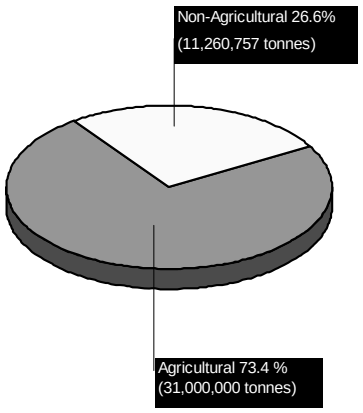

Figure 3.1: National Waste Arisings

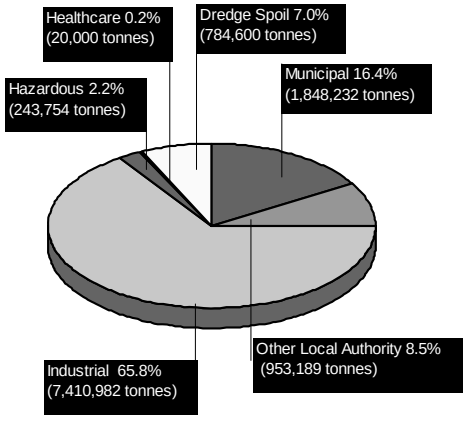

Figure 3.2: Total Non-Agricultural Waste Arisings

MUNICIPAL WASTE AND OTHER LOCAL AUTHORITY WASTE

AMOUNTS ARISING AND WASTE COMPOSITION

It is estimated that 1,432,230 tonnes of municipal waste was collected by or on behalf of local authorities in 1995. This consisted of 981,710 tonnes of household waste, 403,729 tonnes of commercial waste and 46,791 tonnes of street cleansing wastes. It is estimated that a further 117,732 tonnes of household and commercial waste was collected separately for recovery, mainly recycling. Furthermore, it is estimated that only 86% of the population is provided with a waste collection service and when this is accounted for, together with household waste collected for recycling, total household waste arisings are estimated to be

1,324,521 tonnes per annum. In total, therefore, 1,848,232 tonnes of municipal waste are estimated to have arisen in Ireland in 1995.

Other wastes collected either by or on behalf of local authorities which do not fall strictly within the definition of municipal waste are 493,323 tonnes of sludges from water and waste water treatment plants, 277,826 tonnes of industrial waste, 18,720 tonnes of abandoned vehicles and 163,320 tonnes of un-classified waste (see Figure 3.3).

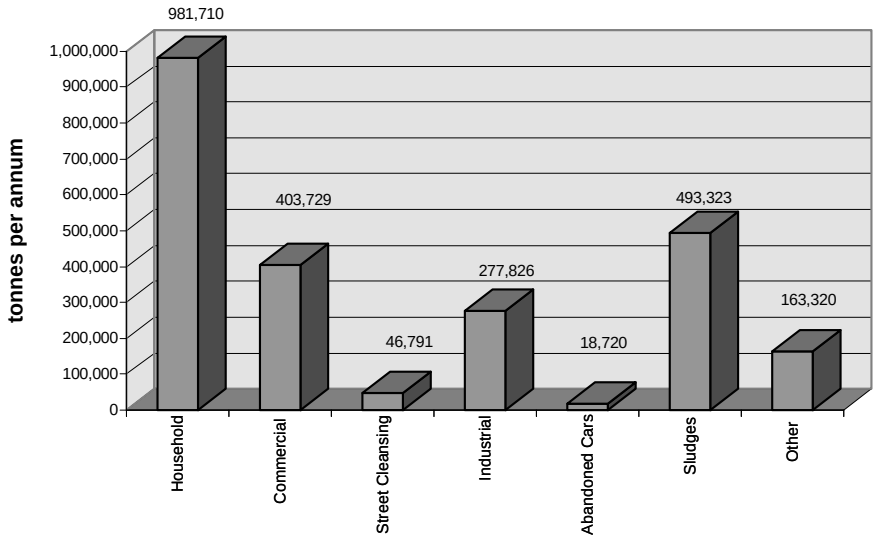

Figure 3.3: Wastes Collected by or on behalf of Local Authorities

In total, therefore, 2,385,419 tonnes of waste were collected by or on behalf of local authorities in 1995. A county by county breakdown of municipal and other local authority wastes collected in 1995 is provided in Table 3.2.

The quantities and composition of household and commercial waste collected by or on behalf of local authorities, respectively, are illustrated in Figures 3.4 and 3.5.

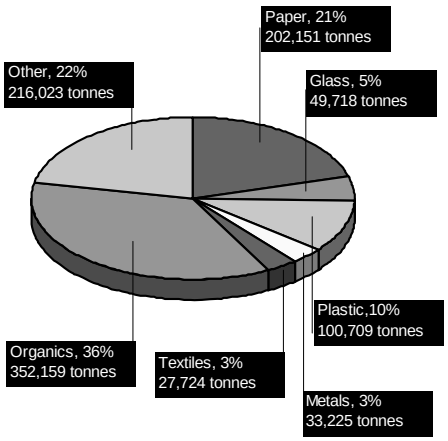

Figure 3.4: Quantities and Composition of Household Waste

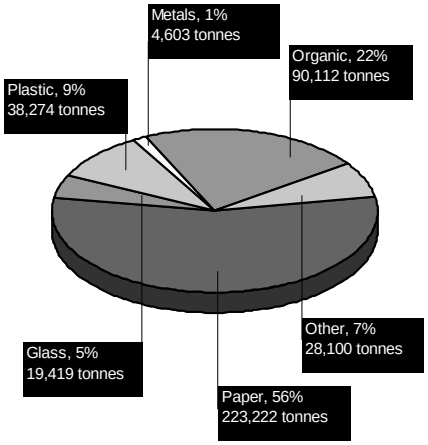

Figure 3.5: Quantities and Composition of Commercial Waste

Table 3.2 Municipal and Other Wastes Collected by Each Local Authority (as tonnes per annum)

Local Authority Name	Municipal Wastes (tonnes per annum)			Other Wastes (tonnes per annum)				
	Household	Commercial	Cleansing	Industrial	Cars	Water Supply Sludges	Waste Water Sludges	Other
Carlow County Council	9500	3800	500	2700	50	300	3600	0
Cavan County Council	6896	5200	0	5200		200	900	0
Clare County Council	29640	11700	1940	10173		440	15900	0
Cork Corporation	42000	67000	3500	13639		0	0	0
Cork County Council	74000	33000	0	104500		0	4100	0
Donegal County Council	28700	11000	0	5000		0	0	1216
Drogheda Corporation	6650	150	350	0		0	0	0
Dublin Corporation	143500	25000	0	0	1800	10500	330000	25000
Dun Laoghaire-Rathdown C.C.	50000	7000	1382	0		0	0	20100
Dundalk U.D.C.	8970	8000	100	2000		2500	0	0
Fingal County Council	99011	0	6310	0		0	5148	1106
Galway Corporation	25000	45000	1000	0		0	0	0
Galway County Council	32915	12325	1000	3235	17	0	1975	800
Kerry County Council	18911	14612	4134	5729	2500	2877	13657	441
Kildare County Council	39690	12065	1000	29956		9000	7500	0
Kilkenny Corporation	3200	0	200	0		0	0	0
Kilkenny County Council	14200	11550	0	0	4000	0	7000	0
Laois County Council	14000	2500	500	3000		24336	0	8090
Leitrim County Council	4000	590	400	100	45	50	750	0
Limerick Corporation	24000	14000	7000	16900		5000	0	0
Limerick County Council	26800	19000	600	0		140	8500	0
Longford County Council	6153	2081	0	2059		0	0	0
Louth County Council	3144	3372	340	323		0	1528	0
Mayo County Council	10546	23759	2200	9258		200	5339	14693
Meath County Council	28000	10000	2500	10023	30	500	6895	0
Monaghan County Council	12500	5000	0	2500		0	0	0
Offaly County Council	12500	4200	100	0	2	100	10040	4087
Roscommon County Council	6200	1500	740	12400		1500	5700	0
Sligo County Council	12230	815	715	4755	25	20	50	510
South Dublin County Council	59350	0	1150	0	1300	0	0	800
Tipperary N.R. Co. Co.	17000	0	0	0		0	0	0
Tipperary S.R. Co. Co.	22000	4000	500	9000	3000	50	3000	0
Waterford Corporation	16650	6747	2630	0	240	0	0	52413
Waterford County Council	9900	1860	2700	7400	10	0	175	0
Westmeath County Council	13094	3006	300	516	30	0	1045	7220
Wexford County Council	21000	20000	3000	14000	5200	100	500	150
Wicklow County Council	29860	13897	0	3460	471	282	1926	26702
TOTAL	**981,710**	**403,729**	**46,791**	**277,826**	**18,720**	**58,095**	**435,228**	**163,320**

A comparison between urban and rural household waste composition is provided in Table 3.3 and Figure 3.6. Some differences were observed and the higher percent composition of paper and organics in the urban waste stream is considered significant; it confirms observations made in earlier surveys (EPA, 1996). Using the pairing procedure described in Chapter Two, each local authority was assigned a set of household waste composition results either from their own surveys or by being paired with a similar local authority that conducted a survey. These county by county results are presented in Appendix D and form a benchmark against which future surveys may be compared. The increased number of waste composition surveys conducted by local authorities enables a much greater level of confidence to be attached to the national figures for different materials such as glass, paper and plastic in the household stream.

It must be emphasised, however, that all of the surveys conducted for the study were carried out in winter. Ideally, surveys should be conducted in both summer and winter to more accurately reflect seasonal variation. Furthermore, the likely significant seasonal impact of tourism on waste composition in areas with large tourist populations is not accounted for in present figures. Local authorities which cater for large tourist populations should take this important factor into account when conducting waste composition surveys.

Table 3.3: Comparison of Urban and Rural Household Waste Composition

Material	Urban Waste (%)	Rural Waste (%)
Paper	22.9	16.3
Glass	5.3	4.6
Plastics	10.3	10.2
Metals	3.5	3.2
Textiles	2.5	3.4
Organics	39.6	29.2
Other	15.9	33.1

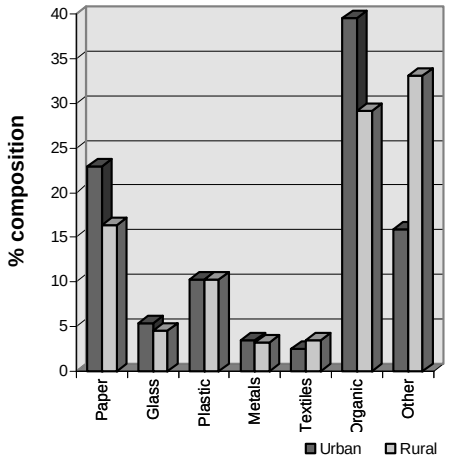

Figure 3.6: Comparison of Urban and Rural Household Waste Composition

A commercial waste composition survey was conducted at a shopping centre in Dublin and the overall results obtained are presented in Figure 3.7, along with the results of a similar survey conducted in the United Kingdom (MEL, 1992). Outlets surveyed included a building society, a chiropractor, a fruit and vegetable shop, a hardware store, a butcher, a newsagent, a florist and a photographic laboratory. The combined results were used to obtain national figures for the various materials that make up the commercial waste stream. These figures should be treated with caution as they are based on the results of one survey only and simply provide a first estimate of commercial waste composition in Ireland. Results for each outlet surveyed are presented in Appendix D, which includes the waste per employee calculated for each commercial outlet sampled. The average waste generated per employee was calculated to be 0.9 tonnes per annum, ranging from a low of 0.02 tonnes per employee per annum for a chiropractor to a high of 2.19 tonnes per employee per annum for a butcher.

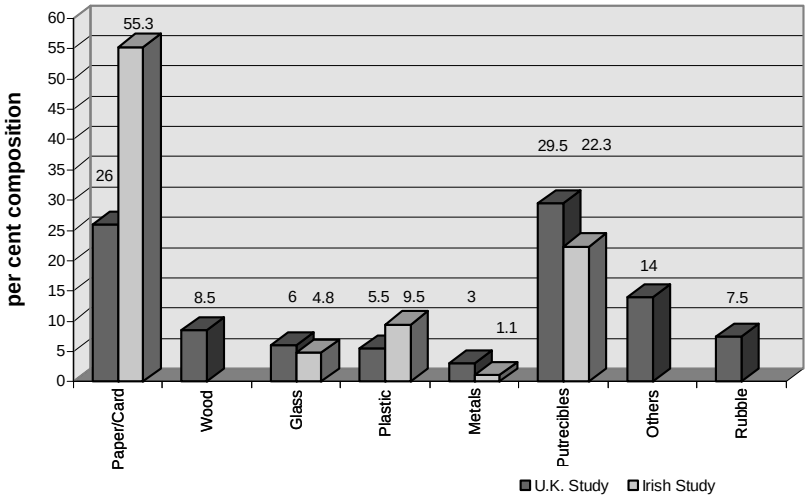

Figure 3.7: Results of Commercial Waste Composition Surveys Conducted in Ireland and the United Kingdom

DISPOSAL AND RECOVERY ROUTES

Information on disposal and recovery routes for municipal wastes and other wastes collected by or on behalf of local authorities was obtained from the local authority questionnaire and the recycling organisation questionnaire. Of the 1,549,962 tonnes of municipal waste collected in Ireland in 1995, 1,432,230 tonnes were consigned to landfill with 117,732 tonnes recovered for recycling. The composition of household and commercial waste landfilled in Ireland is provided in Table 3.5, with the disposal and recovery rates for different materials in the combined household and commercial waste stream presented in Table 3.6. The national recovery rate for household and commercial waste in 1995 was 7.8% with 92.2% of the stream consigned to landfill[2].

Disposal and recovery rates for the various materials in the household and commercial waste streams when considered separately are presented in Tables 3.7 and 3.8, respectively, with similar rates for packaging materials in the combined household and commercial waste stream presented in Table 3.9. The overall recovery rate for household waste is 4.3% with 95.7% consigned to landfill.

For packaging materials in the combined household and commercial waste stream, the recovery rate is 15.6% with 84.4% consigned to landfill. Packaging is defined as any material, container or wrapping, used for or in connection with the containment, transport, handling, protection, promotion, marketing or sale of any product or substance. The major categories are paper, glass, plastic and metals. If the packaging component of the non-hazardous industrial waste stream is added to that of the combined household and commercial waste stream, the recovery rate increases to 21.9%, as shown in Table 3.10. The principal recovery route for packaging materials in the household and commercial waste streams and the non-hazardous industrial waste stream is recycling.

[2] Street cleansing waste is not included when estimating the recovery rate as, generally, it is considered as non-recoverable material for recycling purposes.

Table 3.5: Composition of Household and Commercial Waste Landfilled in Ireland

Material	Household				Commercial		Total	
	Urban		Rural					
	(%)	tonnes/ annum	(%)	tonnes/ annum	(%)	tonnes/ annum	(%)	tonnes/ annum
Paper	22.9	145,212	16.3	56,939	55.3	223,222	30.7	425,373
Glass	5.3	33,768	4.6	15,950	4.8	19,419	5.0	69,138
Plastic	10.3	65,083	10.2	35,626	9.5	38,274	10.0	138,983
Metals	3.5	22,023	3.2	11,202	1.1	4,603	2.7	37,828
Textiles	2.5	15,885.	3.4	11,839	0.0	0	2.0	27,724
Putrescibles	39.6	250,469	29.2	101,690	22.3	90,112	31.9	442,271
Other	15.9	100,713	33.1	115,310	7.0	28,100	17.6	244,122
Total	**100.00**	**633,154**	**100.00**	**348,556**	**100.00**	**403,729**	**100.00**	**1,385,439**

Table 3.6: Disposal and Recovery Rates in the Household and Commercial Waste Stream in Ireland

Material	Quantity Landfilled	Quantity Recovered	Gross Quantity Available	National Landfill Rate	National Recovery Rate
	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(%)	(%)
Paper	425,373	84,000	509,373	83.5	16.5
Glass	69,138	28,500	97,638	70.8	29.2
Plastic	138,983	394	139,377	99.7	0.3
Metals	37,828.07	1,308	39,136	96.7	3.3
Textiles	27,724	3,500	31,224	88.8	11.2
Putrescibles	442,271	30	442,301	100	0.0
Other	244,122	0	244,122	100	0.0
Total	**1,385,439**	**117,732**	**1,503,171**	**92.2**	**7.8**

Table 3.7: Disposal and Recovery Rates in the Household Waste Stream in Ireland

Material	Quantity Landfilled	Quantity Recycled	Gross Quantity Available	Recycling Rate
	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(%)
Paper	202,151	31,639	233,790	13.5
Glass	49,718	7,905	57,623	13.7
Plastic	100,710	159	100,869	0.2
Ferrous	20,958	368	21,326	1.7
Aluminium	8,406	940	9,346	10.1
Other Metals	3,862	0	3,862	0.0
Textiles	27,724	3,500	31,224	11.2
Putrescibles	352,159	30	352,189	0.0
Other	216,022	0	216,022	0.0
Total	**981,710**	**44,541**	**1,026,251**	**4.3**

Table 3.8: Disposal and Recovery Rates in the Commercial Waste Stream in Ireland

Material	Quantity Landfilled	Quantity Recycled	Gross Quantity Available	Recycling Rate
	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(%)
Paper	223,222	52,361	275,583	19.0
Glass	19,419	20,595	40,014	51.5
Plastic	38,274	235	38,509	0.6
Metals	4,603	0	4,603	0.0
Textiles	0	0	0	0.0
Putrescibles	90,112	0	90,112	0.0
Other	28,100	0	28,100	0.0
Total	**403,729**	**73,191**	**476,920**	**15.3**

Table 3.9: Disposal and Recovery Rates for Packaging Materials in the Household and Commercial Waste Stream in Ireland

Material	Quantity Landfilled	Quantity Recycled	Gross Quantity Available	% Landfilled	% Recycled
	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(%)	(%)
Paper	142,634	38,000	180,634	79.0	21.0
Glass	59,530	28,500	88,030	67.6	32.4
Plastic	135,211	159	135,370	99.9	0.1
Ferrous	22,033	368	22,401	98.4	1.6
Aluminium	6,569	940	7,509	87.5	12.5
Other	1,429	0	1,429	100	0.0
Total	**367,405**	**67,967**	**435,372**	**84.4**	**15.6**

Table 3.10: Disposal and Recovery Rates for Packaging Materials in the Household and Commercial Waste Stream and the Non-Hazardous Industrial Waste Stream in Ireland

Material	Quantity Disposed Household and Commercial Waste	Quantity Disposed Non - Hazardous Industrial Waste	Quantity Recycled Household & Commercial Waste	Quantity Recycled Non-Hazardous Industrial Waste	Gross Quantity Available Household Commercial and Non-Haz. Industrial	% Recycled
	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(tonnes/annum)	(%)
Paper	142,634	56,063	38,000	44,986	281,682	29.5
Glass	59,530	5,000	28,500	3,752	96,782	33.3
Plastic	135,211	2,191	159	489	138,050	0.5
Ferrous	22,033	25	368	144	22,570	2.3
Aluminium	6,569	97	940	88	7,694	13.4
Other	1,429	68,578	0	22,432	92,438	24.3
Total	**367,405**	**131,954**	**67,967**	**71,890**	**639,216**	**21.9**

INDUSTRIAL WASTE

AMOUNTS ARISING AND WASTE COMPOSITION

National reported and projected figures for hazardous and non-hazardous industrial waste arisings in 1995 are presented in Table 3.11. Total reported figures for non-hazardous and hazardous industrial waste were 4,243,900 tonnes and 167,406 tonnes, respectively. Using the scale-up procedure described in Chapter Two, this gives rise to projected figures of 7,410,982 tonnes and 243,754 tonnes of non-hazardous and hazardous industrial waste, respectively. As with all figures obtained through extrapolation, the projected values should be viewed with a certain amount of caution and considered only as best estimates of total hazardous and non-hazardous industrial waste arisings in Ireland. The county by county distribution of reported industrial waste is presented in Figure 3.8.

Table 3.11: Summary of Reported and Projected Industrial Waste Arisings in Ireland in 1995

	Hazardous Industrial Waste (tonnes/annum)	Non-Hazardous Industrial Waste (tonnes/annum)	Total Industrial Waste (tonnes/annum)
Reported Quantities	167,406	4,243,900	4,411,306
Projected Quantities	243,754	7,410,982	7,654,736

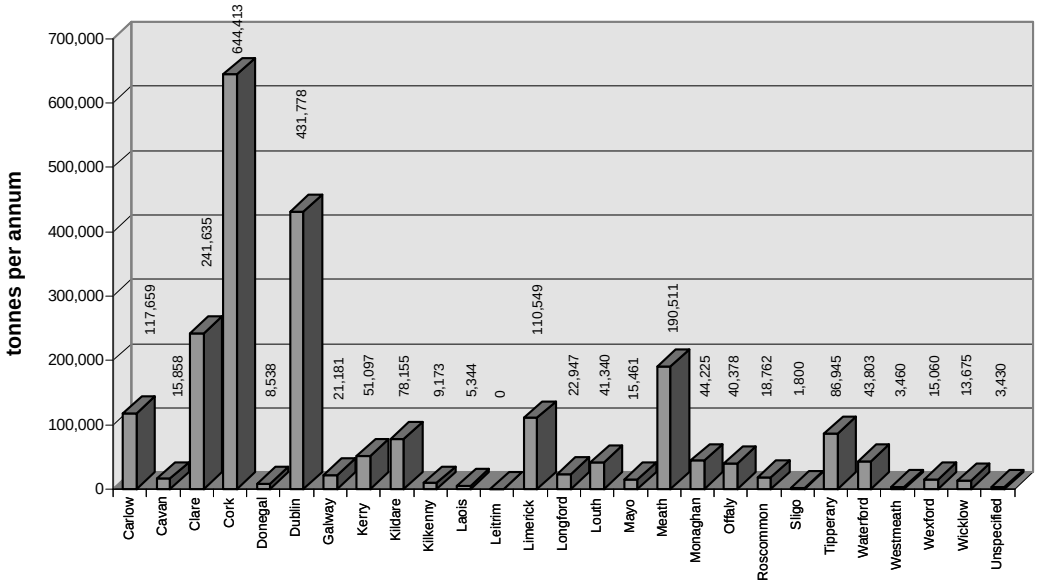

Figure 3.8: County by County Distribution of Reported Industrial Waste Arisings by Coun (excluding mining wastes)

A breakdown of reported and projected hazardous and non-hazardous waste arisings by industry sector is presented in Table 3.12. The industry sectors listed in Table 3.12 are taken from Commission Regulation (EEC) 761/93 which established a community-wide classification system for economic activities. By far the greatest quantity of reported hazardous waste arose in the chemicals, chemical products and man-made fibres

sector (88.4%). Sectors which reported greater than 100,000 tonnes of non-hazardous industrial waste per annum were: chemicals, chemical products and man-made fibers; construction; electricity, gas and water supply; food products, beverages and tobacco; mining; other non-metallic mineral products; and, transport, storage and communication.

Table 3.12: Reported and Projected Quantities of Industrial Waste By NACE Sector

SECTOR	NACE code	HAZARDOUS		NON-HAZARDOUS		TOTAL INDUSTRIAL	
		Reported	Projected	Reported	Projected	Reported	Projected
		(tonnes/annum)					
Unspecified		756	756	10,082	10,082	10,838	10,838
Basic Metals and Fabricated Metal Products	DJ	1,173	13,109	68,479	205,174	69,652	218,284
Chemicals, Chemical Products and Man-Made Fibres	DG	148,058	179,809	122,397	149,695	270,455	329,503
Coke, Refined Petroleum Products and Nuclear Fuel	DF	6,886	6,886	3,581	3,581	10,467	10,467
Construction	F	145	1,212	433,534	1,318,908	433,679	1,320,120
Electrical and Optical Equipment	DL	3,832	4,157	19,183	44,492	23,015	48,649
Electricity, Gas and Water Supply	E	1,193	1,458	322,094	351,849	323,287	353,307
Food Products; Beverages and Tobacco	DA	419	3,653	357,996	894,931	358,415	898,584
Leather and Leather Products	DC	1	19	10,830	208,783	10,831	208,802
Machinery and Equipment not elsewhere classified	DK	143	539	15,493	35,601	15,636	36,140
Manufacturing not elsewhere classified	DN	18	581	944	3,043	962	3,624
Mining (excludes quarrying)	C	2	2	2,200,002	2,200,002	2,200,004	2,200,004
Other Non-Metallic Mineral Products (includes quarrying)	DI	1,945	16,125	442,653	1,533,931	444,598	1,550,057
Pulp, Paper and Paper Products; Printing, Publishing	DE	50	216	80,083	181,946	80,133	182,162
Rubber and Plastic Products	DH	971	1,870	27,782	56,051	28,753	57,921
Textiles and Textile Products	DB	37	101	20,786	53,206	20,823	53,307
Transport Equipment	DM	0	0	10	1,326	10	1,326
Transport, Storage and Communication	I	1,771	13,257	105,497	136,568	107,268	149,825
Wood and Wood Products	DD	5	5	2,473	21,816	2,478	21,821
TOTAL		**167,406**	**243,754**	**4,243,900**	**7,410,982**	**4,411,306**	**7,654,736**

Reported industrial waste arisings were also categorised according to the codings provided in the European Waste Catalogue (EWC) and Hazardous Waste List (HWL). The EWC/HWL provides a detailed breakdown of waste types together with information about the processes and activities from which the waste types arose. Hazardous and non-hazardous industrial waste arisings categorised by the main headings in the EWC and HWL are presented in Table 3.13. Only reported quantities are listed because the scale-up methodology used in the study did not extend to the projection of quantities for individual waste types. A detailed breakdown of reported industrial wastes categorised according to the EWC and HWL is provided in Appendix B.

It is intended that the NACE classification system and the EWC/HWL coding system will be used in future for classification of all waste arisings and disposal/recovery activities. A separate document detailing how the EWC/HWL is being applied in Ireland is being published in parallel with this report.

Table 3.13: Reported Hazardous and Non-Hazardous Industrial Waste Arisings in Ireland Categorised According to the European Waste Catalogue (EWC) and Hazardous Waste List (HWL)

EWC/HWL MAIN CATEGORIES		HAZARDOUS	NON-HAZARDOUS
		(tonnes/annum)	
01 00 00	waste resulting from exploration, mining, dressing and further treatment of minerals and quarry		2,341,497
02 00 00	waste from agriculture, horticulture, hunting, fishing and aquaculture primary production, food preparation and processing		331,031
03 00 00	waste from wood processing and the production of paper, cardboard, pulp, panels and furniture	14	70,091
04 00 00	wastes from the leather and textile industries		25,801
05 00 00	wastes from petroleum refining, natural gas purification, and pyrolytic treatment of coal	6,000	1,291
06 00 00	wastes from inorganic chemical processes	8,701	37,485
07 00 00	wastes from organic chemical processes	140,793	67,958
08 00 00	wastes from the MFSU of coatings, adhesive, sealants and printing inks	1	53
09 00 00	wastes from the photographic industry	0	0
10 00 00	inorganic wastes from thermal processes	36	591,109
11 00 00	inorganic waste with metals from metal treatment and the coating of metals; non-ferrous hydrometallurgy	1,071	3,302
12 00 00	wastes from shaping and surface treatment of metals and plastics	197	9,438
13 00 00	oil wastes (except 05 00 00 and 12 00 00)	2,740	
14 00 00	wastes from organic substances employed as solvents (except 07 00 00 and 08 00 00)	3,465	
15 00 00	packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified		39,688
16 00 00	waste not otherwise specified in the catalogue	250	17,909
17 00 00	construction and demolition waste (including road construction)	473	561,819
18 00 00	wastes from human or animal health care and/or related research (excluding kitchen and restaurant wastes which do not arise from immediate health care)	1	
19 00 00	wastes from waste treatment facilities, off-site wastewater treatment plants and the water industry	3,274	82,971
20 00 00	municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions	389	62,457
TOTAL		**167,406**	**4,243,900**

DISPOSAL AND RECOVERY ROUTES

The disposal and recovery routes for total reported hazardous and non-hazardous industrial waste are summarised in Table 3.14 and illustrated in Figure 3.9. In total, 3,645,600 tonnes (82.6 %) were disposed of through various routes, principally landfill, with 762,483 tonnes (17.3 %) recovered. A summary of disposal/recovery practices for each industrial sector is presented in Table 3.15.

Table 3.14: Summary of Major Disposal/Recovery Routes for Reported Industrial Waste in Ireland

DISPOSAL/RECOVERY ROUTE	tonnes/annum	(%)
Landfill	3,197,247	72.5
Disposal to Inland Waters	38,281	0.9
Disposal to Sea and Oceans	166,545	3.8
Biological Treatment	60,522	1.4
Physico-Chemical Treatment	7,664	0.2
Incineration	35,915	0.8
Other Disposal	139,426	3.2
Total Disposal	**3,645,600**	**82.6**
Re-Use	156,859	3.6
Re-Use as Fuel	62,798	1.4
Solvent Recovery	57,233	1.3
Organic Material Recovery	84,734	1.9
Metal Recovery	12,828	0.3
Inorganic Material Recovery	31,576	0.7
Oil Re-refining/Re-Use	7,936	0.2
Other Recovery	348,519	7.9
Total Recovery	**762,483**	**17.3**
Unspecified	**3,223**	**0.1**
Total	**4,411,306**	**100**

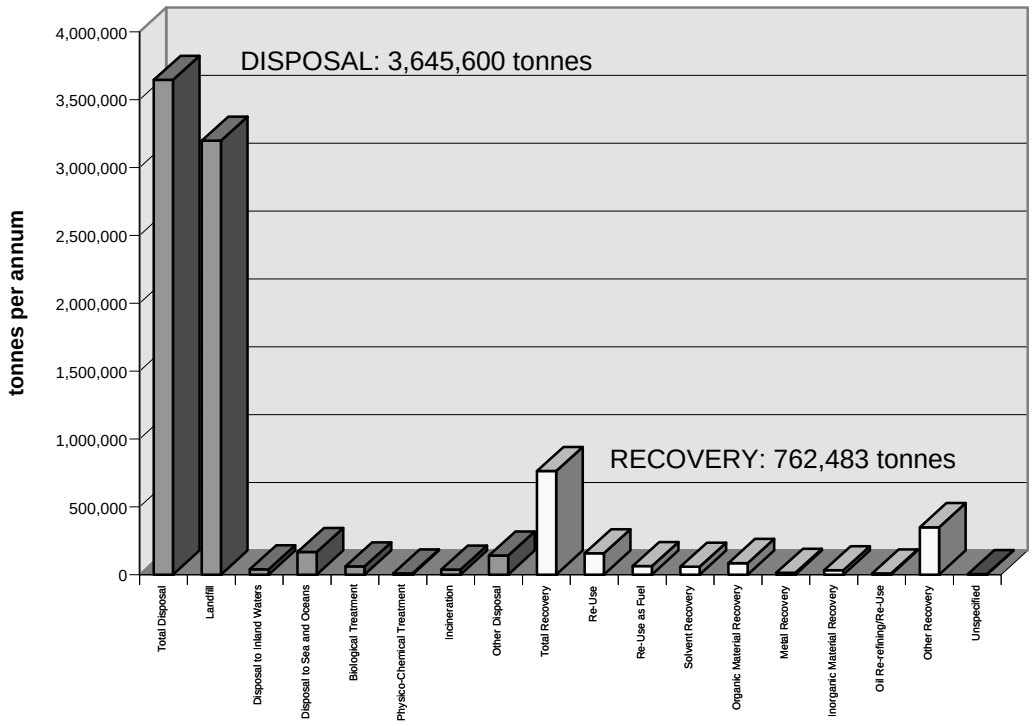

Figure 3.9: Summary of Disposal and Recovery Routes for Reported Industrial Waste Arisings

Table 3.15: Disposal/Recovery Practices in Each Industrial Sector Surveyed

SECTOR	NACE code	DISPOSAL		RECOVERY		OTHER	
		tonnes/annum	(%)	tonnes/annum	(%)	tonnes/annum	(%)
Basic Metals and Fabricated Metal Products	**DJ**	60,082	86.3	9,563	13.7		
Chemicals, Chemical Products and Man-Made Fibres	**DG**	149,209	55.2	121,029	44.8	216	0.1
Coke, Refined Petroleum Products and Nuclear Fuel	**DF**	3,566	34.1	6,901	65.9		
Construction	**F**	152,090	35.1	280,764	64.7	824	0.2
Electrical and Optical Equipment	**DL**	16,125	70.1	6,607	28.7	281	1.2
Electricity, Gas and Water Supply	**E**	262,540	81.2	60,746	18.8		
Food Products; Beverages and Tobacco	**DA**	215,844	60.2	142,011	39.6	573	0.2
Leather and Leather Products	**DC**	4,930	45.5	5,901	54.6		
Machinery and Equipment not elsewhere classified.	**DK**	15,039	96.2	525	3.4	72	0.5
Manufacturing not elsewhere classified.	**DN**	265	27.5	560	58.3	137	14.2
Mining and Quarrying	**C**	2,200,002	100.0	2			
Other Non-Metallic Mineral Products	**DI**	401,741	90.4	42,336	9.5	534	0.1
Pulp, Paper and Paper Products; Printing and Publishing	**DE**	16,291	20.3	63,843	79.7		
Rubber and Plastic Products	**DH**	23,463	81.6	5,264	18.3	26	0.1
Textiles and Textile Products	**DB**	10,741	51.6	9,806	47.1	277	1.3
Transport Equipment	**DM**	5	50.0	5	50.0		
Transport, Storage and Communication	**I**	106,295	99.1	953	0.9	21	0.0
Wood and Wood Products	**DD**	865	34.9	1,608	64.9	5	0.2
Unspecified		6,506	60.0	4,060	37.5	272	2.5
TOTAL		**3,645,600**	**82.6**	**762,483**	**17.3**	**3,223**	**0.1**

A detailed breakdown of disposal/recovery practices for each sector is provided in Appendix B.

DISPOSAL/RECOVERY OF HAZARDOUS WASTE

The total reported quantity of hazardous waste is 167,506 tonnes per annum, giving rise to projected annual quantities of 243,754 tonnes. A breakdown of hazardous waste arisings by industry sector and European Waste Catalogue/Hazardous Waste List codings was presented in Tables 3.11 and 3.12 above. Disposal and recovery routes are summarised in Table 3.16. Of the reported hazardous waste arisings, 57.4% is disposed of by various routes, with incineration and biological treatment being the main routes of disposal. The recovery rate for reported hazardous waste arisings is 42.5%. Over ninety per cent (90.2%) of reported hazardous waste is treated in Ireland with 78.2% treated on-site and 12.0% treated off-site.

Table 3.16: Disposal and Recovery Routes for Hazardous Waste

DISPOSAL/RECOVERY ROUTE	REPORTED QUANTITIES		PROJECTED QUANTITIES	
	tonnes/annum	(%)	tonnes/annum	(%)
Landfill	3,352	2.0	4,881	2.0
Incineration	31,326	18.7	45,613	18.7
Biological Treatment	43,531	26.0	63,384	26.0
Physico-Chemical Treatment	4,949	3.0	7,206	3.0
Other Disposal	12,920	7.7	18,812	7.7
Sub-Total Disposal	**96,078**	**57.4**	**139,896**	**57.4**
Re-Use	1,993	1.2	2,903	1.2
Recovery/Recycling	69,077	41.3	100,581	41.3
Sub-Total Recovery	**71,070**	**42.5**	**103,484**	**42.5**
Unspecified	257	0.1	374	0.1
TOTAL	**167,405**	**100**	**243,754**	**100**

It should be noted that the treatment options used in the industrial questionnaire have been grouped into the more general categories used above based on the definitions shown below:-

Landfill A system designed and constructed to contain discarded waste so as to minimise the release of contaminants to the environment.

Incineration The controlled high temperature oxidation of primarily organic compounds to produce carbon dioxide and water.

Biological Treatment The degradation of organic waste by the action of micro-organisms, resulting in either biotransformation (the simplification of an organic compound to a daughter compound) or mineralisation (the complete breakdown of organic molecules into cellular mass, carbon dioxide, water and inert inorganic residuals).

Chemical Treatment The use of chemical reactions to effect transformation of hazardous waste streams into less hazardous substances.

Physical Treatment Physical treatment covers a wide range of separation techniques which may be used in isolation or in conjunction with other treatment technologies as pre- or post-treatment.

Other Disposal Any of the other methods of disposal set out in Schedule III of the Waste Management Act.

Re-Use The re-use of a material in its current physical and chemical form without further treatment or other transformation.

Recovery/Recycling The production of a re-usable material or capturable energy by the use of any of a number of treatment/transformation processes.

4. PRIORITY WASTE STREAMS

INTRODUCTION

The European Council Directive Resolution adopted in Dublin on 7 May 1990 on Waste Policy Management (OJ 1990, C122/2) considered it desirable to establish programmes for particular types of waste and invited the Commission to present proposals for action at community level.

In 1991 the Commission initiated its programme on Priority Waste Streams. Project Groups were established to determine solutions for the following waste streams; Used Car Tyres, End of Life Vehicles, Construction and Demolition Waste, Waste from Electric and Electronic Equipment, Healthcare Waste, and Chlorinated Solvents. Each group comprised representatives of all member states and industrial sectors as well as EU personnel.

The European Council have also adopted a number of Directives to deal with the environmental effects of certain products when they become waste. These include packaging and packaging waste, batteries and accumulators, PCBs, and waste oils.

This chapter summarises the current situation in both Europe and Ireland for each of the priority waste streams.

BATTERIES

DEFINITION

Battery or accumulator means a source of electrical energy generated by direct conversion of chemical energy and consisting of one or more primary (non-rechargeable, e.g. alkaline manganese) batteries or secondary (rechargeable, e.g. lead acid, nickel-cadmium) cells.

EU SITUATION

On 18 March 1991 the European Council adopted Directive 91/157/EEC on Batteries and Accumulators containing certain dangerous substances. This Directive establishes:

- a marketing ban on batteries and accumulators with a heavy metal content;
- that Member States must take measures to ensure that spent batteries and accumulators are recovered and disposed of in a controlled manner by drawing up prevention programmes and programmes to collect the batteries and accumulators referred to in the Annex of the Directive; and
- the marking of the batteries and accumulators referred to in the Annex (Commission Directive 93/86/EEC of 4 October 1993 refers to markings).

CURRENT SITUATION IN IRELAND

The European Communities (Batteries and Accumulators) Regulations 1994 (SI No. 262 of 1994) gives effect to Council Directive 91/157/EEC and to Commission Directive 93/86/EEC on batteries and accumulators containing dangerous substances. The Regulations require that certain batteries and accumulators should not be incorporated into appliances unless they can be readily removed. They also require the marking of certain batteries and accumulators in relation to heavy metal content, safe removal, recyclability and separate collection.

The majority of batteries used here are imported into Ireland. There is only one known manufacturer of batteries in Ireland, Unicorn, which manufactures lead acid batteries.

At present, there is no statutory control over the recycling process of batteries in Ireland. While batteries are collected and "scrapped" as a commercial enterprise by companies, it is accepted that this is done to salvage the lead content for resale.

The carcasses of batteries are sometimes disposed of by burning thereby releasing into the environment potentially harmful by-products. Thus, there is a need for a systematic and controlled disposal/recycling system.

TYPES OF BATTERIES USED IN IRELAND

Batteries in Ireland can be classified into three categories:

Industrial:

- stand by power e.g. starting engines, emergency lighting, computer backup, telecommunication (lead acid, Ni - Cd);
- traction e.g. electrical vehicles, leisure vehicles (mainly lead acid);

Automotive:

- it is estimated that approximately 99.9% of batteries for starting engines are lead acid type;

Consumer:

- batteries for portable phones, hearing aids etc.

The Society of the Irish Motor Industry (SIMI) in conjunction with battery importers and distributors of automotive batteries have submitted a proposal to the Department of the Environment to deal with the disposal of spent batteries. The proposal is for a pilot scheme in the Greater Dublin Area with the provision of a number of collection depots for batteries. It is hoped that the industry will be able to feed used batteries from other parts of the country into this catchment.

Statoil is promoting recycling and has multimaterial collection points at a number of its garages. These consist of a number of containers for the collection of different materials from batteries which are then delivered to Hammond Lane.

QUANTITIES OF BATTERIES ARISING IN IRELAND

The quantity of batteries available has been calculated from CSO import/export data. A summary of the data is presented in Table 4.1. All the major battery importers/distributors were also sent a questionnaire requesting relevant information. A response rate of approximately 14% was achieved.

Lead batteries account for the greatest quantity arising. This could be due to either a combination of an increase in the number of cars and industrial growth (with an increase in the use of lead batteries), or, alternatively, it may be due to a change made in the CSO coding system between 1992 and 1993.

Table 4.1 Summary of Batteries Arising in Ireland

Battery Type	Quantity of batteries in tonnes per annum						
	1990	**1991**	**1992**	**1993**	**1994**	**1995***	**Average**
Lead	2594.7	2675.2	782.4	3644.2	4480.8	5912.3	3348.3
Ni - Cd	140.2	193.4	306.4	306.3	-494.1	-415.4	6.1**
Mercury Oxide	-19.8	0.3	13.7	7.5	3.1	3.3	1.3**
Alkaline	567.3	659.8	1226.8	828.9	573.1	495.3	725.2
Other	2915.4	2807.4	3790.3	1585.7	1781.4	1531.0	2401.9
Total	**6197.8**	**6336.1**	**6119.5**	**6372.7**	**6344.2**	**7526.5**	**6482.8**

Source: CSO data
* Projected figures for 1995 using available data.
** Average figures are low due to a negative balance between import and export CSO data.

TYRES

EU SITUATION

An estimated 1,955,000 tonnes of used tyres arise each year in the Community. About 46% of the total tyres used are disposed of to landfill. The Commission in its 1993 Report on the Priority Waste Stream of used tyres proposed a strategy to phase out the disposal of tyres in landfill by the year 2000, and to phase out their incineration in the absence of energy recovery (European Commission, 1993). To achieve this would require:

- reducing the number of used tyres through preventative measures in the field of tyre maintenance;
- increasing the retreading of used tyres from 20% in 1990 to 25% by the year 2000; and
- recovering at least 65% of discarded used tyres by the year 2000 (against 30% in 1990).

A process of pyrolysis (incineration without oxygen) is being evaluated for waste tyres in the United Kingdom and some other EU countries.

CURRENT SITUATION IN IRELAND

Two companies manufacture tyres within Ireland, Semperit Ireland which manufactures car tyres, and Capwell Industries Ltd., which manufactures solid rubber tyres. There are a large number of distribution outlets importing all types of tyres. The Semperit plant was visited as part of the study and it was learned that a company called Greenstar based at Sandyford Co. Dublin recycle tyres in a compound within the Semperit factory.

Currently there are no proposed or planned methods for the disposal of tyres in Ireland. Until recently, the disposal of tyres was not perceived to be a problem, with farmers willing to take large numbers of tyres for the covering of silage pits. However, with farmers having accumulated the quantities they need and as the trend is towards baling of silage which does not require tyres as a cover material, it is forecast that there will be a difficulty in disposal in the future.

Capwell Industries Ltd, which manufacture solid rubber tyres for wheelbarrows etc., uses strippings from retreaded tyres to make 'crumb' which is then used as a filler for its own products. The firm does not believe it is viable to produce crumb from rubber tyres other than the strippings and cites a number of reasons for this situation: the cost of synthetic rubber is low and tyres usually have steel radially within them which renders them difficult to reprocess.

TYRE COMPOSITION

Tyres are made from natural rubber (truck tyres) or artificial rubber (car tyres). Average composition of a car tyre includes rubber hydrocarbon (48%), carbon black (22%), steel (15%), textile (5%), zinc oxide (1.2%) and sulphur (1%). Once treated with sulphur they are immune to breakdown from bacteria so that when disposed of in landfills, they remain intact for decades (EEA, 1995)

QUANTITY OF TYRES ARISING IN IRELAND

Waste tyre arisings were estimated from import/export data (CSO) and information supplied by Semperit. A summary of quantities arising is presented in Table 4.2. This includes new, retreaded and used tyres, based on the tyre replacement market. Using this data an average quantity of 20,551 tonnes of used tyres arose per year over the last six years.

The average number of new replacement car tyres over the past six years is approximately 1.22 million or 9146 tonnes/annum. Data available for the last three years show an average replacement rate of 0.04 million or 534 tonnnes/annum per year for retreaded car tyres. Over the last three to four years the number of car tyres arising as waste based on the replacement market is therefore greater than 1.2 million per annum.

The Irish Tyre Distributor's Association estimates approximately 0.8 million car tyres arising as waste per annum.

Table 4.2 Summary of Tyres Arising in Ireland

Vehicle	Quantities of Tyres (tonnes per annum)						
	1990	1991	1992	1993	1994	1995*	Average
Car	7948	7742	10512	8872	11371	8430	9146
Bus/lorry	6674	5232	6428	5095	6174	8208	6302
Aircraft		190	120	46	15		93
Motorcycle			43	125	37	67	68
Bicycle	189	128	127	124	97	86	125
Agric/civil	2861	3100	3231	2391	4321	4003	3318
Other	1354	1099	3393	1013	1516	941	1553
Total	**19026**	**17491**	**23854**	**17666**	**23531**	**21735**	**20551**

Source : CSO data and Semperit Ireland Ltd.

* Represents projected figures for 1995 using available data.

Notes :

1. Tyre quantities given for specific vehicle types are quanitities of new replacement tyres.
2. 'Other' quantities consists of retreaded and used tyres and is calculated as the balance between CSO import and export data for these categories.

REMARKS

Currently, used tyres are not a major problem in Ireland, with farmers utilising them as cover for silage pits. Problems could occur in the near future as farmers reach the supply they need and also with the increasing trend towards silage bales which do not require tyres for cover. Tyres can pose a serious fire risk if not stored in proper conditions.

RECOMMENDATIONS

- Traditionally, tyres have been used as an initial cushion to protect landfill liner systems. However, their general disposal in the body of landfills is not favoured by the EU Project Group on waste tyres. Therefore, the landfilling of tyres should be limited, particularly in the case of whole tyres, because a

large mass of them is structurally unstable and because of the risk of fire. They are also slow to decompose and have a tendency to work to the surface as a result of buoyancy due to trapped air.

- Possible ways in which used tyres can be recovered in future in Ireland should be reviewed together with their collection and methods of disposal. The re-use of tyres by retreading should be encouraged where possible. The viability and acceptability of energy recovery technologies should also be assessed.

END OF LIFE VEHICLES

EU SITUATION

The EU Project Group on end of life vehicles submitted its report to the European Commission in March 1994. The Group's strategy in the short term is based on the integration of collection activities and the processing of end of life vehicles in networks which tackle both aspects. The long term strategy is for new vehicles coming onto the market to be designed for easier recovery. The Commission is currently preparing a draft Directive on end of life vehicles.

CURRENT SITUATION IN IRELAND

Currently there are two shredding plants in Ireland dealing with end of life vehicles, one based in Cork the other in Dublin. A site visit was undertaken to the Hammond Lane works to observe the handling of this priority waste stream. The majority of end of life vehicles collected throughout Ireland are brought to these plants for processing. The Cork company has a mobile crusher. These two companies usually collect end of life vehicles from other scrap merchants, who crush them for transport purposes, and from local authorities. Other companies which crush end of life vehicles normally crush other waste scrap with it such as white goods. This creates a problem when trying to quantify individual waste streams. In most local authority areas, citizens are encouraged to bring end of life vehicles to a local authority landfill site or other designated area such as a scrapyard.

COMPONENTS OF END OF LIFE VEHICLES

A typical car unit for disposal designed in the 1980's would consist of approximately 66.3% steel and 3% non ferrous metals. The remaining 30.7% is composed of a combination of plastics (4.4%), glass (3.6%), rubber (3.5%), textile and carpets (6.2%), electrics (2.4%), fluids (4.8%) and other materials (5.7%) (HMSO, 1995). Since the composition is high in steel, the recovery of 'end of life' vehicles is very dependent on the steel industry for a market. Currently approximately 75% of a car unit is recycled. Plastic and glass have a poor recovery record, but their use in cars has reduced fuel consumption and production costs. Plastic recovery is difficult because there are a number of different grades of plastic used in vehicle design. Vehicle designers are now designing their products to be more easily dismantled by reducing the range of plastics used. In line with the long term strategy reported by the EU Project Group, EU manufacturers are trying to use only one grade of plastic to make it easier to segregate (*Chemical Week* - Special Supplement Recycling Breathing Life into Waste, 31 January 1996).

QUANTITIES OF 'END OF LIFE' VEHICLES ARISING IN IRELAND

The quantity of end of life vehicles can be estimated from the replacement market by assuming that the same number of vehicles were scrapped. The Society of Irish Motor Industry (SIMI) reports that 86,924 new passenger cars, 13,410 new light commercial vehicles, and 2,963 new heavy commercial vehicles were purchased in 1995. Hammond Lane estimates that one car unit for waste weighs about 0.6 tonnes. Taking replacement cars only, this would give an estimated waste quantity for end of life cars of 52,154 tonnes per annum. The number of end of life vehicles is expected to increase due to the introduction of the Government's car scrappage scheme. From July to December 1995 this scheme resulted in 5,300 cars being scrapped. Up to mid-February, 1996 this number had increased to 7,843 (Revenue Commissioners, personal communication). Ten scrappage dealers have been licensed to deal with the scrappage of these vehicles.

LOCAL AUTHORITY INFORMATION

When a vehicle is deemed waste by its owner it is usual for the logbook to be returned to the nearest motor tax office. This office then sends the logbook to the local authority. It should be possible to update the local authority database on end of life vehicles using this information.

RECOMMENDATIONS

- There is a need for better statistical information in this area. All scrap merchants who collect end of life vehicles should be obliged to keep records of the number scrapped and the quantity of material which is recovered and disposed of.

ELECTRICAL/ELECTRONIC EQUIPMENT WASTE

DEFINITION OF ELECTRICAL/ELECTRONIC EQUIPMENT WASTE

Electrical and Electronic Equipment is equipment using electricity or through which electricity flows, and/or which contains an electronic circuit, i.e. a circuit with active and/or passive components (Priority Waste Stream Project Group (1995), Report to EU on Waste from Electrical and Electronic Equipment).

EU SITUATION

The group responsible for the "Priority Waste Stream Programme" of Electrical and Electronic Equipment Waste submitted its results to the European Commission in July 1995. The general aim of the project is to reduce the amount of residues disposed of, to recover valuable raw materials and energy, and to produce a design for equipment which facilitates environmentally sound management in the waste phase. The group drew up the following lists, which can be added to or subtracted from in the future, for electric/electronic equipment.

List of equipment included:

- data processing equipment,
- office and service equipment,
- telecommunications equipment,
- video and sound equipment,
- household appliances,
- medical equipment/systems,
- light sources,
- equipment for hotels, restaurants and cafes,
- cables (insulated), including those associated with or incorporated in equipment,
- automatic dispensers,
- monitoring and control instruments (industrial and professional),
- toys.

List of equipment excluded:

- equipment operating above 500 volt supply,
- transport equipment,
- military equipment (excluded under the Treaty of Rome),
- energy production equipment (except transmission equipment),
- any products already dealt with under other priority waste streams,
- consumables (such as toner cartridges, magnetic tapes and disks).

IRISH SITUATION

Lines of inquiry into this priority waste stream included analysis of results from industrial waste questionnaires, local authorities' household waste surveys, waste contractors, recycling organisation questionnaires, and contact with the major equipment distributors in Ireland.

In general, the response from contact with consumer goods distributors indicated that for this sector the amount of work being carried out with this type of electrical and electronic equipment waste was negligible. In most cases, it was not known how this equipment waste was being disposed of with the general assumption that the customer was disposing of it to landfill.

Multis, a recycling company based in Galway, reconstitute computer systems whereby it collects products and tries to find a secondary use for them. Approximately 90% of its source material comes from the United Kingdom with the other 10% coming from Ireland. Multis has distribution outlets in Spain/France/Germany. The company has a waste management hierarchy which is similar to that used by Siemens Nixdorf in Germany (EMI, 1996) and is as follows:

- reuse of system (product recycling): depends on the suitability of the returned system for upgradeability or conversion;
- reuse of components (material recycling): use of individual component parts of the system;
- recycling of secondary raw materials: recycle valuable substances as secondary raw materials, the functionality is lost but the original material is preserved.

Another company Greenstar, based at Sandyford Co. Dublin, recovers and recycles electronic equipment at the Intel factory at Leixlip.

ELECTRICAL/ELECTRONIC EQUIPMENT WASTE BY SECTOR

Electrical/electronic equipment waste can be placed into a number of different product sectors. One of the recommendations made by the EU Project Group was that waste minimisation should work on a sector - specific basis. Sectors could include:

- IT equipment,
- household equipment (white goods),
- consumer electronics (brown goods),
- medical equipment,
- telecommunications,
- light sources,
- cables,
- monitoring and control instruments,
- toys.

It is possible to recycle between 80 and 90% of end of life equipment in the IT sector. Siemens Nixdorf stated that it currently has a recycling rate of 86% in Germany alone.

COMPONENTS OF ELECTRICAL/ELECTRONIC EQUIPMENT (EEE) WASTE

It is usual, when dealing with the physical composition of EEE waste, to examine four main categories (Priority Waste Stream Project Group (1995), Report to EU on Waste from Electrical and Electronic Equipment):

- ferrous metals: the largest fraction of EEE by weight e.g., “equipment for hotels, restaurants and cafes”, “offices and services”, “medical equipment”;
- non ferrous metals e.g., “cables” (copper accounts for 2/3 of non ferrous metals in EEE waste; aluminium is also important; heavy metals account for about 3% of non ferrous metals);
- glass e.g., “video and sound equipment”, “data processing equipment”;
- plastics: according to various sources this accounts for 12-20% of the EEE waste e.g., “telecommunications” and “household appliances”.

QUANTITIES OF ELECTRICAL/ELECTRONIC EQUIPMENT WASTE ARISING IN IRELAND

It is suggested that there are approximately 49,000 tonnes of electrical/electronic equipment waste arising in Ireland (EU estimate for Ireland).

It is expected that many recycling organisations involved in the scrap metal business obtain electrical and electronic equipment waste as ferrous and non ferrous metals which together represent the largest fraction of this type of waste. This would not be identified as electrical and electronic equipment waste but as scrap metal. In particular, metal from a large number of ‘white goods’ is recovered in this way

REMARKS

From contacting scrap dealers it is apparent that there is a problem quantifying end of life electrical/electronic equipment. This is mainly due to the fact that ‘white goods’ e.g. fridges, cookers, washing machines, are scrapped and crushed without records being kept. The resulting scrap metal is also mixed with other scrap metals for further processing.

Due to the number and form of the electric and electronic equipment products used, waste management developments will be gradual. Items now arising for disposal were not designed with recovery in mind and it will take some time before any such redesigned items arise as waste.

RECOMMENDATIONS

- To develop a detailed strategy, a number of trials similar to those being carried out in the United Kingdom should be undertaken.
- A landfill prohibition on ‘white goods’ may be useful to divert waste more easily to recovery and encourage retailers to seek recovery outlets.
- Manufacturers might consider contracting recycling companies to collect and dispose of their end of life electrical and electronic equipment waste.

CONSTRUCTION / DEMOLITION WASTE

DEFINITION OF CONSTRUCTION AND DEMOLITION WASTE

Construction and demolition waste is taken to include all waste which arises from construction, renovation and demolition activities. This includes waste, surplus and damaged products and materials arising at construction works or used temporarily during the on-site activities (Priority Waste Stream Project Group 1995, Report to EU on Waste from Construction and Demolition).

EU SITUATION

The Project Group responsible for construction and demolition waste submitted its Report to the EU in April, 1995. The general aim of this project was to reduce the amount of such waste disposed of in landfills and give priority to the reuse or recycling of raw materials.

IRISH SITUATION

As an industrial sector, the construction/demolition industry is one of the largest producers of waste in Ireland. Construction/demolition waste arises mainly from construction/demolition contractors but a number of the other industrial sectors also produce this type of waste and dispose of it through recycling/waste contractors.

In general, the operators dealing with this waste stream keep no records of quantities or types arising. The majority of local authority run landfill sites allow the disposal of this type of waste without a record of it being kept.

Currently most construction/demolition contractors involved with this waste will remove it to the cheapest available location. Cost is of primary importance and normally the quicker the waste material can be moved from site the better. Most construction/demolition jobs are competitively priced and do not provide for the segregation of waste at source or at a later stage.

Lines of inquiry into this waste stream concentrated on the construction/demolition industry and waste contractors. The response rate to the industrial waste questionnaire amongst this sector was 11%. In order to achieve this moderate response, a follow-up call was made to contractors where more than 40 persons were employed. In most cases, waste quantity records were not available, as they were not recorded, with the general response being that operators place material where they can in order to keep costs down. Construction/demolition contractors using skips indicated a general lack of knowledge as to what type of material was being placed in the skips.

COMPONENTS AND EWC CLASSIFICATION OF CONSTRUCTION AND DEMOLITION WASTE

The European Waste Catalogue (EWC) lists construction and demolition waste in section 17 00 00. The EWC should be used as the cataloguing system for future construction and demolition waste management planning, as recommended in the draft report to the EU by the Project Group on this waste stream.

Construction and demolition wastes vary greatly in their composition depending on the type of construction/demolition activity and its location. Soil and stones usually form the greatest portion of this waste stream, on average some 45% (*Warmer Bulletin* No. 47, Nov. 95). The construction and demolition waste composition survey carried out as part of the present study revealed soil and stones accounting for 51% of the material sampled. The results of this survey are presented in Appendix D.

QUANTITIES OF CONSTRUCTION / DEMOLITION WASTE ARISING IN IRELAND

The reported quantity of construction/demolition waste arising was 0.56 million tonnes per annum, which when projected using the scale-up procedure described in Chapter Two, gives an estimated national figure of 1.52 million tonnes per annum which is equivalent to 0.43 tonnes per capita per annum.

Questionnaires returned from waste contractors indicated a quantity of 285,300 tonnes per annum with only 1.2% of this being recycled. As only a small number of the waste contractors dealing with this waste stream returned questionnaires this quantity must be regarded as a small portion of that being handled by such operators. The waste contractors that responded to the survey mainly classified the waste as mixed construction and demolition waste.

Previous studies indicated construction and demolition waste arisings in Ireland to be in the region of 2.5 million tonnes in 1990 (European Demolition Association, 1992) and 0.2 million tonnes by Environmental Research Limited (ERL) in 1980.

DISPOSAL OF CONSTRUCTION/DEMOLITION WASTE IN IRELAND

A significant proportion of construction and demolition waste, estimated to be in the region of 0.87 million tonnes (57% of the total projected arisings) per annum is disposed of to landfill. This includes many wastes which are potentially recoverable. It is estimated that soil and stones account for approximately 36 % of this total.

A number of local authorities in Ireland allow construction and demolition waste into landfill without recording it. Operators involved with construction/demolition waste rarely separate the waste.

PREVENTION/RECOVERY/REUSE

It is estimated that approximately 0.53 million tonnes (35% of total projected arisings) of construction and demolition waste is currently recovered. Soil and stones are estimated to account for about 97% of this total.

Construction and demolition wastes can be minimised by ensuring that correct quantities of material are ordered. Better co-ordination between service providers (e.g. water, electricity) can result in the avoidance of unnecessary excavation. Reuse of material on-site can also be a primary means of preventing the generation of construction and demolition waste. Examples of reuse of construction/demolition waste include landfill engineering (construction of site roads and cells to receive other waste) and restoration of mineral extraction sites.

The limitations on reuse and recycling of construction and demolition waste include (*Warmer Bulletin*, 1995):

- a need for predictable and consistent performance from materials such as concrete (i.e. quality control);
- inconsistency of materials or unreliability of supply with wastes coming from different sources and containing different materials in different proportions;
- contamination of materials e.g., soils contaminated by previous site uses.

Treatment and recycling of construction and demolition waste is a key task when aiming at the preservation of natural resources and disposal capacity. One method to achieve recycling of this type of waste would be to have processing sites at central locations in the largest cities and towns which would take in unsorted loads of construction/demolition wastes from sites within the area. These processing sites should be capable of consistently producing graded materials to exact specifications. An advantage of such processing facilities is that they can take quantities from a variety of sources and therefore would be more likely to be able to meet the demands of consistency of supply and quality control required by construction contracts. This type of operation is carried out in Denmark, the Netherlands and increasingly in the United Kingdom.

COMMENTS ON SURVEY RESPONSES

Survey results from both the industrial waste questionnaire (31% of the projected total) and the waste contractors' questionnaire (99% of the returned totals) would suggest that the EWC coding *"17 07 01 - Mixed construction and demolition waste"* would need to be modified. The coding needs to be more specific

so that the waste can be described in sufficient detail to allow decisions to be made in the management of construction and demolition waste.

RECOMMENDATIONS

- Construction/demolition waste should be considered a priority waste stream in Ireland with potential for increases in recycling quantities. It is 'priority' due to its volume, its resource value, lack of facilities for recovery, its unregulated status and general unsightliness where random or indiscriminate disposal arises.
- The viability of processing plants at centralised locations should be assessed.
- Operators should record all incoming waste into landfill including construction/demolition waste.
- Legislation to regulate the disposal/recycling of material arising from future construction/demolition developments might be introduced.
- Greater use should be made of return and collect systems for construction and demolition waste in the larger urban areas.
- Waste and landfill operators dealing with construction/demolition waste should have to quantify and identify the waste according to EWC codes.
- EWC code "17 07 01 - Mixed construction and demolition waste" should be modified to allow the waste to be identified in greater detail.
- Recovery targets should be set for each of the sub-classifications of construction and demolition waste based on what is technically feasible using Best Available Techniques Not Entailing Excessive Costs (BATNEEC).

WASTE OILS

DEFINITION

Waste oil means any mineral-based lubrication or industrial oil which has become unfit for the use for which it were originally intended, and in particular used combustion engine oils and gearbox oils, and also mineral lubricating oils, oils for turbines and hydraulic oils (Council Directive 87/101/EEC).

EU DIRECTIVES

Council Directive 87/101/EEC amending Directive 75/439/EEC establishes that Member States shall take the necessary measures to ensure that waste oils are collected and disposed of without causing any avoidable damage to man and the environment. Member States should take the measures necessary to give priority to the processing of waste oil by regeneration provided they respect the more stringent conditions laid down by 87/101/EEC, those being that they do not constitute toxic and dangerous waste (78/319/EEC) under European Communities (Toxic and Dangerous) Regulations 1982; SI No. 33 and that they do not contain PCB/PCT in concentrations greater than 50 ppm.

SITUATION IN IRELAND

The European Communities (Waste Oils) Regulations 1992 (SI No. 399 of 1992) revoke European Communities (Waste Oils) Regulations 1984 (SI No. 107 of 1984). The newer regulations give effect to Council Directive 87/101/EEC amending 75/439/EEC and they make local authorities responsible for the planning, organisation and supervision of collection and disposal operation, in particular through the implementation of a permit system.

Local authorities usually provide oil recycling banks at stand alone and civic amenity centres. There are also a number of recycling centres which cater for oil collection (such as those in Statoil garages). The largest collectors of oil in Ireland are Atlas Oil of Portlaoise and Allied Oil of Dundalk. These companies collect waste oil from three major sources; garages, ships and industrial tank cleaning.

QUANTITIES OF WASTE OIL ARISING IN IRELAND

Results from the industry survey indicated that approximately 17,670 tonnes of waste oil (12 00 00 and 13 00 00 in the EWC) were produced in 1995. A further 19,400 tonnes of oily sludges (05 00 00 in the EWC) are estimated to have arisen in 1995.

The total amount of waste oil collected by Atlas Oil and Allied Oil in 1995 was 15,742 tonnes which is a combination of water and oil. Atlas Oil handled some 13,000 tonnes of waste oil/water from which it recovered approximately 9,150 tonnes. Allied Oil indicated that it recovered about 2,200 tonnes of the oil it collected. This results in a total recovered quantity of 11,350 tonnes, most of which is lubricating oil.

PCB (POLYCHLORINATED BIPHENYLS)

EU SITUATION

EU Directive 76/403/EEC establishes that Member States should take the necessary measures to make mandatory the disposal of waste PCBs or of PCBs in objects or equipment no longer capable of being used. Under the directive, provision should be made for the setting up or designation by Member States of installations, establishments or undertakings to be responsible for the disposal of PCBs. There is a current proposal to replace the existing directive with a new directive to promote better control of the management of PCBs and improve the way in which they are disposed of and replaced.

IRISH SITUATION

The European Communities (Waste) Regulations, 1984 (SI No. 108 of 1984) implement EU Directive 76/403/EEC. These regulations require the holder of waste PCBs or any object or equipment which contains PCBs and which is no longer capable of being used to:

- notify the Minister forthwith of such holding and of the manner in which it is proposed to dispose of it;
- comply with any directions given by the Minister (or other authorised person) in relation to such disposal; and
- if required by the Minister or other authorised person, provide evidence of the manner in which the holding was disposed of .

COMPOSITION AND SOURCES

PCBs are man-made substances made by substituting from one to ten chlorine atoms onto the biphenyl aromatic structure. This substitution can produce 209 different compounds called congeners. These materials do not occur naturally and are extremely resistant to biological degradation (London Waste Regulation Authority, 1995).

These substances have been or are being used in electric and other equipment such as transformers and capacitors where they act as an insulating layer.

QUANTITIES OF PCB WASTE ARISING IN IRELAND

In order to assess the situation in Ireland, the principal contractors were contacted and sent a questionnaire. Replies obtained are insufficient to enable a reliable estimate to be made.

PACKAGING WASTE

DEFINITION

Packaging is defined as any material, container or wrapping, used for or in connection with the containment, transport, handling, protection, promotion, marketing or sale of any product or substance, including such packaging as may be prescribed.

EU SITUATION

EU Directive 94/62/EC on packaging follows the recommended hierarchy of waste management i.e., to prevent, reduce, reuse, recycle and/or to recover waste prior to final disposal. The Directive set targets for the recovery and recycling of packaging materials; for recovery of between 50% and 65% of all packaging waste, and for recycling of between 25% and 45% of all packaging materials contained in packaging waste, with a minimum of 15% for each individual material. The target for Ireland, which received a derogation, is to attain 25% recovery of packaging materials by the year 2000.

The Directive establishes that Member States must take the necessary steps to have return, collection and recovery systems set up so as that the targets set by the Directive can be met.

IRISH SITUATION

In 1994, the Government published a strategy document on recycling of packaging waste materials entitled 'Recycling for Ireland' (Department of the Environment, 1994). At the time, it was estimated that 403,995 tonnes of household/commercial packaging waste arose in Ireland, 10.3% of which was recycled (MCOS, 1994). Based on these figures, the Government set targets for each major category of packaging waste. These targets are listed in Table 4.3.

Table 4.3 Target figures in 'Recycling for Ireland'

Packaging Material	Target Recycling Rate for 1999 (%)
paper	25
glass	55
plastic	25
metals	25
ferrous metal	25
aluminium	25
Total	**33**

Following the publication of the national recycling strategy, the Government invited the Irish Business Employers' Confederation (IBEC) to propose a strategy for the organisation and financing of a voluntary system for recovery/recycling of packaging waste which would achieve the targets required by the Directive. In response to the Government's invitation, IBEC established an Industry Task Force on Recycling which published its strategy for recycling packaging waste in February, 1996 (IBEC, 1996). The Task Force recommends, inter alia:

- an overall target of 25% recycling of packaging waste for the five year period up to 2001. Individual targets for each material should be avoided where possible except where necessary to meet commitments under the EU Directive on Packaging and Packaging Waste;

- the setting up of an industry organisation called REPAK, which will be funded by industry, to co-ordinate the recycling/recovery of industrial packaging waste.

The proposed methods of achieving this level of packaging waste recycling through the industrial/commercial and domestic sectors are:

- **industrial/commercial waste**: enterprises will be obliged to segregate packaging waste into separate material streams; measure and record the tonnage's of packaging waste handled; and ensure its transportation for recycling. REPAK will co-ordinate on a regional basis, the collection, segregation, storage and transport of waste packaging to the appropriate point in the recycling chain;

- **domestic waste**: a combination of 'bring' schemes and 'collect' schemes will be extended and utilised for the recycling of domestic packaging waste. The 'bring' schemes will be similar to those in current use, with a further development of multi-material bring sites, such as that operating in Greystones, Co. Wicklow. Two 'collect' schemes will be operated. Kerbside Dublin will operate its current scheme but extended to 50,000 households while a second proposed 'collect' scheme will be launched in partnership with a local authority or private operator. This is proposed as an integrated collection scheme, where materials will be collected at the same time and using the same vehicles used for the ordinary refuse collection service.

QUANTITIES OF PACKAGING WASTE ARISING IN IRELAND

The estimated total packaging waste arisings in Ireland is approximately 0.64 million tonnes per annum. The breakdown of this quantity is given in Table 4.4. The quantity of household/ commercial packaging in Ireland is now estimated at 435,372 tonnes compared with 403,995 in January 1994, an increase of approximately 3.9% per annum.

Table 4.4 Packaging Waste Arisings in Ireland

Waste Type	Quantity (tonnes/annum)
Household and commercial: *disposed*	367,405
Household and commercial: *recycled*	67,967
Household and commercial: *sub-total*	**435,372**
Non-hazardous industrial: *disposed*	131,954
Non-hazardous Industrial: *recycled*	71,890
Non-hazardous industrial: *sub-total*	**203,844**
TOTAL	**639,216**

ASSESSMENT OF PRIORITY WASTE STREAMS IN IRELAND

It is suggested that the priority waste streams should be classified in terms of the current state of knowledge. A suggested grouping could be as follows:

Group A Packaging
Batteries
PCBs
Waste Oils

Group B Construction/Demolition
Waste Tyres
Electrical/Electronic Equipment

Group C End of Life Vehicles.

The wastes in Group A have already received attention in both EU and Irish contexts. Packaging was one of the main targets of the National Recycling Strategy. IBEC on behalf of industry has responded with its own proposals. It is suggested that in the case of PCBs and waste oils that record keeping and reporting by the contractors involved, in terms of origin and destination of these wastes, should be improved.

Very little information exists at present on the wastes in Group B. Tyres and electrical /electronic equipment are expected to become more problematic in Ireland in future as present disposal outlets are depleted and as a greater volume of electrical/electronic waste is collected for recovery purposes. The high quantities of construction/demolition waste generated annually as revealed by the present study and the recycling value of this waste stream suggest action is required to deal more efficiently with this potentially valuable resource.

End of life vehicles assigned to Group C are adequately handled at present by the parties involved although the records of quantities collected/disposed/recovered could be improved to assist local waste management planning.

Legislation has been implemented in Ireland for waste oils and for waste PCBs. Industry groups involved directly with battery and packaging wastes have proposed strategies to deal with these waste types respectively. There is a general trend in the EU to deal with waste via groups implementing their own strategies voluntarily rather than through government legislation and this approach should be encouraged.

In summary, it is recommended that recovery outlets for packaging waste in the household and commercial sectors be expanded. Construction/demolition waste should be prioritised as the next most important waste stream to be addressed in terms of quantity available and recovery opportunities.

5. OTHER WASTE STREAMS

INTRODUCTION

The other waste streams targeted include healthcare waste, radioactive waste, dredge spoils, agricultural waste and waste from water and waste water treatment facilities. Data for these waste streams were obtained from existing inventories.

HEALTHCARE WASTE

DEFINITION OF HEALTHCARE WASTE

The Department of Health has adopted the definition for healthcare waste, recommended by the EU Project Group for this priority waste stream, as 'the solid or liquid waste arising from healthcare activities'.

COMPONENTS OF HEALTHCARE WASTE

Healthcare waste consists of household hospital waste and healthcare risk waste. Household hospital waste is similar to general domestic type waste such as kitchen wastes, paper and packaging, and poses no greater health risk. Healthcare risk waste is defined as waste coming untreated from any of the following categories of material:

- biological,
- infectious,
- chemical, toxic or pharmaceutical wastes including cytotoxins,
- sharps (e.g. needles, scalpels, sharp broken materials),
- radioactive waste.

QUANTITIES OF HEALTHCARE WASTE ARISING

The Department of Health estimates national healthcare waste arisings to be approximately 20,000 tonnes per annum, with about 4,000 tonnes of this categorised as healthcare risk waste. A recent survey conducted on behalf of hospital waste contractors suggested that approximately 10,000 tonnes of healthcare risk waste are generated by hospitals and other medical institutes (EMI, 1996).

MANAGEMENT OF HEALTHCARE WASTE

The stringent emission levels from incineration plants required by EU legislation has resulted in the closure of a number of hospital incinerators as it was not considered cost effective to upgrade them to comply with the standards. This has led to a situation where a significant quantity of wastes generated by hospitals in Ireland is being exported for safe disposal. There has been considerable pressure on the healthcare sector to find alternative ways of dealing with these wastes.

The Department of Health's policy on healthcare waste is outlined in its document 'Health Services Waste Policy for Ireland' (Department of Health, 1994). The twin primary aims of the policy are to minimise the impact of waste on the environment and to bring about better conditions for those handling waste.

Methods of disposal were evaluated by the Department which concluded that the options are incineration to a high environmental standard or use of other technologies such as shredding and disinfection by microwaves, steam or chemicals. Four regional treatment centres are envisaged, two in Dublin and one each in Cork and Galway, employing one of the treatment technologies, operated by the Health Boards or private contractors.

AGRICULTURAL WASTE

FARM WASTE COMPONENTS

Agricultural waste consists mainly of organic matter such as manure, slurry and silage effluent. Other wastes arising on farms include household waste, soiled water, washings, plastic, fencing, scrap, machinery, waste oil, pesticides and veterinary medicines.

AGRICULTURAL WASTE ARISINGS AND DISPOSAL

Teagasc, based on 1991 agricultural statistics, has calculated the quantity of animal manure's arising from housed livestock to be in the region of 31 million tonnes per annum. Grazing animals produce about 28 million tonnes of this manure during the indoor winter period, with the other 3 million being produced by pigs and poultry.

The sole disposal route for slurries in Ireland is landspreading. When applied to land as a fertiliser in line with soil nutrient requirements, it provides valuable nutrients and organic matter thus allowing farmers to reduce the amount of inorganic fertiliser applied. However, if applied to land in excess of soil nutrient requirements, eutrophication of surface waters through runoff or contamination of groundwater through infiltration can result.

MANAGEMENT OF FARM WASTE

The Farm Relief Service has entered into a franchise agreement with the UK based firm, Farm Films Producers Group Ltd., and is launching a pilot scheme to collect and recycle plastics from farms to deal with the increasing problem of plastic from silage pits and bales.

Farmers are becoming more aware of environmental issues particularly with the introduction of the Rural Environmental Protection Scheme (REPS). This scheme involves the implementation of Council Regulation (EEC) No. 2078/92 and one of its requirements is for farmers to implement a comprehensive waste management plan for the farm and farmyard.

The Department of Agriculture, Food and Forestry has produced a booklet entitled *Control of Farm Pollution, Guidelines and Recommendations*. Teagasc also provides advice and codes of good practice on the correct application of slurry to land.

RADIOACTIVE WASTE

DEFINITION

Radioactive waste is defined as material containing radionuclides (unstable nuclides that emit ionising radiation) for which no further use is envisaged.

REGULATORY BODY

The Radiological Protection Institute of Ireland was established in 1992 under the Radiological Protection Act, 1991. The Institute is the national organisation with regulatory, monitoring and advisory responsibilities in matters pertaining to radioactivity.

One of the Institute's responsibilities is to control by licence the custody, use, manufacture, importation, transportation, distribution, exportation and disposal of radioactive substances, irradiating apparatus and other sources of radiation.

DISUSED SEALED RADIOACTIVE SOURCES

The total number of sealed sources in storage is approximately 7600, with an associated nominal activity (activity in a given quantity of material is the number of spontaneous nuclear disintegration's occurring per unit time, it is measured in Becquerels (Bq) with 1 Bq equal to 1 disintegration per second) of 4737

Gigabecquerels (Gbq). Since many of the sources have decayed substantially the current activity is estimated as 2216 Gbq. The sources are stored in some 70 different locations throughout the country. The most abundant cores in storage are molybdenum-99 (Mo-99) cores of technetium-99m (Tc-99m) generators. Tc-99m are the most widely used radionuclide in nuclear medicine (Radiological Protection Institute, 1994).

UNSEALED RADIOACTIVE SOURCES

The 1988 report by the Nuclear Energy Board reported that there were some 33 main users of unsealed sources, including radiotherapy and nuclear medicine departments of hospitals and certain laboratories located in hospitals, third level education establishments and commercial enterprises. Nuclear medicine and radiotherapy departments of hospitals are the largest producers of radioactive waste and most of this is discharged as patient excreta. The total amount of radioactivity from unsealed sources disposed of was 6316 Gbq for the year of 1988. Disposal via sewer accounts for approximately 99% (526gbq) of the activity of the radioisotopes from unsealed sources. The isotope Tc-99m accounts for 97% of the total waste.

STORAGE AND DISPOSAL OF RADIOACTIVE WASTE

The Radiological Protection Institute of Ireland is satisfied that all the sealed sources currently in storage in the country are stored in a manner which does not pose a hazard to people or the environment. It comments that long term on-site storage is far from ideal, with a risk of a source being inadvertently disposed of with rubbish or scrap and stresses the need for a more permanent solution to the problem of storage and disposal of these disused radioactive sources. It recommends the provision of a waste storage facility (Nuclear Energy Board, 1988).

The Nuclear Energy Board concluded in its report in 1988 that disposal to sewer was adequate, but if there was a substantial increase in usage then alternative means of disposal may be required.

SEWAGE SLUDGE

DEFINITION

Sewage sludge is a by-product of sewage treatment processes.

URBAN WASTE WATER TREATMENT DIRECTIVE

The phased implementation of the Urban Waste Water Treatment Directive (91/271/EEC) over the period to 2005, requires the provision of secondary treatment plants and in some cases higher standards of treatment (depending on the status of the receiving water). The Directive also requires the dumping of sewage sludge at sea to cease by the end of 1998 and requires that sewage sludge shall be reused whenever appropriate.

AMOUNTS ARISING AND DISPOSAL METHODS

Approximately 37,685 tonnes dry solids (TDS) or 851,380m^3 wet volume of sewage sludge were produced in Ireland in 1993 (Weston-FTA, 1993). With the implementation of the above Directive the volume of sludge being produced is expected to increase three fold.

A breakdown into the different treatment processes for the quantity of sludge generated in 1993 is as follows:

- Primary treatment 15,755 tonnes (42%)
- Secondary treatment 18,714 tonnes (50%)
- Tertiary treatment 3,217 tonnes (8%)

The methods for disposal of this sludge are:

- Landfill 15,877 tonnes (42%)
- Ocean dumping 13,552 tonnes (36%)

- Landspread 4,444 tonnes (12%)
- Other 3,913 tonnes (10%)

The database has been developed to contain information on both waste water treatment sludges and water treatment sludges from local authorities. However, while information was received from most local authorities during the present survey it was considered incomplete.

DREDGE SPOILS

Dredge spoils arise mainly from harbour development and maintenance operations. Between 1985 and 1993, a total of 7,061,400 tonnes arose for disposal ranging from a low of 204,000 tonnes in 1985 to a high of 1,610,159 tonnes in 1989. From the records of the Department of the Marine, average arisings are 784,000 tonnes per year. Almost all dredge spoil arising in Ireland is disposed of at sea, much of it adjacent to where is has arisen.

6. INVENTORY OF RECOVERY AND DISPOSAL FACILITIES

INTRODUCTION

This chapter provides an inventory of waste recovery and disposal facilities in Ireland in 1995. Waste recovery infrastructure consists of a growing number of urban and rural bring schemes and one collect system (Kerbside Dublin) operating in three areas in west and north west Dublin. There are also civic amenity sites mostly on existing landfills where the public can deposit recyclable materials. The disposal facilities are almost exclusively landfills of which there are currently 118 active sites in the country. Information in this chapter is based on an analysis of the local authority questionnaires.

RECOVERY SCHEMES

RECYCLING BRING SCHEMES

A recycling bring scheme can be defined as a planned network of bring facilities where waste may be deposited by members of the public, each site strategically located so as to serve an optimum number of people in a neighbourhood. This differs from individual recycling bring banks in that the scheme is planned and managed as one unit in a strategic way in order to provide a specific number of recycling centres for a specified number of people.

The survey revealed a total of five recycling schemes currently operating in Ireland. The most significant of these is the Greystones Recycling Scheme in Co. Wicklow providing a density of one bring centre per 1,000 population. The remainder of these schemes would not all entirely satisfy the definition given above. However, all the schemes differ from the more common recycling bring banks in that each scheme is managed as a unit and serves a particular geographic area. All schemes are privately operated with the exception of Greystones which is publicly owned but operated privately under contract. The locations of these schemes are shown in Figure 6.1.

RECYCLING BRING BANKS

Recycling bring banks are individual stand-alone units such as bottle banks, can banks or textile banks which are normally located in an area such as a shopping centre. They can consist of a single unit for a single material such as glass or a collection of units for different materials. The materials brought by the public to these banks are glass, aluminium, can, paper and textiles. The Greystones scheme also includes collection of PET bottles. The survey revealed a total of 426 bring bank locations throughout the country. The principal operator of this system is Rehab Recycling Partnership in co-operation with local authorities. The regional distribution of these facilities is shown on Figure 6.2.

KERBSIDE DUBLIN

A curbside collection of recyclable materials operated by Kerbside Dublin has been operating in Dublin since November 1991. This is a unique partnership which includes the Dublin Chamber of Commerce, industry, local authorities, the European Recovery and Recycling Association (ERRA) and Government bodies.

Figure 6.1: Locations of Recyling Schemes

Figure 6.2: Locations of Bring Banks (not including recycling schemes)

Initially 25,000 households in the south and west of the city were involved in the scheme which has now been extended to the Castleknock area to include an additional 10,000 households. Each household is provided with a green box into which recyclables are deposited and the boxes are collected each week from the roadside. The materials collected are glass, paper, plastics, and cans. Kerbside Dublin estimate that each household averages about 3.8 kg of recyclable waste per week. Recent difficulties with the paper market have resulted in restrictions being placed on the types of paper collected with the result that newspapers, magazines or telephone books are no longer accepted. It is anticipated that these difficulties with paper will reduce the recyclables collected from each household to around 2.2 kg per week. The scheme is very popular with participation rates averaging 70% and as high as 90% in some areas. Kerbside also operate a bring scheme monthly at four locations in the Dublin area, namely Sutton, Clontarf, Ballinteer and Cabinteely.

CIVIC AMENITY SITES

A civic amenity site is a facility at which wastes may be deposited by members of the public in accordance with conditions specified by the local authority as respect to the nature, type and quantity of waste that may be deposited, and includes facilities for:

- the segregation, mixing, baling, storage or treatment of waste prior to its recovery or disposal;
- the recovery of waste; and
- the disposal of waste (other than household).

The survey revealed a total of 28 civic amenity sites. The majority of the facilities are on landfill sites whereas new civic amenity sites are more likely to be 'stand alone' facilities in urban areas.

The concept of a civic amenity facility is "a convenient location where householders and commercial operators can drop off recyclable and other bulky wastes". Ideally such facilities should be located in or close to urban centres. These sites should provide facilities to drop off items such as glass, aluminium cans, steel cans, PET bottles, mixed plastics and paper, in addition to green, bulky and mixed civic amenity waste. This type of facility is widespread in Europe e.g. in Denmark, Netherlands, Germany and the United Kingdom. In Ireland the first such site was at Lismore in County Waterford. This was planned, constructed and is being operated by the local authority. The distribution of civic amenity sites throughout the country is illustrated in Figure 6.3.

LANDFILL FACILITIES

NUMBER AND CAPACITY OF ACTIVE LANDFILLS

Questionnaires completed by local authorities indicate that there were 118 active landfill sites in Ireland in 1995. Local authorities operated 87 of these landfill sites, while the other 31 sites were privately run. Of the latter, one was operated by a contractor on behalf of a local authority; the remaining 30 were mainly private industrial landfills. While information was obtained for the majority of landfill sites, only limited information was provided for some of the privately operated sites.

The location and size, as tonnes accepted per annum, of the active landfill sites are shown in Figure 6.4. The majority of these sites are relatively small with 58% accepting less than 15,000 tonnes per annum. A further 34% accept up to 50,000 tonnes per annum with only 7% accepting greater than 50,000 tonnes per annum.

The remaining life span of landfills reported to be operating in 1995 is presented in Figure 6.5. Many of the existing landfills are nearing capacity with fewer than 5% having a remaining capacity of more than 20 years. A further 45% have between 5 and 20 years' remaining capacity and as many as 29% have less than five years' remaining capacity with 21% of unknown capacity. Landfills of unreported capacity are more than likely reaching capacity as are many small private sites; both can be assumed to be almost at the end of their life span. Furthermore, they are unlikely to meet new landfill guidelines in terms of siting and operation.

In addition, 13% of the active landfills are stated be sited on regional aquifers.

TYPES OF WASTE ACCEPTED

All local authority operated sites accept municipal waste, while only two accept hazardous waste (Rossmore in Cork County Council and Marlinstown in Co. Westmeath, both of which accept asbestos waste for landfilling under current Department of the Environment guidelines for such disposal). The majority of local authority sites accept inert waste. Only 12 sites reported non-acceptance of inert waste (nine in Cork, one in Kilkenny and two in Wexford). Approximately 50% reported acceptance of liquid sludges with 43 of the 87 sites indicating acceptance of this waste.

Only two of the 30 privately operated landfill sites accept municipal waste (including household waste), two accept hazardous waste (Ballylinan in Co. Laois, which allows waste arising from the manufacturing of cement-asbestos products and Simonstown in Co. Louth, which accepts asbestos), 17 accept inert waste and eight accept liquid sludges.

RECORDED DETAILS OF WASTE DELIVERED TO LANDFILL

Sixty two of the local authority operated landfill sites indicated that records of quantity and type of waste are kept. Currently 12 of the local authority sites have available or have proposals for a weighbridge (Kinsale Rd. in Cork County Borough.; Ballyogan in Dun Laoghaire-Rathdown County Council; Dunsink and Baleally in Fingal County Council; Carrowbrowne in County Galway; Muingnaminnane, North Kerry and Coolcaslagh, Killarney in County Kerry; Silliot Hill, Kilcullen in County Kildare (planned); Kyletalesha, Portlaoise in County Laois; Kilbarry in Waterford County Borough (under construction); Dungarvan in Waterford; and Ballymurtagh in County Wicklow (planned)).

Only one of the Local Authority landfill sites (Ballyguyroe in County Cork), does not allow individual disposal of waste by the public. Thirty eight of the local authority sites which do accept waste via public delivery keep records of the quantity and type of waste being disposed of.

Figure 6.3: Location of Civic Amenity Sites

Figure 6.4: Location and Size of Active Landfills

Figure 6.5: Remaining Capacity of Active Landfills

AQUIFER CLASSIFICATION

The aquifer classification section of the questionnaire was completed for 48 active landfill sites in Ireland. A summary of the classification is given in Table 6.1.

Table 6.1 Aquifer Classification Underlying Active Landfill Sites

Aquifer Type	Number underlying Active Landfills
Regionally Important	14
Locally Important	20
Poor	14
Unknown or no aquifer	69

The 14 active landfills reported by local authorities to be located on regionally important aquifers are as follows. All are local authority sites unless otherwise indicated.

- Doora, Ennis, Co. Clare
- Ballyguyroe, Co. Cork
- Bandon, Co. Cork
- Rossmore, Co. Cork
- Mell, Drogheda Borough
- Dunmore, Co. Kilkenny
- Drumlish, Co. Longford (privately operated on behalf of Longford Co. Co.)
- Claremorris, Co. Mayo
- Castlerea, Co. Roscommon
- Roscommon, Co. Roscommon
- Strokestown, Co. Roscommon
- Kilbarry, Co. Waterford
- Dungarvan, Co. Waterford
- Bawnard, Co. Waterford (private landfill).

LANDFILL LINERS

The survey indicates some 18 of the active landfill sites are lined, 5 of which are artificially lined while the other liners are stated to consist of natural material such as clay.

SURFACE AND GROUND WATER MONITORING

Surface water monitoring was indicated on 25 of the local authority landfill sites and on two of the privately operated sites. Monitoring of ground water was indicated on 17 local authority operated sites and on four of the privately operated sites.

GAS MONITORING

Gas monitoring was indicated on three sites (Kinsale Road, Cork Corporation; Ballyguyroe, Cork County Council; and White River, Co. Louth). Gas venting was reported to occur on 17 local authority sites and on two of the privately operated sites. Only two of the active landfill sites have indicated gas collection, namely

Kinsale Road (Cork Corporation) (flared at present but a contract has been signed for re-use) and Friarstown in South Dublin (planned installation).

LEACHATE COLLECTION

Leachate collection was indicated at 18 of the active landfill sites. On-site treatment of the leachate occurs at six of these sites with the remaining 12 mainly pumping or tankering it to sewage treatment works. Some 30 local authority sites and five privately operated sites indicated sampling and testing of the leachate.

RODENT AND BIRD CONTROL

Rodent control was indicated on 82 of the local authority landfill sites and on six of the privately operated sites. Bird control was indicated on 18 of the local authority landfill sites.

COVER MATERIAL

Daily cover was stated to be available on 35 of the local authority landfills and on four of the private landfills. A compactor is available on 80 of the local authority sites and on eight of the privately operated landfill sites.

MANAGEMENT PLANS AND AFTERCARE OF THE ACTIVE LANDFILLS

It was noted that 33 of the local authority landfill sites and eight of the privately operated sites had management plans. Closure plans exist for 23 of the local authority landfill sites and for two of the privately operated landfill sites.

CLOSED LANDFILLS

Information was sought on closed landfill sites in the context of those closed before and after 1984 as this is when the last survey of closed landfill sites was conducted.

The information received is not considered complete and the total number of closed landfills on which information was received is 182 and is shown in Table 6.2. Of these landfills 58 were closed pre-1984 and the remainder were closed between 1984 and 1995. The returns indicate that closed landfills accepted non-hazardous and/or inert waste.

Table 6.2: Summary of Closed Landfill Sites

Local Authority Area	Number of Closed Landfills	Waste Accepted	Notes
Carlow County Council	2	Municipal and Inert	Closed post 1984.
Cork County Council	2		Both landfills closed in 1980.
Donegal County Council	3	Municipal	Prior to 1984 the county council closed approx. 20 small village tips.
Dublin Corporation	15	Municipal, Commercial, Industrial, and Inert	All closed pre-1984.
Dun Laoghaire-Rathdown County Council	7	Municipal and Commercial	Five of the landfills were operated privately where the prime objective was land reclamation.
Fingal County Council	43	Municipal and Inert	All the landfills were closed after 1984.
Galway Corporation	1	Municipal	The current landfill at Carrowbrowne is an extension of this site.
Galway County Council	7	Municipal, Commercial, Industrial and Inert	All the landfills were closed after 1984.
Kerry County Council	5	Municipal, Commercial, Industrial and Inert	Four of the sites were closed pre-1984.
Kildare County Council	2	Municipal, Commercial and Industrial	Both closed pre-1984.
Kilkenny County Council	1	Municipal and non-toxic Industrial	Closed post-1984.
Laois County Council	5	Municipal, Commercial and Industrial	Three of the landfills were closed pre-1984.
Leitrim County Council	4	Municipal	All the landfills accepted very small quantities when open.
Limerick Corporation	2	Municipal	All the landfills were closed after 1984.
Limerick County Council	1	Municipal	Closed in 1989.
Longford County Council	8	Municipal	Four of the sites were closed pre-1984.
Louth County Council	1	Municipal, Commercial and Industrial	Closed after 1984.
Mayo County Council	5	Municipal, Commercial and Industrial	Three of the landfills were closed pre-1984.
Meath County Council	7	Municipal	All the landfills were closed after 1984.
Monaghan County Council	3	Municipal, Commercial, Industrial and Inert	One of the landfills was closed pre-1984.
Offaly County Council	5	Municipal, Commercial and Industrial	Three of the landfills were closed pre-1984.
Sligo County Council	1	Municipal, Commercial and Industrial	Closed in 1984.
South Dublin County Council	2	Inert	All the landfills were closed after 1984.
Tipperary N-R County Council	5	Municipal, Commercial and Industrial	All the landfills were closed after 1984.
Tipperary S-R County Council	3	Municipal	All the landfills were closed after 1984. 40 more sites were closed but information was difficult to assemble.
Waterford County Council	3	Municipal and Inert	All the landfills were closed after 1984. The closed site at Lismore is now a Civic Amenity Site.
Westmeath County Council	5	Municipal, Commercial, Industrial and Inert	Two of the landfills were closed pre-1984.
Wexford County Council	22	Municipal and Inert	Six of the landfills were closed pre-1984.
Wicklow County Council	9	Municipal, Commercial and Industrial	Three of the landfills were closed pre-1984.
Total	**182**		

7. TRENDS AND INDICATORS

INTRODUCTION

In this chapter the results of the 1995 surveys for the National Waste Database are compared with previous national publications on waste arisings. As stated in Chapter One, the first comprehensive attempt at quantifying waste production and disposal practices in Ireland was undertaken by An Foras Forbatha (AFF) with the publication of a National Database on Waste in 1987. The data published in that report was gathered in 1984. The only category for which it was considered that complete and reasonably accurate returns were received at the time was household and commercial waste collected by the local authorities. In areas outside the direct control of local authorities such as waste disposal by private firms and hazardous waste arising, the data were considered incomplete and less reliable. Since publication, the National Database on Waste was only partially updated; the toxic and dangerous waste survey, which formed a part of the National Database on Waste, being repeated both in 1988 and 1992 by the Department of the Environment and the industrial waste sub-set partially updated in 1987 (Boyle, 1987). Further surveys of waste arisings have since been conducted by and on behalf of the Department of the Environment (ERL, 1993; MCOS, 1994; Department of the Environment, 1994). Surveys on the generation and disposal of industrial waste generated by the manufacturing sector have also been conducted by Forbairt, formerly EOLAS (ERU, 1986, 1993). A review of available information on waste arisings was recently published in the State of the Environment Report (EPA, 1996).

It should be noted that in many cases comparison between these various studies is difficult due to changes in waste terminology and classification over the years. This is of particular relevance with regard to commercial waste which in many cases is classified by local authorities under the more general term *trade waste*, which sometimes includes non-hazardous industrial waste. To address this, a review was conducted of waste definitions used both domestically and internationally. A Glossary of Terms was compiled and circulated to local authorities and forms Appendix A. Generally, the definitions provided are those contained in the Waste Management Act, 1996. For proper national, regional and local waste management planning to be conducted, it is essential that an agreed set of definitions be used by all involved and those set out in Appendix A are proposed for this purpose. Furthermore, the European Waste Catalogue and Hazardous Waste List was adopted as the identification and coding system for waste in this study which renders comparison with previous surveys difficult. However, the future use of the EWC/HWL, which is a broadly-based and inclusive waste coding system, will simplify development of waste statistics both at national and international level.

A set of indicators for tracking changes in the waste sector is proposed, based on the information available in the National Waste Database. Municipal waste is first considered followed by industrial waste, hazardous waste and waste infrastructure.

MUNICIPAL WASTE TRENDS

ARISINGS AND COMPOSITION

Trends in municipal waste arisings over the past decade are difficult to establish due to the different methodologies used to gather waste statistics. However, a tentative comparison can be made of household and commercial waste collected by or on behalf of local authorities in 1984, 1993 and 1995, which gives an indication of trends in municipal waste arisings. The data collection methodologies used in 1984 and 1993 for information on household and commercial waste collected by or on behalf of local authorities were similar to that used in the present survey and a comparison of the results obtained is illustrated in Figure 7.1. Household and commercial waste collected by or on behalf of local authorities was estimated to be 854,866

tonnes, 1,186,312 tonnes and 1,385,439 tonnes in 1984, 1993[3] and 1995, respectively. This represents an increase of over 38% in eleven years, equivalent to about 3.5% per annum.

Total municipal waste collected in 1995 has been estimated to be 1,549,962 tonnes, which includes household and commercial waste collected by or on behalf of local authorities, household and commercial waste collected for recycling and street cleansing waste. As stated in Chapter Three, actual household waste arisings are expected to be higher than that collected, as only 86% of the population is provided with a collection service.

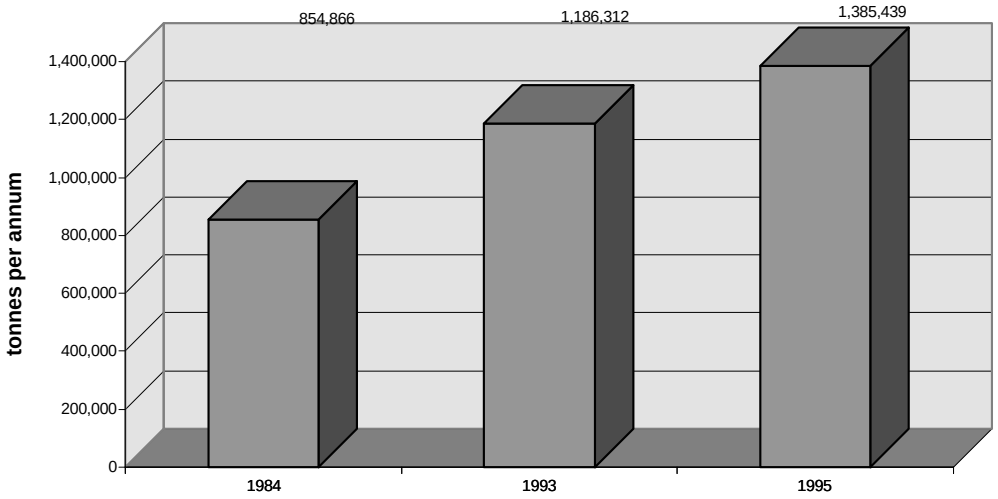

Figure 7.1: A Comparison of Household and Commercial Waste Collected by or on behalf of Local Authorities Over the Past Decade.

If the household waste fraction is adjusted to account for this anomaly, total municipal waste arisings in Ireland for 1995 are estimated to be 1,848,232 tonnes. This should be taken as a benchmark against which future comparisons can be made. On a per capita basis, this is equivalent to 0.52 tonnes per person per annum.

Household waste figures have been generated for 1984, 1993 and 1995. The 1984 figure (962,667 tonnes) is a combined figure for household and commercial waste and therefore cannot be directly related to the figures generated for 1993 and 1995. A comparison between figures obtained in 1993 and 1995 is presented in Figure 7.2. The value presented for 1993 (911,665 tonnes) is the sum of household waste collected by or on behalf of local authorities and household waste collected for recycling. This compares with 1,026,251 tonnes for 1995. The apparent increase in collected household waste since 1993 is considered to be a function of more comprehensive reporting in 1995 than in 1993. The quantities shown in Figure 7.2 are the amounts collected for either disposal or recycling and therefore, strictly speaking, cannot be termed 'total arisings' for reasons outlined above. Household waste arisings for 1995 are estimated to be 1,324,521 tonnes, which includes waste from households not provided with a collection service. The two values presented for 1995, household waste collected (1,026,251 tonnes) and household waste arisings (1,324,521 tonnes), should be considered as the benchmarks against which future comparison can be made.

Arising from this study, there now exists a considerable body of information on both urban and rural household waste composition. Summary results for 1995 are presented in Figures 7.3 and 7.4 for urban and rural waste, respectively, together with results reported for 1993 (MCOS, 1994).

[3] The figure for 1993 is that reported by local authorities for household and commercial waste collected. In the survey of local authorities carried out that year, commercial waste collected was reported to be 287,850 tonnes.

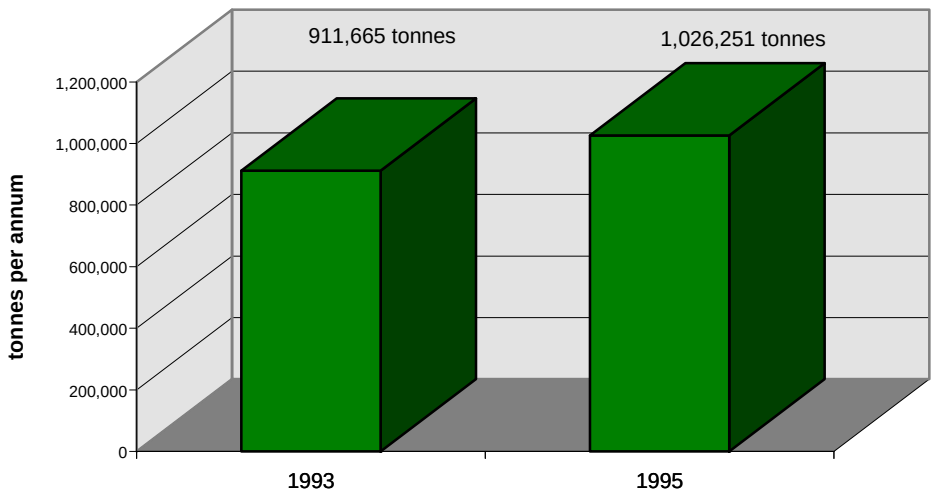

Figure 7.2: Household Waste Collected for Disposal and Recycling in 1993 and 1995.

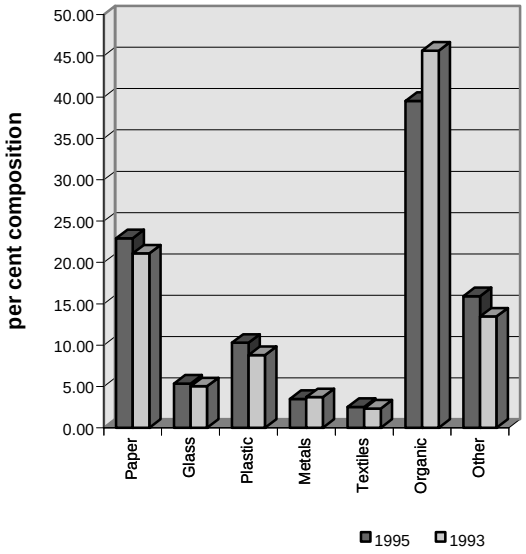

Figure 7.3: Urban Waste Composition; 1993 and 1995

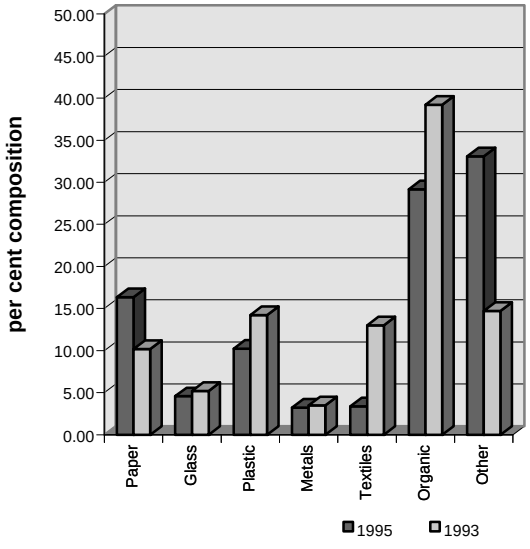

Figure 7.4: Rural Waste Composition; 1993 and 1995

There is a significant change in the composition of rural waste in Ireland while the composition of urban waste remains reasonably constant compared with 1993 figures. These variations in the composition of rural waste account for the significant change to the quantities 'available for recycling' of the various materials estimated for 1995. Given the considerably larger dataset now available for household waste composition, the 1995 results can be considered to be more reliable than those reported for 1993 which were based on relatively small datasets.

Trends in commercial waste are more difficult to establish due to the generally poor quality of information available. Commercial waste arisings can be estimated either using input methods, i.e., multiplying waste generation per employee figures based on waste composition surveys by the total number of employees in the commercial sector, or output methods, i.e., measurement or estimation of volumes or weights from disposal outlets, waste collection contractors or recycling facilities. While the quality of information for estimating commercial waste arisings using either input or output methods in Ireland is poor, it is improving.

In 1993, using an input method based on international figures for waste generation per employee, commercial waste collected for disposal and landfilled was estimated to be 656,122 tonnes. This was based on an average waste generation per employee figure of 1.127 tonnes per annum (MCOS, 1994). The commercial waste composition survey conducted as part of the present study, while limited to a small number of commercial outlets, provides the first domestic average waste generation per employee data for the commercial sector. On average, 0.9 tonnes per employee per annum was generated by the outlets included in the survey, ranging from 0.02 tonnes per employee per annum for a chiropractor to 2.19 tonnes per employee per annum for a butcher. Pending the development of a more comprehensive waste composition base for the commercial sector, a value of 0.9 tonnes per employee per annum is considered a reasonable 'input' average value to be used for planning purposes. Total commercial waste disposed of based on a waste per employee value of 0.9 tonnes per annum and using 1994 employee data for the commercial sector are estimated to be 571,500 tonnes, which is comparable to the figure cited above for 1993. If the weight of commercial waste recycled is added to this, the input method results in an estimate of 644,691 tonnes of commercial waste arising in Ireland in 1995. This compares to the estimate of 767,034 tonnes reported for 1993.

Based on output estimates, in 1993, local authorities reported that they had collected 287,850 tonnes of commercial waste (MCOS, 1994) which compares with 403,729 tonnes reported for 1995. When tonnages collected for recycling are added, estimated arisings, i.e., the sum of waste collected by or on behalf of local authorities and waste collected for recycling for 1993 and 1995, respectively, are 398,762 tonnes and 476,920 tonnes. It has been mentioned above that in many cases there does not appear to be a clear distinction between commercial and non-hazardous industrial waste. This may partly explain the large discrepancy that currently exists between commercial waste arisings estimated using input and output methods. As the quality of information improves, there should be convergence between estimates generated from input and output methodologies.

DISPOSAL AND RECOVERY

In 1993, 92.6 per cent of the household and commercial waste stream was reported to be consigned to landfill with 7.4 per cent recycled. For household waste, 1.4 per cent was recycled with the balance landfilled. The recycling rate for commercial waste was reported to be higher, with 14.5 per cent recycled and the balance landfilled. Comparable figures for 1995 indicate that the overall recycling rate for household and commercial waste has risen to 10.4 per cent. However, scrap metal was included as part of the commercial waste stream in 1993 and it is now considered that this material is better classified as part of the industrial waste stream. With scrap metals excluded from the commercial waste stream, the national recycling rate for the household and commercial waste stream for 1995 is 7.8%.

There has been a significant increase in recycling of household waste from 1.4 per cent in 1993 to 4.3 per cent in 1995. This means that approximately 31,500 tonnes of household waste previously consigned to landfill is now diverted to recycling. For commercial waste, the recycling rate for 1995 is estimated to be 15.3 per cent although it should be noted that the tonnages for commercial waste recycled and landfilled in 1995 are lower than those reported for 1993 and that different methods were used to estimate commercial waste arisings and per cent recycled for the two years. Quantities of materials recovered from the household and commercial waste stream in 1995 are compared to those reported for 1993 in Figure 7.5. Recycling rates for these materials are presented in Figure 7.6.

Particular attention has been paid recently to encouraging increased levels of recycling of packaging materials in the municipal waste stream. The principal packaging materials are glass, metals, paper, and plastics. The household and commercial waste composition surveys conducted during the course of this study were used to estimate quantities of packaging materials. Estimated tonnages for paper, glass, plastic and metals for 1995 are

presented in Figure 7.7 alongside equivalent figures for 1993 and figures published by IBEC in its document 'Working Together on Waste' (IBEC, 1996). Recycling rates for these materials, expressed as the percentage of each packaging material contained in the household and commercial waste stream that is recycled, are presented in Figure 7.8. The recycling rate for packaging materials in the household and commercial waste stream was reported to be 10.3 per cent in 1994. The equivalent rate for 1995 is estimated to be 15.6 per cent. Furthermore, if the packaging content of the non-hazardous industrial waste stream is considered alongside the household and commercial waste stream, the recycling rate for packaging materials rises to 21.9 per cent.

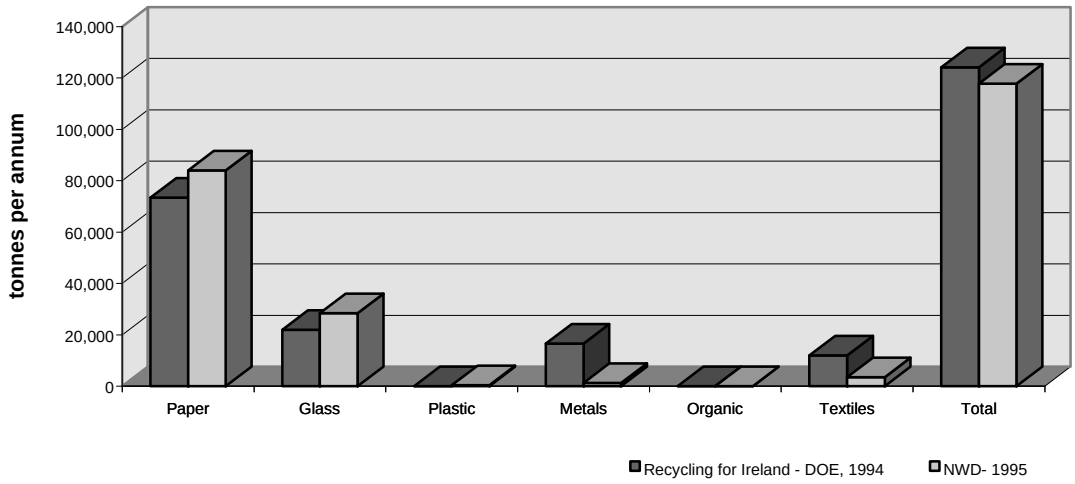

Figure 7.5: Estimated Quantities of Materials Recovered from the Household and Commercial Waste Stream

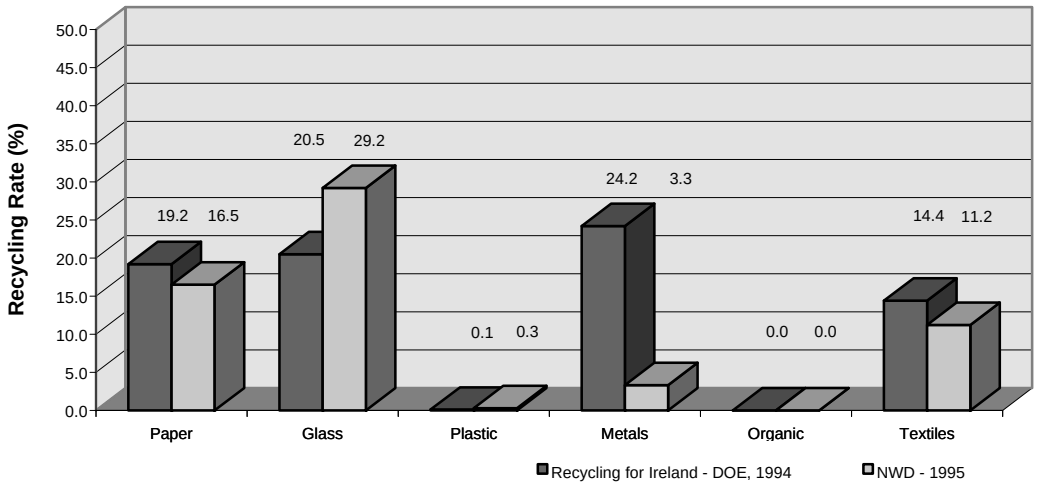

Figure 7.6: Recycling Rates for Materials Recovered from the Household and Commercial Waste Stream.

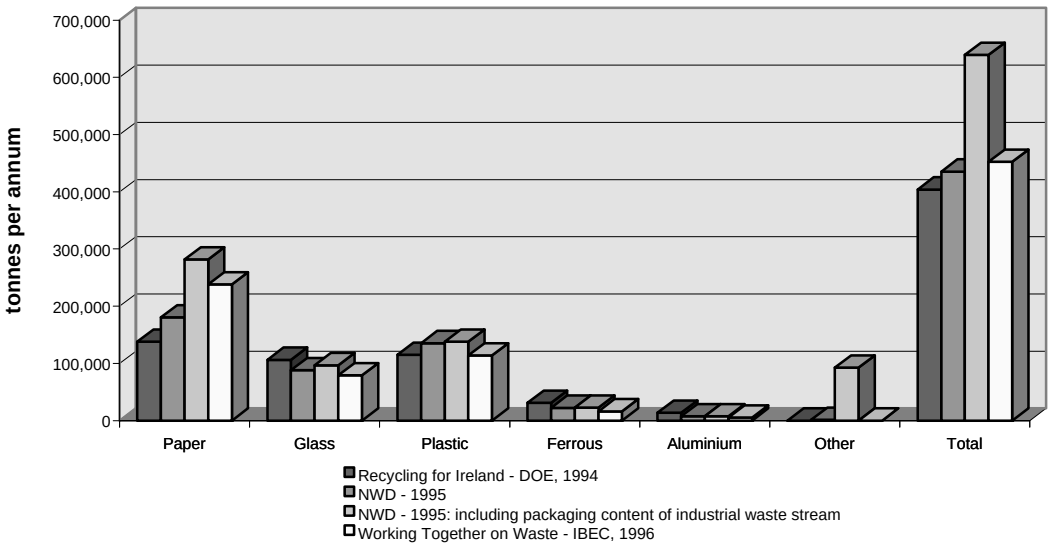

Figure 7.7: Estimated Quantities of Packaging Materials Arising in the Household and Commercial Waste Stream

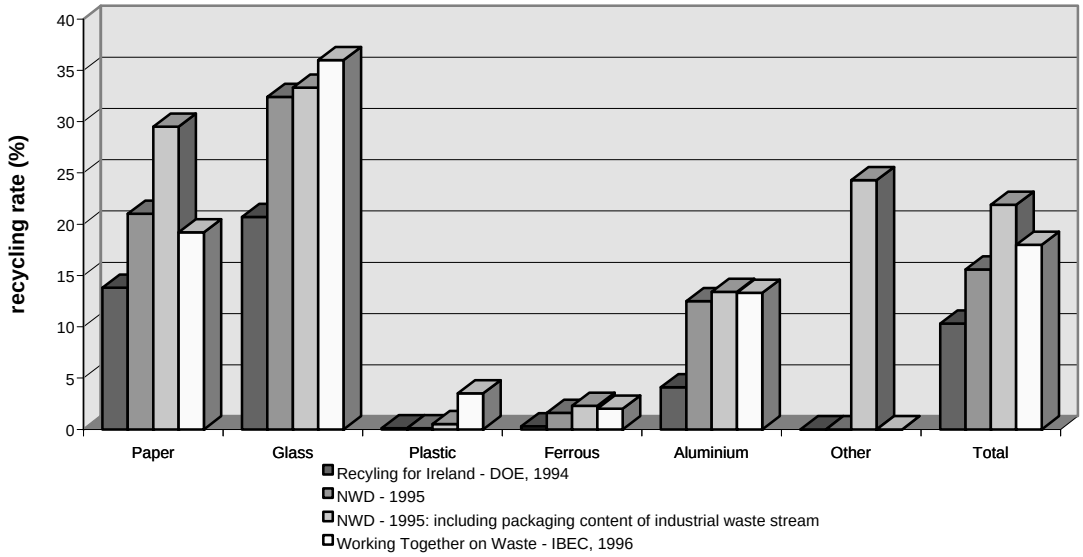

Figure 7.8: Recycling Rates for Packaging Materials Recovered from the Household and Commercial Waste Stream.

INDUSTRIAL WASTE TRENDS

ARISINGS

In 1984, each local authority was requested to estimate the amounts and types of waste disposed of by private firms. From this information and subsequent updates, industrial waste arisings in Ireland were estimated to be 4,720,000 tonnes (EPA, 1996). Forbairt, formerly EOLAS, also conducted surveys of the manufacturing sector and reported estimated manufacturing sector industrial waste arisings of 1,306,000 tonnes per annum in 1991 (ERU, 1993). This did not include mining and quarrying waste or waste from construction and demolition activities.

The approach taken in this study was to survey all manufacturing sector companies with greater than 20 employees. Respondents were also asked to catagorise their waste according to the European Waste Catalogue/Hazardous Waste List coding system. This was the most comprehensive survey of the industrial sector conducted to date and it provides a useful baseline from which future surveys can be planned. As reported in Chapter Two, a response rate of 16% based on the number of industry returns, was obtained. A scale-up factor was calculated for each industry sector so that national waste arisings could be estimated for each sector. In total, 4,411,306 tonnes of waste were reported to have arisen of which 167,406 tonnes (3.8%) were classified as hazardous. Almost 50% of the total reported industrial waste is waste from mining activities (2,200,004 tonnes). Projected waste arisings for 1995 were 7,654,736 tonnes, of which 243,754 tonnes were classified as hazardous (3.2%). The lower percentage hazardous waste in projected national arisings is a result of the high questionnaire response rate obtained from the chemical and pharmaceutical sector, which is the largest producer of hazardous waste.

The mining, non-metallic mineral, construction and public works, food beverage and tobacco, public utilities, chemical and pharmaceuticals and transportation sectors produce the largest quantities of non-hazardous waste, all reporting in excess of 100,000 tonnes per annum.

RECOVERY AND DISPOSAL

In 1987, 13 per cent of the industrial waste stream was reported to be recovered for re-use with the remainder disposed of through various routes: on-site disposal (55 per cent), landfill (20 per cent), ocean disposal (11 per cent) and incineration (<1 per cent) (Boyle, 1987). This compares with a recovery rate in 1995 of 17.3 per cent. The principal disposal outlets reported for disposal in 1995 were on-site disposal (49.9 per cent), landfill (22.6 per cent) ocean disposal (3.8 per cent), disposal to inland waters (0.9 per cent), incineration (0.8 per cent) and other means of disposal (3.2 per cent). The major trends therefore are an increase in the percentage of waste recovered for re-use and a decrease in the amount of waste disposed of at sea.

HAZARDOUS INDUSTRIAL WASTE TRENDS

ARISINGS

The current survey is the first to be undertaken since the definition of hazardous waste was altered with the introduction of the European Hazardous Waste List (94/904/EC). Prior to the current survey, the most comprehensive information available on hazardous waste in Ireland related to the twenty seven substances or families of substances regulated by the Toxic and Dangerous Waste Regulations. Surveys of local authorities were conducted in 1984, 1988 and 1992. In 1992, a total of 99,393 tonnes of regulated waste was reported to have arisen. This compares with 72,850 tonnes in 1988 and 52,500 tonnes in 1984. Information was also published on other 'problematic' wastes not defined by the Toxic and Dangerous Waste Regulations (ERU, 1993) giving rise to an estimate of 139,600 tonnes of hazardous industrial waste in 1992 (EPA, 1996).

In the present survey, reported quantities of hazardous waste, as defined by the Hazardous Waste List, were 167,406 tonnes which, when scaled up, gives estimated national hazardous waste arisings of 243,754 tonnes. Of this projected total, it is estimated that approximately 119,000 tonnes would be classifiable under the Toxic and Dangerous Waste Regulations[4], which is comparable to the 99,393 tonnes of regulated waste reported for 1992. It is clear, therefore, that the application of the Hazardous Waste List significantly broadens the spectrum of wastes now classified as hazardous. Waste now categorised under the HWL as hazardous and not previously included under the 'toxic and dangerous' waste classification include:

- Aqueous solutions from organic chemical processes (e.g. manufacture, supply formulation and use of pharmaceuticals, soaps, etc. (07 01 01, 07 02 01, etc.)).

[4] This figure is a "best-estimate" due to the difficulty in relating the hazardous *substances* of the 1982 Regulations to the source-specific *wastes* of the HWL.

- Solutions from regeneration of ion exchange resins (e.g. wastes from water/wastewater industry (19 08 07)).
- Acid and alkaline solutions not from surface treatment of metals (i.e. from any inorganic chemical process).
- All waste oils (13 00 00).

These wastes make up approximately 42% (70,583 tonnes) of reported hazardous waste. Figure 7.9 presents a comparison of hazardous waste statistics since 1984. For 1984, 1988 and 1992 there is a distinction made between wastes listed under the Toxic and Dangerous Waste Regulations and other 'problematic' wastes that were not regulated by the Toxic and Dangerous Waste Regulations. For 1995, projected wastes categorised according to the HWL are split into those classifiable under the Toxic and Dangerous Waste Regulations (119,456 tonnes), aqueous wastes listed in the HWL but excluded from the provisions of the Waste Management Act 1996 as they are covered by prior statutes (58,582 tonnes) and other wastes listed in the HWL but not classifiable under the Toxic and Dangerous Waste Regulations. For the time being, in the absence of any formal de-listing procedure, all wastes listed on the HWL must be deemed hazardous until proven otherwise.

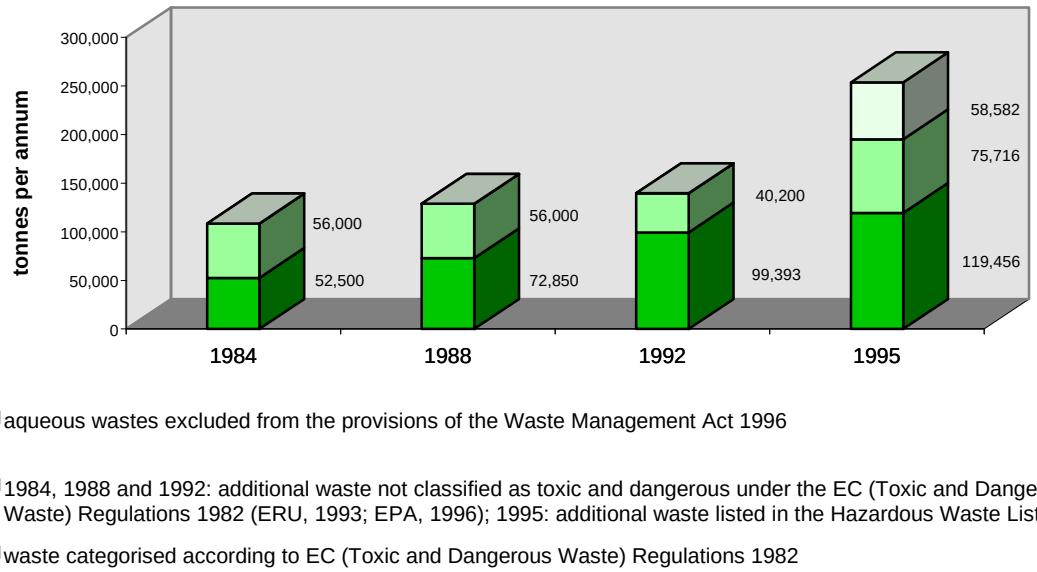

Figure 7.9: Estimated Hazardous Waste Arisings; 1984 to 1995

RECOVERY AND DISPOSAL

The most recent information on the recovery and disposal of hazardous waste in Ireland was that published for waste categorised as toxic and dangerous under the Toxic and Dangerous Waste Regulations. In 1992, of the 99,393 tonnes reported to have arisen, 80.3 per cent was managed in Ireland with the remaining 19.7 per cent exported. The recovery rate for toxic and dangerous waste in 1992 was reported to be 54 per cent. Direct comparison between the data for 1992 arisings and those for 1995 is not possible due to the adoption of the Hazardous Waste List as the reference for hazardous wastes. However, a tentative comparison of the principal disposal/recovery routes reported in 1992 and 1995 is presented in Figure 7.10. In 1995, it was reported that 42.5 per cent of hazardous waste arisings were recovered. The principal disposal routes were biological treatment which accounted for 26.0 per cent and incineration which accounted for 18.7 per cent. In 1995, it was estimated that 90.2 per cent of hazardous waste reported to have arisen was treated in Ireland with the balance exported.

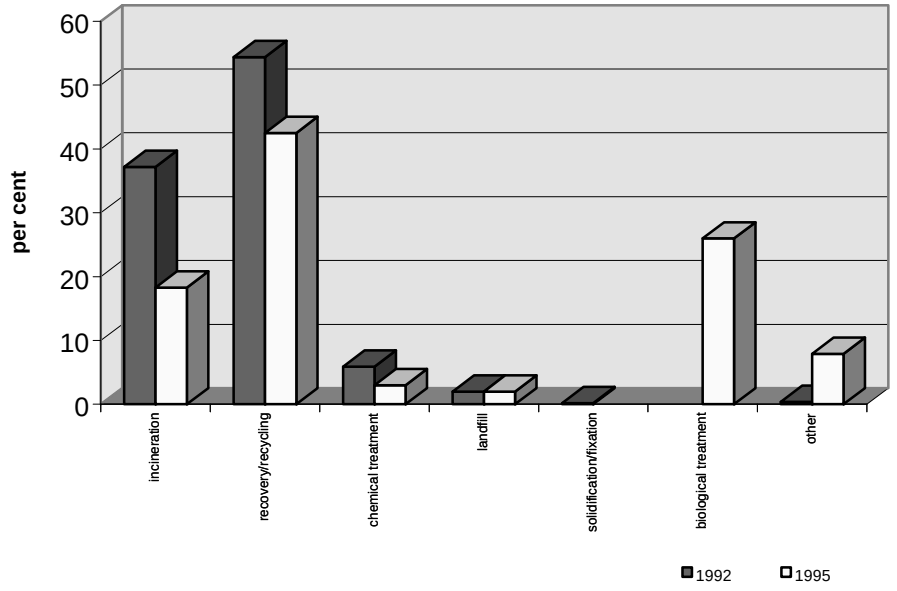

Figure 7.10: Comparison of Principal Disposal/Recovery Routes for Hazardous Waste in 1992 and 1995

WASTE DISPOSAL FACILITIES

From local authority replies to the surveys in this project, it is estimated that there are 118 municipal waste landfills in the country at present: 87 publicly owned/leased and 31 on site industrial facilities. These vary in size and remaining life span as outlined in Chapter 4. Figures 4.4 and 4.5 show that the four largest landfills are in Dublin County and Cork City. Also, it appears that the East and South East of the country has the greatest need for additional landfill capacity with the South East's landfills reaching capacity within the next 5 years. There is likely to be an increasing trend over the next 5-10 years away from almost total reliance on landfill for disposal.

INDICATORS

MUNICIPAL WASTE

The most common indicator used for tracking changes in municipal waste arisings is the amount generated per person per annum. However, due to the variety of definitions used for municipal waste, caution should be exercised when comparing values from different countries and, indeed, from different surveys conducted in the same country. For this reason, it is important to provide definitions for indicators. Recommended 'municipal waste' indicators are listed in Table 7.1 along with values calculated for 1995.

Key waste generation indicators include per capita production of household and municipal waste arisings which are estimated to be 0.38 and 0.52 tonnes per person per annum, respectively; per capita collection of household and municipal waste which are estimated to be 0.29 and 0.44 tonnes per person per annum, respectively, and commercial waste generated per employee per annum which is estimated to be 0.9 tonnes. Key municipal waste disposal and recovery indicators include the percentage of household and commercial waste collected that is recovered (7.8 per cent for 1995) and landfilled (92.2 per cent for 1995); the percentage of household waste collected that is recovered (4.3 per cent for 1995) and landfilled (95.7 per cent) and the percentage of commercial waste collected that is recovered (15.3 per cent for 1995) and landfilled (84.7 per cent).

INDUSTRIAL WASTE

Indicators proposed for industrial waste arising in Ireland are presented in Table 7.2. They are:

- waste generated per employee (WPE) for each NACE sector;

  Waste generated per employee figures should be treated with a certain amount of caution due to the wide variation in waste generation among the individual industry sectors and the relatively low response to the survey. They do, however, provide an indication of the range of waste production across the industrial sectors. Two waste per employee indicators are provided for each sector, one which is based on all returns received (overall) and one from which high volume producers within each sector have been screened (low volume). It is likely that the low volume figures more reliably reflect waste production as the overall figure is affected by very high volume wastes generated by a small number of industries. Estimated figures range from 0.49 tonnes per employee per annum for the Transport Equipment sector to 286 tonnes per employee per annum for the Other Non-Metallic Mineral Products sector, which includes quarrying activities.

- percentage production of total industrial waste by each sector;
- percentage production of total hazardous waste by each sector;
- the percentage hazardous waste composition of industrial waste for each sector; and
- the recovery rate for each sector.

Recommended industry-wide indicators are:

- recovery rate for total industrial waste, which is estimated to be 17.3 per cent for 1995;
- recovery rate for hazardous waste which is estimated to be 42.5 per cent for 1995; and
- domestic recovery/disposal rate for hazardous waste, that is, the percentage of hazardous waste produced in Ireland that is either recovered or disposed of in Ireland, which is estimated to be 90.2 per cent for 1995.

DEVELOPMENT OF THE NATIONAL WASTE DATABASE

This report is the first of a series of reports funded through the EU Environmental Monitoring R&D Programme. One of the stated objectives of the programme is ‘to improve environmental monitoring and data collection in the interests of more detailed evaluation of the impacts of development on the environment and of sustainable use of natural resources’. This project responds directly to this objective by providing a new tool for gathering data on waste management in Ireland in a form which can be integrated into European data collection systems.

The availability of accurate information is the key to good planning and it is hoped that the National Waste Database will contribute increasingly accurate information on waste management in Ireland in the coming years. It should be stressed, however, that the accuracy of any database is only as good as the information provided to it. There is still much room for improvement in this area. Accurate tracking of waste arisings, recovery rates and disposal rates will require more sophisticated measurement tools than are currently used with the widespread absence of weighbridges at landfill sites a case in point. The trend towards viewing waste as a resource and the increasing costs of disposal will hopefully encourage more accurate quantitative measurement of waste as will greater application of the ‘polluter pays principle’.

Table 7.1: Recommended Indicators for Municipal Waste

INDICATOR	1995 VALUE
Municipal waste collected/person/annum, where municipal waste collected is defined as the sum of the quantity of household and commercial waste collected by or on behalf of local authorities, the quantity of household and commercial waste collected for recovery and the quantity of street cleansing waste, where all values are calculated using output methods.	0.44 tonnes
Municipal waste arising/person/annum, where municipal waste arising is defined as the sum of total estimated household waste arising based on output methods, total estimated commercial waste arising based on input methods and street cleansing waste based on output methods.	0.52 tonnes
Percentage of household and commercial waste collected that is disposed of to landfill	92.2 %
Percentage of household and commercial waste collected that is recovered	7.8 %
Percentage of household and commercial waste arising that is recovered	6.8 %
Household waste collected/person/annum, where household waste collected is defined as the sum of the quantity of household waste collected by or and on behalf of local authorities and the quantity collected for recovery.	0.29 tonnes
Household waste arising/person/annum, where household waste arising is the quantity estimated to have arisen from all households in Ireland and the quantity collected for recycling	0.38 tonnes
Percentage of household waste collected that is disposed of to landfill	95.7 %
Percentage of household waste collected that is recovered	4.3 %
Household waste generated/urban household/week, where household waste generated is calculated from waste composition surveys (range in brackets)	22.2 kg (16 - 32 kg)
Household waste generated/rural household/week, where household waste generated is calculated from waste composition surveys (range in brackets)	23.2 kg (17 - 35 kg)
Commercial waste generated/employee/annum, where commercial waste generated is calculated from waste composition surveys (range in brackets)	0.9 tonnes (0.02 - 2.19 tonnes)
Percentage recovery of commercial waste collected	15.3 %
Percentage disposal by landfill of commercial waste collected	85.7 %

Table 7.2: Recommended Indicators for Industrial Waste

SECTOR	NACE CODE	WPE[1] (overall)	WPE[2] (low volume)	% of Total Industrial Waste	% of Total Hazardous Waste	% of Sector Waste that is Hazardous	Recovery Rate
		(tonnes/annum)					(%)
Unspecified		3.41	3.41	0.14	0.31	7.0	37.5
Basic Metals and Fabricated Metal Products	**DJ**	40.52	10.47	2.85	5.38	6.0	13.7
Chemicals, Chemical Products and Man-Made Fibres	**DG**	25.51	6.08	4.30	73.77	54.6	44.8
Coke, Refined Petroleum Products and Nuclear Fuel	**DF**	67.53	67.53	0.14	2.82	65.8	65.9
Construction	**F**	193.69	56.66	17.25	0.50	0.1	64.7
Electrical and Optical Equipment	**DL**	2.59	0.75	0.64	1.71	8.5	28.7
Electricity, Gas and Water Supply	**E**	29.69	12.19	4.62	0.60	0.4	18.8
Food Products; Beverages and Tobacco	**DA**	33.08	7.24	11.74	1.50	0.4	39.6
Leather and Leather Products	**DC**	121.70	121.70	2.73	0.01	0.0	54.6
Machinery and Equipment not elsewhere classified	**DK**	34.67	1.99	0.47	0.22	1.5	3.4
Manufacturing not elsewhere classified	**DN**	1.06	1.06	0.05	0.24	16.0	58.3
Mining (excludes quarrying)	**C**	**n/a**	**n/a**	28.74	0.00	0.0	**0**
Other Non-Metallic Mineral Products (includes quarrying)	**DI**	321.38	286.04	20.25	6.62	1.0	9.5
Pulp, Paper and Paper Products; Printing, Publishing	**DE**	36.34	14.23	2.38	0.09	0.1	79.7
Rubber and Plastic Products	**DH**	6.10	1.92	0.76	0.77	3.2	18.3
Textiles and Textile Products	**DB**	3.74	1.89	0.70	0.04	0.2	47.1
Transport Equipment	**DM**	0.49	0.49	0.02	0.00	0.0	50.0
Transport, Storage and Communication	**I**	23.59	1.48	1.96	5.44	8.8	0.9
Wood and Wood Products	**DD**	5.17	2.63	0.29	0.00	0.0	64.9
Average Industrial Waste Recovery Rate							17.3

[1] Waste Per Employee (WPE) calculated from all returns from each sector
[2] Waste Per Employee (WPE) calculated from returns from each sector excluding those obtained from high volume producers

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APPENDIX A: GLOSSARY OF TERMS

(Reference to *Schedules* in definitions refer to the Waste Management Act, 1996)

Waste Any substances or object belonging to a category of waste, specified in the *First Schedule* (of the Waste Management Act 1996) or included in the EWC, which the holder discards or intends or is required to discard and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved.

Household Waste Waste produced within the curtilage of a building or self-contained part of a building used for the purposes of living accomodation.

Commercial Waste Waste from premises used wholly or mainly for the purposes of a trade or business or for the purposes of sport, recreation, education or entertainment but does not include household, agricultural or indutrial waste.

Industrial Waste Includes waste produced or arising from manufacture or industrial activities or processes.

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

Inert Waste Waste that, when deposited into a landfill, does not undergo any significant physical, chemical or biological transfer.

Packaging Waste Any packaging or packaging material covered by the definition of waste in Directive 75/442/EEC.

Packaging Any material, container or wrapping, used for or in connection with the containment, transport, handling, protection, promotion, marketing or sale of any product or substance including such packaging as may be prescribed.

Hazardous Waste Means- (i)hazardous waste for the time being mentioned in the list prepared pursuant to Article 1 (4) of Council Directive 91/689/EEC of 12 December, 1991, being either

(I) Category I waste that has any of the properties specified in Part III of the *Second Schedule,* or

(II) Category II waste that

(A) contains any of the constituents specified in Part II of the *Second Schedule*, and

(B) has any of the properties specified in Part III of the said *Schedule,*

(ii) such oher waste, having any of the properties specified in Part III of the *Second Schedule,* as may be prescribed for the purposes of this definition.

Disposal In relation to waste, includes any of the activities specified in the *Third Schedule*, and waste disposal activity shall be construed accordingly.

Recovery	In relation to waste, means any activity carried on for the purposes of reclaiming or re-using, in whole or in part, the waste and any activities related to such reclamation, recycling or re-use, including any of the activities specified in the *Fourth Schedule*, and waste recovery activity shall be construed accordingly.
Recycling	The subjection of waste to any process or treament to make it re-usable in whole.
Recovery Rate	Percentage of usable recycled materials that have been removed from the total amount of municipal solid waste generated in a specific area or by a specific business.
Recycle/Re-use	Minimising waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e. recycling of aluminium cans, paper bottles, etc).
Re-use	Using a product or component of municipal solid waste in its original form more than once, e.g. refilling a glass bottle that has been returned or using a coffee jar to hold nuts and bolts.
Prevention	The reduction of the quantity and of the harmfulness for the environment of waste products.
Authorised Waste Collector	A holder of a waste collection permit.
Facility	In relation to the recovery or disposal of waste, any site or premises used for such purpose.
Transfer Station	A facility where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere.
Participation Rate	Percentage of the population within a catchment area of a particular recycling facility, actually using that facility.
Civic Amenity Site (Civic Amenity Facilities)	Facilities at which waste may be deposited by members of the public in accordance with any conditions for the time being specified by the local authority as respects the nature, type and quantity of waste that may be deposited, and other facilities for (i) The segregation, mixing, baling, storage or treatment of waste prior to its recovery or disposal (ii) The recovery of waste (iii) The disposal of waste (other than household).
Recycling Bring Scheme	A scheme which provides facilities in high density areas, where waste may be deposited by members of the public, each site strategically located so as to serve an optimum amount of people in a neighbourhood.
Home Compost Scheme	Provision of home composting units (free of charge or at a subsidised price) to a designated number of households in an area.
Recycling Bring Banks	Individual stand alone units within a neighbourhood civic amenity site, recycling bring scheme, etc. For example, bottle bank, can bank, textile bank.
Landfill	Waste disposal facility used for the deposit of waste onto or under land.

APPENDIX B: STATISTICS

B1: DISPOSAL/RECOVERY ROUTES FOR EACH INDUSTRY SECTOR

A detailed breakdown of disposal and recovery routes reported for each industry sector is provided here. The following Table provides the description of each NACE industry code used below.

NACE Code	Industry Sector
DJ	Basic Metals and Fabricated Metal Products
DG	Chemicals, Chemical Products and Man-Made Fibres
DF	Coke, Refined Petroleum Products and Nuclear Fuel
F	Construction
DL	Electrical and Optical Equipment
E	Electricity, Gas and Water Supply
DA	Food Products, Beverages and Tobacco
DC	Leather and Leather Products
DK	Machinery and Equipment not elsewhere classified
DN	Manufacturing not elsewhere classified
C	Mining and Quarrying
DI	Other Non-Metallic Mineral Products
DE	Pulp, Paper and Paper Products; Printing and Publishing
DH	Rubber and Plastic Products
DB	Textiles and Textile Products
DM	Transport Equipment
I	Transport, Storage and Communication
DD	Wood and Wood Products

METHOD OF DISPOSAL/RECOVERY	NACE CODES (refer to code key above)									
	DJ	DG	DF	F	DL	E	DA	DC	DK	DN
Landfill	58,732	27,914	1,251	147,111	14,318	171,044	208,270	4,680	342	265
Land treatment	55	3,571	1,310				1,850			
Surface impoundment		60				26,408				
Engineered landfill		634	1	5,000		0				
Deep injection							894			
Release to inland waters		33,263				5,001	12			
Release to seas and oceans		5,533	1,000			60,000				
Biological pretreatment		43,310			875	23	727		14,673	
Physico-chemical pretreatment	1,292	2,672	5		600	31	920	250		
Incineration on land	4	32,288		5	328	1	3,171		24	
Permanent storage							0			
Blending prior to disposal		220			4					
Packaging prior to disposal							0			
Storage prior to disposal	0	4				7				
Re-use in current form	959	47,040		546	1,154	57,554	15,539			40
Re-use as fuel	56	2,659			435	1	2,372			
Solvent recovery	0	54,763			2,323	1	1		80	
Organic substance recovery	81	959			2,101	37	55,089		80	520
Metal recovery	4,306	1,807	100	61	567	2,470	597		361	0
Inorganic material recovery		32	30	30,000	16	415	612			
Acid/base regeneration		100			2					
Pollution abatement component recovery		10							1	
Catalyst recovery		30								
Used oil re-refining/re-use	19	84	6,770	145	10	203	136	1	1	
Beneficial land treatment	4,316	13,571		250,000		61	67,425	4,400		
Accumulation prior to recovery	2	1		9		31	235		2	
Use of recovered residuals								1,500		
Undefined method	10	228		804	280	1	561		72	137
SUBTOTAL	**69,653**	**270,455**	**10,467**	**433,679**	**23,014**	**323,288**	**358,415**	**10,831**	**15,636**	**962**

METHOD OF DISPOSAL/RECOVERY	NACE CODES (refer to code key above)								
	C	DI	DE	DH	DB	DM	I	DD	Unspecified
Landfill	2,200,002	295,709	16,207	22,673	10,399	5	4,668	855	6,050
Land treatment			20						
Surface impoundment		104,880	30		0				
Engineered landfill		1,105	15						
Deep injection			9						
Release to inland waters			0	4					
Release to seas and oceans					1		100,000		0
Biological pretreatment				350	330		504		30
Physico-chemical pretreatment		3	0	38947			1,118		380
Incineration on land		34	10		12			5	8
Permanent storage							5	5	
Blending prior to disposal									1
Packaging prior to disposal									36
Storage prior to disposal		10	0						1
Re-use in current form		26,200	6	989	5,776	0	6	3	1,042
Re-use as fuel		8,000	48,000	407	20			805	52
Solvent recovery		4	3	4					52
Organic substance recovery		23	315,726	3,534	3,965		0	708	1,926
Metal recovery		470	94	154	21	5	794	80	968
Inorganic material recovery		320		140					0
Acid/base regeneration									
Pollution abatement component recovery									0
Catalyst recovery									3
Used oil re-refining/re-use	2	347	14	36	23		153		17
Beneficial land treatment		6,832						12	
Accumulation prior to recovery		140			1				
Use of recovered residuals									
Undefined method		521	1	27	277		21	5	272
SUBTOTALS	**2,200,204**	**444,598**	**80,133**	**28,753**	**20,823**	**10**	**107,268**	**2,478**	**10,838**

B2: WASTES REPORTED BY INDUSTRY CATEGORISED ACCORDING TO EWC/HWL CODES

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
01 00 00	**waste resulting from exploration, mining, dressing and further treatment of minerals and quarrying**		
01 01 00	*waste from mineral excavation*		
01 01 02	waste from mineral non-metalliferous excavation	No	13,200.00
01 02 00	*waste from mineral dressing*		
01 03 00	*waste from further physical & chemical processing of metalliferous minerals*		
01 03 03	tailings	No	18,500.00
01 03 02	dusty and powdery waste	No	614.00
01 04 00	*waste from further physical & chemical processing on non-metaliferous minerals*		
01 04 01	waste gravel and crushed rocks	No	11,100.00
01 04 02	waste sand and clays	No	59,700.00
01 04 03	dusty and powdery waste	No	7,401.00
01 04 05	waste from washing and cleaning of minerals	No	19,482.00
01 04 06	waste from stone cutting and sawing	No	6,500.00
01 04 99	wastes not otherwise specified	No	2,205,000
01 05 00	*drilling muds and other drilling wastes*		
Subtotal			**2,341,497.00**
02 00 00	**waste from agricultural, horticultural, hunting, fishing and aquaculture primary production, food preparation and processing**		
02 01 00	*primary production waste*		
02 01 03	plant tissue waste	No	26,000.00
02 02 00	*wastes from the preparation and processing of meat, fish and other foods of animal origin*		
02 02 01	sludges from washing and cleaning	No	663.20
02 02 02	animal tissue waste	No	19,512.00
02 02 03	materials unsuitable for consumption or processing	No	12,711.00
02 02 04	sludges from on-site effluent treatment	No	4,236.50
02 02 99	wastes not otherwise specified	No	2,857.70
02 03 00	*wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee & tobacco preparation, processing,conserve production; tobacco processing*		
02 03 01	sludges from washing, cleaning, peeling, centrifuging and separation	No	3,451.00
02 03 03	wastes from solvent extraction	No	0.01
02 03 04	materials unsuitable for consumption or processing	No	89.50
02 03 05	sludges from on-site effluent treatment	No	500.00
02 03 99	wastes not otherwise specified	No	121.00
02 04 00	*wastes from sugar processing*		
02 04 01	soil from cleaning and washing beet	No	165,000.00
02 04 99	wastes not otherwise specified	No	7,000.00
02 05 00	*wastes from the dairy products industry*		
02 05 01	materials unsuitable for consumption or processing	No	287.00
02 05 02	sludges from on-site effluent treatment	No	30,125.00
02 05 99	wastes not otherwise specified	No	26,092.91
02 06 00	*wastes from the baking and confectionary industry*		
02 06 01	materials unsuitable for consumption or processing	No	947.00
02 07 00	*wastes from the production of alcoholic and non-alcoholic beverages (excluding coffe, tea & cocoa)*		
02 07 01	wastes from washing, cleaning and mechanical reduction of the raw material	No	6,380.00

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
02 07 02	wastes from spirits distillation	No	4,600.00
02 07 03	waste from chemical treatment	No	3,000.00
02 07 04	materials unsuitable for consumption or processing	No	15,390.00
02 07 05	sludges from on-site effluent treatment	No	1,416.80
02 07 99	wastes not otherwise specified	No	650.00
Subtotal			**331,030.61**
03 00 00	**wastes from wood processing and the production of paper, cardboard, pulp, panels and furniture**		
03 01 00	*wastes from wood processing and the production of paper, cardboard, pulp, panels and furniture*		
03 01 01	waste bark and cork	No	3,350.00
03 01 02	sawdust	No	1,278.75
03 01 03	shavings, cuttings, spoiled timber/particle board/veneer	No	3,131.50
03 01 99	wastes not otherwise specified	No	87.70
03 02 00	*wood preservation waste*	Yes	5.00
03 02 04	inorganic wood preservatives	Yes	9.00
03 03 00	*wastes from pulp, paper and cardboard production and processing*		
03 03 01	bark	No	40,000.00
03 03 06	fibre and paper sludge	No	205.50
03 03 07	rejects from paper and cardboard recycling	No	194.10
03 03 99	wastes not otherwise specified	No	21,843.92
Subtotal			**70,105.47**
04 00 00	**wastes from the leather and textile industries**		
04 01 00	*wastes from the leather industry*		
04 01 01	fleshings and lime split waste	No	5,900.00
04 01 06	sludges containing chromium	No	4,400.00
04 01 08	waste tanned leather (blue sheetings, shavings, cuttings, buffing dust) containing chromium	No	100.00
04 02 00	*wastes from textile industry*		
04 02 01	wastes from unprocessed textile fibres and other natural fibrous substances mainly of vegetable origin	No	114.00
04 02 02	wastes from unprocessed textile fibres mainly of animal origin	No	5.00
04 02 03	wastes from unprocessed textile fibres mainly artificial or synthetic	No	802.00
04 02 05	wastes from processed textile fibres mainly of vegetable origin	No	4,121.66
04 02 06	wastes from processed textile fibres mainly of animal origin	No	645.21
04 02 07	wastes from processed textile fibres mainly of artificial or synthetic origin	No	5,871.60
04 02 08	wastes from processed mixed textile fibres	No	36.00
04 02 10	organic matter from natural products (e.g. grease, wax)	No	0.50
04 02 12	non-halogenated wastes from dressing and finishing	No	290.00
04 02 99	wastes not otherwise specified	No	3,514.75
Subtotal			**25,800.72**
05 00 00	**wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal**		
05 01 00	*oily sludges and solid wastes*		
05 01 02	desalter sludges	No	100.00
05 01 03	tank bottom sludges	Yes	6,000.00
05 01 06	sludges from plant, equipment and maintenance operations	No	100.00
05 02 00	*non oily sludges and solid wastes*		
05 03 00	*spent catalysts*		
05 03 01	spent catalysts containing precious metals	No	10.00
05 03 02	other spent catalysts	No	30.00

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
05 04 00	*spent filter clays*		
05 05 00	*oil desulphurisation waste*		
05 05 01	waste containing sulphur	No	1,000.00
05 06 00	*waste from the pyrolytic treatment of coal*		
05 07 00	*wastes from natural gas purification*		
05 07 99	wastes not otherwise specified	No	50.50
05 08 00	*wastes from oil generation*		
Subtotal			**7,290.50**
06 00 00	**wastes from inorganic chemical processes**		
06 01 00	***waste acidic solutions***		
06 01 01	sulphuric acid nd sulphurous acid	Yes	500.00
06 01 02	hydrochloric acid	Yes	144.16
06 01 05	nitric acid and nitrous acid	Yes	0.01
06 01 99	waste not otherwise specified	Yes	4,002.40
06 02 00	***waste alkaline solutions***		
06 02 02	soda	Yes	30.00
06 02 03	ammonia	Yes	10.78
06 02 99	wastes not otherwise specified	Yes	4,000.00
06 03 00	***waste salts and their solutions***		
06 03 02	saline solutions containing sulphates, sulphites or sulphides	No	8,071.00
06 03 03	solid salts containing sulphates, sulphites or sulphides	No	262.00
06 03 04	saline solutions containing chlorides, fluorides and halides	No	5,500.00
06 03 06	saline solutions containing phosphates and related solid salts	No	21.00
06 03 10	solid salts containing ammonium	No	6.00
06 03 99	wastes not otherwise specified	No	11,402.40
06 04 00	***metal-containing wastes***		
06 04 01	metallic oxides	No	7.00
06 04 05	wastes containing other heavey metals	Yes	13.00
06 04 99	wastes not otherwise specified	No	28.00
06 05 00	***sludges from on-site effluent treatment***		
06 05 01	sludges from on-site effluent treatment	No	509.54
06 06 00	***wastes from sulphur chemical processes(production and transformation) and desulphurisatin processes***		
06 07 00	***wastes from halogen chemical processes***		
06 07 99	wastes not otherwise specified	No	11,440.00
06 08 00	***wastes from the production of silicon and silicon derivatives***		
06 09 00	***wastes from phosphorus chemical processes***		
06 10 00	***wastes from nitrogen chemical processes and fertilizer manufacture***		
06 10 01	waste from nitrogen chemical processes and fertilizer manufacture	No	150.00
06 11 00	***wastes from the manufacturing of inorganic pigments and aopacifiers***		
06 12 00	***wastes from production, use and regeneration of catalysts***		
06 12 01	spent catalysts containing precious metals	No	0.30
06 12 02	other spent catalysts	No	126.50
06 13 00	***wastes from other inorganic chemical processes***		
06 13 02	spent activated carbon (except 06 07 02)	Yes	1.10
Subtotal			**46,186.20**
07 00 00	**wastes from organic chemical processes**		
07 01 00	***waste from the manufacture, formulation, supply and use (msfu) of basic organic chemicals***		
07 01 01	aqueous washing liquids and mother liquors	Yes	535.00

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
07 01 02	sludges from on-site effluent treatment	No	186.40
07 01 03	organic halogenated solvents, washing liquids and mother liquors	Yes	0.10
07 01 04	other organic solvents, washing liquids and mother liquors	Yes	26.50
07 01 10	other filter cakes, spent absorbents	Yes	1,070.00
07 01 99	wastes not otherwise specified	No	30.25
07 02 00	***waste from the msfu of plastics, synthetic rubber and man-made fibres***		
07 02 01	aqueous washing liquids and mother liquors	Yes	700.00
07 02 03	organic halogenated solvents, washing liquids and mother liquors	Yes	3.13
07 02 04	other organic solvents, washing liquids and mother liquors	Yes	134.48
07 02 05	spent catalysts containing precious metals	No	25.00
07 02 99	wastes not otherwise specified	No	4,602.86
07 03 00	***waste from the msfu of organic dyes and pigments (excluding 06 11 00)***		
07 03 04	other organic solvents, washing liquids and mother liquors	Yes	96.00
07 03 08	other still bottoms and reaction residues	Yes	120.00
07 03 99	wastes not otherwise specified	No	1.95
07 04 00	***waste from the msfu of organic pesticides (except 02 01 05)***		
07 04 04	other organic solvents, washing liquids and mother liquors	Yes	12,000.00
07 04 99	wastes not otherwise specified	No	0.70
07 05 00	***waste from the msfu of pharmaceuticals***		
07 05 01	aqueous washing liquids and mother liquors	Yes	52,025.62
07 05 02	sludges from on-site effluent treatment	No	8,137.44
07 05 03	organic halogenated solvents, washing liquids and mother liquors	Yes	7,645.69
07 05 04	other organic solvents, washing liquids and mother liquors	Yes	53,893.25
07 05 05	spent catalysts containing precious metals	No	31.34
07 05 06	other spent catalysts	No	38.10
07 05 07	halogenated still bottoms and reaction residues	Yes	98.00
07 05 08	other still bottoms and reaction residues	Yes	581.40
07 05 09	halogenated filter cakes, spent absorbents	Yes	25.00
07 05 10	other filter cakes, spent absorbents	Yes	736.40
07 05 99	wastes not otherwise specified	No	5,817.40
07 06 00	***waste from the msfu of fats, grease, soaps, detergents, disinfectants and cosmetics***		
07 06 02	sludges from on-site effluent treatment	No	1,162.90
07 06 99	wastes not otherwise specified	No	280.10
07 07 00	***waste from the msfu of fine chemicals and chemical products not otherwise specified***		
07 07 01	aqueous washing liquids and mother liquors	Yes	2,530.00
07 07 02	sludges from on site effluent treatment	No	30,040.00
07 07 03	organic halogenaged solvents, washing liquids and mother liquors	Yes	150.56
07 07 04	other organic solvents, washing liquids and mother liquors	Yes	6,522.70
07 07 08	other still bottoms and reaction residues	Yes	1,900.00
07 07 99	wastes not otherwise specified	No	17,602.90
Subtotal			**208,751.16**
08 00 00	**wastes from the manufacture, formulation, supply and use (mfsu) of coatings (paints, varnishes and vitreous enamels), adhesive, sealants and printing inks**		
08 01 00	***wastes from the manufacture, formulation, supply and use (msfu) of coatings (paints, varnishesand vitreous enamels), adhesive, sealants and printing inks***		
08 01 02	waste paints and varnish free of halogenated solvents	Yes	0.20
08 01 05	hardened paints and varnishes	No	3.00
08 01 08	aqueous sludges containing paint or varnish	No	11.00

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
08 01 09	waste from paint or varnish removal (except 08 01 05 and 08 01 06)	No	0.20
08 01 10	aqueous suspensions containing paint or varnish	No	0.20
08 02 00	***wastes from the msfu of other coating (including ceramic materials)***		
08 03 00	***waste from the msfu of printing inks***		
08 03 02	waste ink free of halogenated solvents	Yes	0.25
08 03 03	waste from water-based ink	No	34.10
08 03 06	ink sludges free of halogenated solvents	Yes	0.50
08 03 99	wastes not otherwise specified	No	4.10
08 04 00	***wastes from the msfu of adhesives and sealants(including waterproofing products)***		
Subtotal			**53.55**
09 00 00	**wastes from the photographic industry**		
09 01 00	***wastes from the photographic industry***		
09 01 99	wastes not otherwise specified	No	0.40
Subtotal			**0.40**
10 00 00	**inorganic wastes from thermal processes**		
10 01 00	***wastes from power station and other combustion plants (except 19 00 00)***		
10 01 01	bottom ash	No	38,200.00
10 01 03	peat fly ash	No	202,300.00
10 01 04	oil fly ash	Yes	36.00
10 01 11	aqueous sludges from boiler cleansing	No	3,467.00
10 01 12	spent linings and refractories	No	34.00
10 01 99	wastes not otherwise specified	No	395.00
10 02 00	***wastes from the iron and steel industry***		
10 02 02	unprocessed slag	No	33,000.00
10 02 03	solid wastes from gas treatment	No	3,800.00
10 02 04	sludges from gas treatment	No	100.00
10 02 05	other sludges	No	500.00
10 02 06	spent linings and refractories	No	8,760.00
10 02 99	wastes not otherwise specified	No	8,200.00
10 03 00	***wastes from aluminium thermal metallurgy***		
10 04 00	***wastes from lead thermal metallurgy***		
10 05 00	***wastes from zinc thermal metallurgy***		
10 06 00	***wastes from copper thermal metallurgy***		
10 07 00	***wastes from silver, gold and platinum thermal metallurgy***		
10 08 00	***wastes from other non-ferrous thermal metallurgy***		
10 09 00	***wastes from casting of ferrous pieces***		
10 09 02	casting cores and moulds containing organic binders which have undergone pouring	No	1,900.00
10 09 03	furnace slag	No	960.00
10 09 04	furnace dust	No	240.00
10 10 00	***wastes from casting of non-ferrous pieces***		
10 11 00	***wastes from manufacture of glass and glass products***		
10 12 00	***wastes from manufacture of ceramic goods, bricks, tiles and construction products***		
10 12 03	other particulates and dust	No	1,200.00
10 12 99	wastes not otherwise specified	No	238.00
10 13 00	***wastes from manufacture of cement, lime and plaster and articles and products made from them***		
10 13 01	waste preparation mixture before thermal processing	No	11,388.00
10 13 02	wastes from asbestos-cement manufacture	No	350.00

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
10 13 03	wastes from other cement-based composite materials	No	10,151.00
10 13 04	waste from calcination and hydration of lime	No	1,500.00
10 13 08	spent linings and refractories	No	1,184.00
10 13 99	wastes not otherwise specified	No	263,242.00
Subtotal			**591,145.00**
11 00 00	**inorganic waste with metals from metal treatment and the coating of metals; non-ferrous hydro-metallurgy**		
11 01 00	***inorganic waste with metals from metal treatment and the coating of metals; non-ferrous hydrometallurgy***		
11 01 01	cyanidic (alkaline) wastes containing heavy metals other than chromium	Yes	25.70
11 01 02	cyanidic (alkaline) wastes which do not contain heavy metals	Yes	2.25
11 01 03	cyanide-free wastes containing chromium	Yes	58.00
11 01 04	cyanide-free wastes not containing chromium	No	40.75
11 01 05	acidic pickling solutions	Yes	926.00
11 01 06	acids not otherwise specified	Yes	16.48
11 01 07	alkalis not otherwise specified	Yes	19.00
11 01 08	phosphatizing sludges	Yes	18.00
11 02 00	***wastes and sludges from non-ferrous hydrometallurgical processes***		
11 02 04	sludges not otherwise specified	No	22.90
11 03 00	***sludges and solids from tempering processes***		
11 03 01	wastes containing cyanide	Yes	5.09
11 04 00	***other inorganic wastes with metals not otherwise specified***		
11 04 01	other inorganic wastes with metals not otherwise specified	No	3,238.80
Subtotal			**4,372.97**
12 00 00	**wastes from shaping and surface treatment of metals and plastics**		
12 01 00	***wastes from shaping (including forging, welding, pressing, drawing, turning, cutting and filing)***		
12 01 01	ferrous metal filings and turnings	No	1,015.33
12 01 02	other ferrous metals particles	No	847.60
12 01 03	non-ferrous metal filings and turnings	No	58.57
12 01 04	other non-ferrous metal particules	No	173.75
12 01 05	plastics particles	No	2,115.78
12 01 07	waste machining oils free of halogens (not emulsioned)	Yes	38.80
12 01 09	waste machining emulsions free of halogens	Yes	19.44
12 01 10	synthetic machining oils	Yes	11.88
12 01 11	machining sludges	Yes	2.40
12 01 12	spent waxes and fats	Yes	19.00
12 01 13	welding wastes	No	28.11
12 01 99	wastes not otherwise specified	No	4,988.00
12 02 00	***wastes from mechanical surface treatment processes (blasting, grinding, honing, lapping, polishing)***		
12 02 01	spent blasting grit	No	170.28
12 02 02	sludges from grinding, honing and lapping	No	7.18
12 02 03	polishing sludges	No	1.25
12 02 99	wastes not otherwise specified	No	32.00
12 03 00	***wastes from water and steam degreasing processes (except 11 00 00)***		
12 03 01	aqueous washing liquids	Yes	105.51
Subtotal			**9,634.89**

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
13 00 00	**oil wastes (except edible oils, 05 00 00 and 12 00 00)**		
13 01 00	***waste hydraulic oils and break fluids***	***Yes***	***32.09***
13 01 06	hydraulic oils containing only mineral oil	Yes	1.00
13 01 07	other hydraulic oils	Yes	2.10
13 02 00	***waste engine, gear & lubricating oils***	***Yes***	***2.72***
13 02 01	chlorinated engine, gear and lubricating oils	Yes	35.15
13 02 02	non-chlorinated engine, gear, lubricating oils	Yes	99.12
13 02 03	other engine, gear and lubricating oils	Yes	767.71
13 03 00	***waste insulating and heat transmission oils and other liquids***	***Yes***	***18.47***
13 03 01	insulating or heat transmission oils and other liquids containing pcbs or pcts	Yes	17.50
13 03 02	other chlorinated insulating and heat transmission oils and other liquids	Yes	2.50
13 03 03	non-chlorinated insulating and heat transmission oils and other liquids	Yes	5.15
13 03 04	synthetic insulating and heat transmission oils and other liquids	Yes	1.38
13 03 05	mineral insulating and heat transmission oils	Yes	6.42
13 04 00	***bilge oils***		
13 04 01	bilge oils from inland navigation	Yes	3.00
13 04 03	bilge oils from other navigation	Yes	3.00
13 05 00	***oil/water separator contents***		
13 05 01	oil/water separator solids	Yes	100.00
13 05 03	interceptor sludges	Yes	1,629.34
13 06 00	***oil waste not otherwise specified***		
13 06 01	oil waste not otherwise specified	Yes	13.80
Subtotal			**2,740.45**
14 00 00	**wastes from organic substances employed as solvents (except 07 00 00 and 08 00 00)**		
14 01 00	***wastes from metal degreasing and machinery maintenance***		
14 01 03	other solvents and solvent mixes	Yes	2,900.00
14 02 00	***wastes from textile cleaning and degreasing of natural products***		
14 03 00	***wastes from the electronic industry***	**Yes**	**10.00**
14 03 02	other halogenated solvents	Yes	8.00
14 03 03	solvents and solvent mixes free of halogenated solvents	Yes	520.05
14 03 05	sludges or solid wastes containing other solvents	Yes	26.70
Subtotal			**3,464.75**
15 00 00	**packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified**		
15 01 00	***packaging***		
15 01 01	paper and cardboard	No	22,722.90
15 01 02	plastic	No	2,217.17
15 01 03	wooden	No	3,313.80
15 01 04	metallic	No	1,919.85
15 01 05	composite packaging	No	1,705.50
15 01 06	mixed	No	5,726.93
15 01 07	contaminated packaging	No	319.10
15 02 00	***absorbents, filter materials, wiping cloths and protective clothing***		
15 02 01	absorbents, filter materials, wiping cloths, protective clothing	No	1,763.03
Subtotal			**39,688.28**
16 00 00	**waste not otherwise specified in the catalogue**		
16 01 00	***end of life vehicles***		
16 01 03	used tyres	No	311.50

EWC Code	Description	Hazardous	Quantity (tonnes/annum)
16 02 00	***discarded equipment and shredder residues***		
16 02 01	transformers and capacitors containing pcb or pcts	Yes	0.10
16 02 02	other discarded electronic equipment (e.g. printed circuit boards)	No	52.20
16 02 03	equipment containing chlorofluorocarbons	No	2.00
16 02 05	other discarded equipment	No	308.00
16 02 07	waste from the plastic convertor industry	No	1,145.00
16 03 00	***off-specification batches***		
16 03 01	inorganic off-specification batches	No	214.65
16 03 02	organic off-specification batches	No	133.20
16 04 00	***waste explosives***		
16 05 00	***chemicals and gases in containers***		
16 05 02	other waste containing inorganic chemicals, e.g. lab chemicals not otherwise specified, fire extinguishing powders	No	8.03
16 05 00	***chemicals and gases in containers***	***No***	***3.40***
16 05 01	industrial gases in high pressure cylinders, lpg containers and industrial aerosol containers (including halons)	No	978.97
16 05 03	other waste containing organic chemicals, e.g. lab chemicals not otherwise specified	No	14,752.33
16 06 06	electrolyte from batteries and accumulators	Yes	0.06
16 07 02	waste from marine transport tank cleaning, containing oil	Yes	250.00
Subtotal			**18,159.44**
17 00 00	**construction and demolition waste (including road construction)**		
17 01 00	***concrete, bricks, tiles, ceramics, and gypsum based materials***	**No**	**1,800.00**
17 01 01	concrete	No	4,578.50
17 01 02	bricks	No	8,006.48
17 01 03	tiles and ceramics	No	0.50
17 01 04	gypsum based construction materials	No	5.00
17 01 05	asbestos based construction materials	No	5.00
17 02 00	***wood, glass and plastic***		
17 02 01	wood	No	89.50
17 02 02	glass	No	96.33
17 02 03	plastic	No	2.00
17 03 00	***asphalt, tar, and tarred products***		
17 03 01	asphalt containing tar	No	1,520.00
17 03 02	asphalt (not containing tar)	No	1,080.00
17 03 03	tar and tar products	No	190.00
17 04 00	***metals (including their alloys)***		
17 04 01	copper, bronze, brass	No	64.55
17 04 02	aluminium	No	253.12
17 04 03	lead	No	7.50
17 04 04	zinc	No	130.50
17 04 05	iron and steel	No	628.20
17 04 06	tin	No	5.50
17 04 07	mixed metals	No	2,522.50
17 04 08	cables	No	52.93
17 05 00	***soil and dredging spoil***		
17 05 01	soil and stones	No	374,224.00
17 05 02	dredging spoil	No	109,000.00
17 06 00	***insulation materials***		
17 06 01	insulation materials containing asbestos	Yes	472.50
17 06 02	other insulation materials	No	251.29

EWC Code	Description	Hazardous	Quantity (Tonnes/Annum)
17 07 00	***mixed construction and demolition waste***		
17 07 01	mixed construction and demolition waste	No	57,306.50
sub-total			**562,292.40**
18 00 00	**wastes from human or animal health care and/or related research (excluding kitchen and restaurant wastes which do not arise from immediate health care)**		
18 01 00	***wasts from natal care, diagnosis, treatment or prevention of disease in humans***		
18 02 00	***waste from research, diagnosis, treatment or prevention of disease involing animals***		
18 02 04	discarded chemicals	Yes	1.20
Subtotal			**1.20**
19 00 00	**wastes from waste treatment facilities, off-site waste water treatment plants and the water industry**		
19 01 00	***wastes from incineration or pyrolysis of municipal and similar commercial, industrial and institutional wastes***		
19 01 01	bottom ash and slag	No	97.00
19 01 03	fly ash	Yes	150.00
19 01 04	boiler dust	Yes	0.15
19 01 06	aqueous liquid waste from gas treatment and other aqueous liquid wastes	Yes	172.50
19 01 99	wastes not otherwise specified	No	1,180.00
19 02 00	***wastes from specific physico/chemical treatmnets of industrial wastes (e.g. dechromatation, decyanidation, neutralisation)***		
19 02 01	metal hydroxide sludges and other sludges from metal insolubilisation treatment	Yes	1,463.00
19 03 00	***stabilised/solidified wastes***		
19 03 02	wastes stabilized/solidified with organic binders	No	115.00
19 03 03	wastes stabilized by biological treatment	No	1,996.55
19 04 00	***vitrified wastes and wastes from vitrification***		
19 05 00	***wastes from aerobic treatment of solid wastes***		
19 06 00	***wastes from anaerobic treatment of wastes***		
19 07 00	***landfill leachate***		
19 08 00	***wastes from waste water treatment plants not otherwise specified***		
19 08 02	wastes from desanding	No	2,550.00
19 08 03	grease and oil mixture from oil/waste water separation	Yes	1,408.39
19 08 04	sludges from the treatment of industrial waste water	No	3,064.33
19 08 06	saturated or spent ion exchange resins	Yes	29.58
19 08 07	solutions and sludges from regeneration of ion exchangers	Yes	50.20
19 08 99	wastes not otherwise specified	No	1,840.01
19 09 00	***wastes from the preparation of drinking water or water for industrial use***		
19 09 01	solid wastes from primary filtration and screening	No	4.01
19 09 02	sludges from water clarification	No	60.10
19 09 04	spent activated carbon	No	18.16
19 09 05	saturated or spent ion exchange resins	No	42.20
19 09 06	solutions and sludges from regeneration of ion exchangers	No	72,000.10
19 09 99	wastes not otherwise specified	No	3.90
Subtotal			**86,245.29**
20 00 00	**municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions**		
20 01 00	***separately collected fractions***		
20 01 01	paper and cardboard	No	2,869.16
20 01 01 01	packaging	No	509.40
20 01 01 02	newspapers-brochures	No	721.60

EWC Code	Description	Hazardous	Quantity (Tonnes/Annum)
20 01 01 03	magasines & glossy paper	No	1,699.06
20 01 01 04	other papers	No	2,332.48
20 01 01 05	flat packaging cardboard	No	472.03
20 01 01 06	corrugated packaging cardboard	No	1,984.05
20 01 01 07	other cardboards	No	18.70
20 01 01 08	cardboard composite packaging	No	45.50
20 01 01 09	liquid packaging Al	No	0.20
20 01 01 10	liquid packaging non-Al	No	0.03
20 01 02	glass	No	6.18
20 01 02 01	green glass packaging	No	92.77
20 01 02 02	clear glass packaging	No	4,089.47
20 01 02 03	brown glass packaging	No	460.92
20 01 02 05	other glass waste	No	23.25
20 01 03	small plastics	No	158.83
20 01 03 01	mixed flexible plastic	No	230.01
20 01 03 02	clear PVC bottles	No	1.00
20 01 03 04	mixed rigid plastic	No	178.14
20 01 03 05	opaque PVC jars & bottles	No	24.75
20 01 03 07	brown PET jars & bottles	No	3.53
20 01 03 08	PE bottles	No	250.55
20 01 04	other plastics	No	178.55
20 01 05	small metals (cans etc.)	No	623.00
20 01 05 01	ferrous metal packaging	No	101.35
20 01 05 02	other ferrous metal waste	No	271.90
20 01 05 03	aluminium packaging	No	28.49
20 01 05 04	other aluminium waste	No	2.42
20 01 05 05	other metal packaging	No	8.40
20 01 06	other metals	No	448.03
20 01 07	wood	No	138.50
20 01 08	organic compostable kitchen waste (including frying oil and kitchen waste from canteens and restaurants)	No	603.70
20 01 08 01	food waste	No	19,886.69
20 01 09	oil and fat	No	14.76
20 01 11	textiles	No	3.00
20 01 11 01	packaging	No	102.00
20 01 11 02	other textiles	No	40.00
20 01 11 03	health care textiles	No	35.70
20 01 12	paint, inks, adhesives and resins	Yes	216.69
20 01 13	solvents	Yes	53.10
20 01 14	acids	No	9.50
20 01 15	alkalines	No	2.44
20 01 16	detergents	No	104.18
20 01 17	photo chemicals	Yes	4.00
20 01 18	medicines	No	10.00
20 01 19	pesticides	Yes	0.75
20 01 20	batteries	No	37.09
20 01 21	fluorescent tubes and other mercury containing waste	Yes	114.56
20 01 22	aerosols	No	0.85
20 01 24	electronic equipment (e.g. printed circuit boards)	No	0.85
20 01 25 01	wood packaging	No	69.00

EWC Code	Description	Hazardous	Quantity (Tonnes/Annum)
20 01 25 03	other unclassified combustibles	No	276.00
20 02 00	***garden and park waste (including cemetery waste)***	**No**	**10.00**
20 02 01	compostable wastes	No	92.06
20 02 02	soil and stones	No	1,691.00
20 03 00	***other municipal waste***		
20 03 01	mixed municipal waste	No	20,635.56
20 03 03	street cleaning residues	No	20.00
20 03 04	septic tank sludge	No	254.96
20 03 05	end of life vehicles	No	585.64
Subtotal			**62,846.31**
GrandTotal			**4,411,306**

APPENDIX C: FACILITIES

C1: ACTIVE LANDFILL SITES IN IRELAND

Authority	*Site Name*	Total Void Space (million m^3)	Remaining Space (million m^3)	Quantity Deposited (tonnes/annum)
Carlow County Council				
	Ballyellen Limes Works	n/a	n/a	n/a
	Billy Dixon Ltd.	n/a	n/a	n/a
	Dan Morrisy Ltd.	n/a	n/a	n/a
	Irish Sugar Ltd.	n/a	n/a	n/a
	Kildavin Concrete Ltd.	n/a	n/a	n/a
	Liam Conway Ltd.	n/a	n/a	n/a
	O'Brien Ardistan	n/a	n/a	n/a
	Powerstown	0.7	0.55	19,900
	Stone Development	n/a	n/a	n/a
	Tom McDonald	n/a	n/a	n/a
Subtotals		**0.7**	**0.55**	**19,900**
Cavan County Council				
	Baileboro	n/a	n/a	2,000
	Ballyjamesduff	n/a	n/a	1,000
	Belturbet	n/a	n/a	1,000
	Cavan	n/a	n/a	13,673
Subtotals		**0**	**0**	**17,637**
Clare County Council				
	Air Rianta	n/a	n/a	33,000
	Doora	5	4.25	34,000
	E.S.B.	n/a	n/a	33,000
	Ennistymon	0.1	0.064	3,000
	Lisheen	0.12	0.068	1,174
	Shannon Development	n/a	n/a	33,000
	Syntex	n/a	n/a	33,000
	Whitegate	0.568	0.528	1,500
Subtotals		**5.79**	**4.91**	**171,674**
Cork Corporation				
	Kinsale Road	6	0.75	122,500
Subtotals		**6**	**0.75**	**122,500**
Cork County Council				
	Ballyguyroe	0.9	0.9	24,000
	Bandon	n/a	n/a	4,000
	Benduff	n/a	n/a	13,000
	Derryconnell	n/a	n/a	2,000
	Kealanine	n/a	n/a	4,500
	Kilbarry	n/a	n/a	1,000
	Macroom	n/a	n/a	4,500
	Rafeen	n/a	n/a	20,000
	Rossmore	n/a	n/a	35,000
	Youghal	n/a	n/a	8,000
Subtotals		**0.9**	**0.9**	**116,000**

Authority *Site Name*	Total Void Space (million m^3)	Remaining Space (million m^3)	Quantity Deposited (tonnes/annum)
Donegal County Council			
Balbane	0.2	0.05	7,340
Ballinacarrick	0.39	0.11	37,440
Churchtown	0.28	0.04	11,340
Drumabodan	0.32	0.5	7,340
Dungloe	0.08	0.008	3,340
Subtotals	**1.27**	**0.71**	**66,800**
Drogheda Corporation			
Mell	2.4	1.86	27,150
Subtotals	**2.4**	**1.86**	**27,150**
Dun Laoghaire-Rathdown Co Co			
Ballyogan	3.5	0.15	105,000
Subtotals	**3.5**	**0.15**	**105,000**
Dundalk U.D.C.			
Newry Road	0.95	0.53	26,700
Subtotals	**0.95**	**0.53**	**26,700**
Fingal County Council			
Ardla	0.5	0	25,000
Balleally	4.75	0.7	246,000
Dunsink	6.1	0.25	284,000
Subtotals	**11.35**	**0.95**	**555,000**
Galway Corporation			
Carrowbrowne	0.5	0.05	70,000
Subtotals	**0.5**	**0.05**	**70,000**
Galway County Council			
Ballinasloe	1.019	0.8	27,402
Clifden *	0.048	0	4,310
Inishmore/Aran	0.0162	0	590
Portumna	0.105	0.02	5,200
Tuam	0.1416	0	14,765
Subtotals	**1.33**	**0.82**	**52,267**
Kerry County Council			
Ahascra	0.08	0.004	1,000
Cahirciveen	0.088	0.008	3,500
Coolcaslagh	0.808	0.548	11,000
Dingle	0.1	0.006	2,000
Kenmare	0.115	0.065	3,000
Klinge Pharma and Co	n/a	n/a	n/a
Leanamore	0.025	0.012	1,000
Milltown	0.238	0.128	5,000
North Kerry	0.65	0.604	22,000
Subtotals	**2.1**	**1.37**	**48,500**
Kildare County Council			
Silliot Hill	0.71	0.16	90,000
Subtotals	**0.71**	**0.16**	**90,000**

Authority	*Site Name*	Total Void Space (million m^3)	Remaining Space (million m^3)	Quantity Deposited (tonnes/annum)
Kilkenny County Council				
	Cahirlesk	0.025	0.01	3,000
	Dunmore	0.55	0.3	29,000
	Grannagh	0.16	0.03	7,000
	Shellumsrath	0.025	0.004	3,000
Subtotals		**0.76**	**0.34**	**42,000**
Laois County Council				
	Ballylinan	0.3	0.05	450
	Kyletalesha	2.4	0.8	23,000
Subtotals		**2.7**	**0.85**	**23,450**
Leitrim County Council				
	Carrick-on-Shannon	0.076	0.043	2,500
	Manorhamilton	0.032	0.008	2,200
	Mohill	0.045	0.024	2,000
Subtotals		**0.15**	**0.08**	**6,700**
Limerick Corporation				
	Longpavement	n/a	n/a	30,000
Subtotals		**0**	**0**	**30,000**
Limerick County Council				
	Abbeyfeale	0.03	0.008	1,000
	Croom	0.25	0.08	16,500
	Gortadroma	0.7	0.6	40,000
Subtotals		**0.98**	**0.69**	**57,500**
Longford County Council				
	Drumlish	n/a	n/a	9,010
Subtotals		**0**	**0**	**9,010**
Louth County Council				
	Simonstown	n/a	n/a	20
	White River	n/a	n/a	13,500
Subtotals		**0**	**0**	**13,520**
Mayo County Council				
	Asahi Ltd.	n/a	n/a	75
	Cloonconor, Claremorris	0.1	0	14,425
	Derrinnumera	1.7	0.09	24,929
	Rathroeen, Ballina	1.26	0.56	15,551
	Shranbogroneen,Belmullet	0.26	0.04	1,091
Subtotals		**3.32**	**0.69**	**56,070**
Meath County Council				
	Basketstown	0.5	0.2	45,000
	Lismullen	0.026	0.02	1,500
	Tara Mines Limited	0.38	0.31	n/a
Subtotals		**0.91**	**0.53**	**46,500**
Monaghan County Council				
	Scotch Corner	0.6	0.25	20,000
Subtotals		**0.6**	**0.25**	**20,000**

Authority	*Site Name*	Total Void Space (million m^3)	Remaining Space (million m^3)	Quantity Deposited (tonnes/annum)
Offaly County Council				
	Birr	0.2	0.01	5,700
	Derryclure	0.5	0.36	26,000
	E.S.B. Ferbane	n/a	n/a	8,000
	Edenderry	0.16	0.13	3,900
	Rhode	n/a	n/a	1,500
	Shannonbridge	n/a	n/a	18,000
Subtotals		**0.86**	**0.5**	**63,100**
Roscommon County Council				
	Ballaghaderren	0.189	0.09	3,534
	Boyle	0.177	0.066	3,633
	Castlerea	0.08	0.05	3,533
	Rooskey	n/a	n/a	2,434
	Roscommon	0.35	0.08	6,433
	Strokestown	0.14	0.112	3,033
Subtotals		**0.94**	**0.4**	**22,600**
Sligo County Council				
	Marlowe	0.07	0.024	4,000
Subtotals		**0.07**	**0.024**	**4,000**
South Dublin County Council				
	Friarstown	n/a	n/a	10,000
Subtotals		**0**	**0**	**10,000**
Tipperary N.R. County Council				
	Ballghveeney	n/a	n/a	20,000
	Templemore	n/a	n/a	10,000
	Thurles	n/a	n/a	10,000
Subtotals		**0**	**0**	**40,000**
Tipperary S.R. County Council				
	Connawarries	0.2	0.015	15,000
	Coole	0.45	0.001	500
	Donohill	0.2	0.05	19,500
Subtotals		**0.85**	**0.07**	**35,000**
Waterford Corporation				
	Kilbarry	0	1	78,000
Subtotals		**0**	**1**	**78,000**
Waterford County Council				
	Bawnard	0.06	0.03	2,000
	Dungarvan	0.3	0.1	16,000
	Tramore	0.75	0.5	6,200
Subtotals		**1.11**	**0.63**	**24,200**
Westmeath County Council				
	Ballydonagh	0.4	0.3	15,500
	Marlinstown	0	0.12	18,000
Subtotals		**0.4**	**0.42**	**33,500**

Authority	*Site Name*	Total Void Space (million m^3)	Remaining Space (million m^3)	Quantity Deposited (tonnes/annum)
Wexford County Council				
	Ballyheeagh	0.3	0.04	10,000
	Killurin	1.2	0.3	45,000
Subtotals		**1.5**	**0.34**	**55,000**
Wicklow County Council				
	Ballyduff	0.083	0.068	8,000
	Ballymurtagh	0.24	0.131	17,278
	Fassaroe *	0.04	0.0009	23,714
	IFI Arklow	n/a	n/a	1,000
	Killegar	0.2	0.08	18,400
	Rampere	0.097	0.027	5,746
	Woodfab	n/a	n/a	n/a
Subtotals		**0.66**	**0.31**	**74,138**
GRAND TOTALS		**53.31**	**20.82**	**2,233,416**

* Not included in Figures 6.4 and 6.5 as they were reported to have been closed while study results were being compiled.

C2: DETAILS OF CIVIC AMENITY SITES SITUATED ON LANDFILL SITES AND AS STAND ALONE SITES THROUGHOUT IRELAND

Local Authority Area	Site Name/Location	Situated On	Facilities
Carlow County Council	Powerstown Landfill - On N9 8km south of Carlow	Landfill Site	Bottle, Can, Textile, Paper, Waste Oil, Battery, Vehicles, Constr/Demolition, Compactor, Fridges
Clare County Council	Doora Tiphead - Doora, Ennis	Landfill Site	Bottle, Can, Fridges
Cork Corporation	Kinsale Road Sanitary Landfill - South City Link Road, Cork	Landfill Site	Bottle, Can, Textile, Green Waste, Paper, Waste Oil, Vehicles, Fridges, Newspaper
Dun Laoghaire-Rathdown C.C.	Ballyogan	Landfill Site	Bottle, Can, Paper, Waste Oil, Vehicles, Fridges
Fingal County Council	Balleally - Balleally, Lusk, Co.Dublin	Landfill Site	Bottle, Can, Textile, Waste Oil, Vehicles, Fridges
Fingal County Council	Dunsink - Dunsink Lane, Finglas, D11	Landfill Site	Bottle, Can, Textile, Paper, Waste Oil, Vehicles, Fridges
Galway Corporation	Carrowbrown Landfill - Headford Road, Galway	Landfill Site	Bottle, Can, Vehicles, Fridges
Kildare County Council	Silliot Hill - Silliot Hill, Kilcullen	Landfill Site	Bottle, Can, Textile, Paper, Waste Oil, Battery, Vehicles, Fridges
Laois County Council	Kyletalesha - Portlaoise	Landfill Site	Bottle, Can, Textile, Paper, Waste Oil, Vehicles, Constr/Demolition, Fridges
Louth County Council	White River - Whitewater Rd, Collon	Landfill Site	Waste Oil
Meath County Council	Basketstown - 2km north of Summertown	Landfill Site	Textile
Offaly County Council	Derryclure - 3 miles south of Tullamore along N80	Landfill Site	Bottle, Can, Textile, Waste Oil
Sligo County Council	WDS Ltd - Deep Water Quay, Sligo	Stand Alone Site	Paper, Waste Oil, Vehicles, Constr/Demolition, Fridges
South Dublin County Council	Friarstown - Friarstown Landfill	Landfill Site	Bottle, Can, Textile, Waste Oil, Fridges
South Dublin County Council	Ballymount - Ballymount Road Lower	Stand Alone Site	
Tipperary S.R. Co. Co.	Coole - Knocklofty	Landfill Site	Bottle, Can, Paper, Waste Oil, Fridges
Tipperary S.R. Co. Co.	Donohill - Donohill Tipperary	Landfill Site	Fridges
Tipperary S.R. Co. Co.	Connawarries - Tinahalla, Carrick-on-suir	Stand Alone Site	Fridges
Tipperary S.R. Co. Co.	Legaun Depot - Legaun, Barne	Stand Alone Site	Vehicles, Fridges
Waterford Corporation	Kilbarry Landfill Site - Kilbarry, Waterford	Landfill Site	Bottle, Can, Waste Oil, Vehicles, Constr/Demolition, Fridges
Waterford County Council	Dungarvan - Ballinamuck	Landfill Site	Bottle, Can, Textile, Paper, Vehicles, Fridges
Waterford County Council	Tramore	Landfill Site	Bottle, Can, Textile, Paper, Vehicles, Fridges
Waterford County Council	Limore - Lismore	Stand Alone Site	Bottle, Can, Textile, Paper, Waste Oil, Vehicles, Fridges
Wexford County Council	Ballykerrog - Ballykerrog, 12km south of New Ross	Landfill Site	Bottle, Textile, Waste Oil, Vehicles, Fridges
Wexford County Council	Killurin - Killurin, 2km west of N11, 8km North of Wexford.	Landfill Site	Bottle, Textile, Waste Oil, Vehicles, Fridges
Wicklow County Council	Ballymurtagh - 2km north of Avoca	Landfill Site	Bottle, Textile, Waste Oil, Vehicles, Fridges
Wicklow County Council	Fassaroe - 1km west of Bray on N11	Landfill Site	Waste Oil, Vehicles, Fridges
Wicklow County Council	Rampere - 3km north of Ballinglass	Landfill Site	Vehicles, Fridges

C3: LOCATIONS OF AND FACILITIES AT RECYCLING SCHEMES

Local Authority	Name of Scheme	Street	Operator	Facilities
Dunlaoghaire Rathdown Co Co	Mobile Monthly Centralised Bring Scheme	Ballinteer	Kerbside	Bottle, Can, PET, Paper, PVC, HDPE
	Mobile Monthly Centralised Bring Scheme	Cabinteely	Kerbside	Bottle, Can, PET, Paper, PVC, HDPE
Fingal Co Co	Mobile Monthly Centralised Bring Scheme	Sutton	Kerbside	Bottle, Can, PET, Paper, PVC, HDPE
	Mobile Monthly Centralised Bring Scheme	Clontarf	Kerbside	Bottle, Can, PET, Paper, PVC, HDPE
Laois Co Co	Local Collect Scheme	Portlaoise	St. Mary's Workforce	Bottle, Can, Paper
Westmeath Co Co	Mullingar	Beehives,Hillside Drive	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	Bellview N.S., Delven Rd.	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	Buckley's Supermarket, Austin Friar Street	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	Clonmore S.C., Clonmore Rd.	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	General Hospital, Longford Rd.	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	Mullingar Golf Club, Tullamore Rd.	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	Penny, Green Bridge	Mullingar Employment Action	Bottle, Can, Paper
	Mullingar	The Mall, Oliver Plunkett Street	Mullingar Employment Action	Bottle, Can, Paper
Wicklow Co Co	Greystones Recycling Scheme	Kilcoole	Rehab	Bottle, Can, Textile, Paper, Plastics
	Greystones Recycling Scheme	Newcastle	Rehab	Bottle, Can, Textile, Paper
	Greystones Recycling Scheme	Kilpeddar	Rehab	Bottle, Can, Textile, Paper
	Greystones Recycling Scheme	Kilquade	Rehab	Bottle, Can, Textile, Paper
	Greystones Recycling Scheme	Marine Road	Rehab	Bottle, Textile, Paper
	Greystones Recycling Scheme	Mill Road	Rehab	Bottle, Can, Textile, Paper, Plastics
	Greystones Recycling Scheme	Opposite Library	Rehab	Bottle, Can, Textile, Paper
	Greystones Recycling Scheme	Quinnsworth	Rehab	Bottle, Can, Paper, Plastics
	Greystones Recycling Scheme	Supervalue	Rehab	Bottle, Can, Textile, Paper
	Greystones Recycling Scheme	Car Park	Rehab	Bottle, Can, Textile, Paper

APPENDIX D: WASTE CHARACTERISATION STUDIES

INTRODUCTION

Results of waste characterisation surveys conducted on municipal,commercial and construction/demolition waste are presented here.

D1 MUNICIPAL WASTE

By far the greatest amount of information available is for municipal waste and summary results are presented for each county. Table D1 presents a summary of waste arisings and population statistics for each local authority, and shows howthe pairing procedure described in Chapter Two was applied.

Table D1: Pairing Table for Waste Characterisation Surveys

Local Authority	Waste Arisings	Population	% Urban Population	Paired With (for local authorities that did not report results)	
	(tonnes/ annum)			Urban	Rural
Carlow Co Co	9,500	40,942	44.80	Survey Conducted	Survey Conducted
Cavan Co Co	6,896	52,796	16.30	Longford Co Co	Longford Co Co
Clare Co Co	29,640	90,918	34.20	Survey Conducted	Survey Conducted
Cork Corporation	42,000	127,253	100.00	Survey Conducted	-
Cork Co Co	74,000	283,116	41.00	Cork Corporation	Survey Conducted
Donegal Co Co	28,700	128,117	20.40	Longford Co Co	Longford Co Co
Drogheda U.D.C.	6,650	24,000	100.00	Louth Co Co	-
Dublin Corporation	143,500	478,389	100.00	Survey Conducted	-
Dundalk U.D.C.	8,970	25,843	100.00	Louth Co Co	-
Dun Laoghaire - Rathdown Co Co	50,000	185,410	98.40	South Dublin Co Co	Wicklow Co Co
Fingal Co Co	99,011	152,768	89.60	South Dublin Co Co	Meath Co Co
Galway Corporation	25,000	50,853	100.00	Cork Corporation	-
Galway Co Co	32,915	129,511	12.50	Longford Co Co	Longford Co Co
Kerry Co Co	18,911	121,894	27.60	Survey Conducted	Survey Conducted
Kildare Co Co	39,690	122,656	57.30	Wicklow Co Co	Wicklow Co Co
Kilkenny Co Co & Kilkenny Corporation	17,400	73,615	26.30	Survey Conducted	Waterford Co Co
Laois Co Co	14,000	52,314	27.20	Meath Co Co	Meath Co Co
Leitrim Co Co	4,000	25,301	6.00	Longford Co Co	Longford Co Co
Limerick Corporation	24,000	52,083	100.00	Cork Corporation	-
Limerick Co Co	26,800	109,873	25.00	Cork Corporation	Cork Co Co
Longford Co Co	6,153	30,296	22.50	Survey Conducted	Survey Conducted
Louth Co Co	3,144	40,881	18.90	Survey Conducted	Meath Co Co
Mayo Co Co	10,546	110,713	19.30	Sligo Co Co	Longford Co Co
Meath Co Co	28,000	105,370	30.40	Survey Conducted	Survey Conducted
Monaghan Co Co	12,500	51,293	28.40	Meath Co Co	Meath Co Co
Offaly Co Co	12,500	58,494	35.60	Survey Conducted	Survey Conducted
Roscommon Co Co	6,200	51,897	16.70	Longford Co Co	Longford Co Co
Sligo Co Co	12,230	54,756	32.80	Survey Conducted	Longford Co Co
South Dublin Co Co	59,350	208,739	96.30	Survey Conducted	Wicklow Co Co
Tipperary NR Co Co	17,000	57,854	33.40	Tipperary SR Co Co	Tipperary SR Co Co
Tipperary SR Co Co	22,000	74,918	39.90	Survey Conducted	Survey Conducted
Waterford Corporation	16,650	40,328	100.00	Survey Conducted	-
Waterford Co Co	9,900	51,296	26.50	Waterford Corporation	Survey Conducted
Westmeath Co Co	13,094	61,880	45.20	Survey Conducted	Survey Conducted
Wexford Co Co	21,000	102,069	32.20	Waterford Corporation	Waterford Co Co
Wicklow Co Co	29,860	97,265	56.50	Survey Conducted	Survey Conducted

D1.1 RURAL HOUSEHOLD WASTE CHARACTERISATION

LOCAL AUTHORITY	Rural Waste Arisings	GLASS				PAPER				PLASTIC				TEXTILES			
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Carlow Co Co	5,244.00	3.43	179.87	3.43	179.87	15.45	810.20	2.73	143.16	5.90	309.40	3.97	208.19	1.09	57.16	0.00	0.00
Cavan Co Co	5,771.95	4.81	277.63	4.81	277.63	17.42	1,005.47	5.71	329.58	6.75	389.61	6.75	389.61	1.23	71.00	0.18	10.39
Clare Co Co	19,503.12	10.43	2,034.18	10.43	2,034.18	13.59	2,650.47	4.47	871.79	17.88	3,487.16	17.88	3,487.16	6.52	1,271.60	0.00	0.00
Cork Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cork Co Co	43,660.00	3.65	1,593.59	3.65	1,593.59	17.78	7,762.75	5.72	2,497.35	12.90	5,632.14	12.85	5,610.31	3.05	1,331.63	3.05	1,331.63
Donegal Co Co	22,845.20	4.81	1,098.85	4.81	1,098.85	17.42	3,979.63	5.71	1,304.46	6.75	1,542.05	6.75	1,542.05	1.23	281.00	0.18	41.12
Dun Laoghaire - Rathdown C.C.	800.00	4.86	38.88	4.23	33.84	13.99	111.92	4.90	39.20	17.09	136.72	12.37	98.96	11.47	91.76	0.36	2.88
Fingal Co Co	10,297.14	4.16	428.36	4.05	417.03	18.21	1,875.11	8.40	864.96	7.88	811.41	7.88	811.41	3.80	391.29	0.06	6.18
Galway Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Galway Co Co	28,800.63	4.81	1,385.31	4.81	1,385.31	17.42	5,017.07	5.71	1,644.52	6.75	1,944.04	6.75	1,944.04	1.23	354.25	0.18	51.84
Kerry Co Co	13,691.56	4.13	565.46	3.40	465.51	19.80	2,710.93	5.49	751.67	11.24	1,538.93	10.54	1,443.09	4.50	616.12	0.00	0.00
Kildare Co Co	16,947.63	4.86	823.65	4.23	716.88	13.99	2,370.97	4.90	830.43	17.09	2,896.35	12.37	2,096.42	11.47	1,943.89	0.36	61.01

LOCAL AUTHORITY	Rural Waste Arisings	GLASS				PAPER				PLASTIC				TEXTILES			
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Kilkenny C.C. & Kilkenny Corp	12,823.80	3.66	469.35	3.66	469.35	12.58	1,613.23	3.42	438.57	10.32	1,323.42	13.32	1,708.13	1.06	135.93	0.00	0.00
Laois Co Co	10,192.00	3.57	363.85	3.57	363.85	11.89	1,211.83	2.82	287.41	7.60	774.59	7.60	774.59	2.48	252.76	0.00	0.00
Leitrim Co Co	3,760.00	4.81	180.86	4.81	180.86	17.42	654.99	5.71	214.70	6.75	253.80	6.75	253.80	1.23	46.25	0.18	6.77
Limerick Co Co	20,100.00	3.65	733.65	3.65	733.65	17.78	3,573.78	5.72	1,149.72	12.90	2,592.90	12.85	2,582.85	3.05	613.05	3.05	613.05
Longford Co Co	4,768.58	4.81	229.37	4.81	229.37	17.42	830.69	5.71	272.29	6.75	321.88	6.75	321.88	1.23	58.65	0.18	8.58
Louth Co Co	2,549.78	4.16	106.07	4.05	103.27	18.21	464.32	8.40	214.18	7.88	200.92	7.88	200.92	3.80	96.89	0.06	1.53
Mayo Co Co	8,510.62	4.81	409.36	4.81	409.36	17.42	1,482.55	5.71	485.96	6.75	574.47	6.75	574.47	1.23	104.68	0.06	5.11
Meath Co Co	19,488.00	4.16	810.70	4.05	789.26	18.21	3,548.76	8.40	1,636.99	7.88	1,535.65	7.88	1,535.65	3.80	740.54	0.06	11.69
Monaghan Co Co	8,950.00	4.16	372.32	4.05	362.48	18.21	1,629.80	8.40	751.80	7.88	705.26	7.88	705.26	3.80	340.10	0.06	5.37
Offaly Co Co	8,050.00	3.57	287.39	3.57	287.39	11.89	957.15	2.82	227.01	7.60	611.80	7.60	611.80	2.48	199.64	0.00	0.00
Roscommon Co Co	5,164.60	4.81	248.42	4.81	248.42	17.42	899.67	5.71	294.90	6.75	348.61	6.75	348.61	1.23	63.52	0.18	9.30
Sligo Co Co	8,218.56	4.81	395.31	4.81	395.31	17.42	1,431.67	5.71	469.28	6.75	554.75	6.75	554.75	1.23	101.09	0.18	14.79
South Dublin Co Co	2,195.95	4.86	106.72	4.23	92.89	13.99	307.21	4.90	107.60	17.09	375.29	12.37	271.64	11.47	251.88	0.36	7.91
Tipperary Co Co (NR)	11,322.00	5.01	567.23	5.01	567.23	15.41	1,744.72	7.54	853.68	7.61	861.60	7.61	861.60	0.91	103.03	0.00	0.00
Tipperary Co Co (SR)	13,222.00	5.01	662.42	5.01	662.42	15.41	2,037.51	7.54	996.94	7.61	1,006.19	7.61	1,006.19	0.91	120.32	0.00	0.00
Waterford Co Co	7,276.50	3.66	266.32	3.66	266.32	12.58	915.38	3.42	248.86	10.32	750.93	10.32	750.93	1.06	77.13	0.00	0.00
Westmeath Co Co	7,175.51	2.27	162.88	2.27	162.88	24.15	1,732.89	4.68	335.81	6.37	457.08	6.18	443.45	6.73	482.91	0.05	3.59
Wexford Co Co	14,238.00	3.66	521.11	3.66	521.11	12.58	1,791.14	3.42	486.94	10.32	1,469.36	10.32	1,469.36	1.06	150.92	0.00	0.00
Wicklow Co Co	12,989.10	4.86	631.27	4.23	549.44	13.99	1,817.18	4.90	636.47	17.09	2,219.84	12.37	1,606.75	11.47	1,489.85	0.36	46.76
Totals	**348,556.24**	**4.58**	**15,950.40**	**4.47**	**15,597.56**	**16.34**	**56,939.00**	**5.56**	**19,386.22**	**10.22**	**35,626.17**	**9.82**	**34,213.89**	**3.40**	**11,838.85**	**0.64**	**2,239.50**

LOCAL AUTHORITY	Rural Waste Arisings	METALS				FERROUS METALS				ALUMINIUM				ORGANICS	
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Carlow Co Co	5,244.00	2.60	136.34	2.60	136.34	2.21	115.89	2.21	115.89	0.39	20.45	0.39	20.45	2.53	132.67
Cavan Co Co	5,771.95	3.02	174.31	1.76	101.59	2.40	138.53	1.51	87.16	0.62	35.79	0.25	14.43	27.44	1,583.82
Clare Co Co	19,503.12	2.98	581.19	2.23	434.92	2.23	434.92	2.23	434.92	0.74	144.32	0.00	0.00	29.80	5,811.93
Cork Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cork Co Co	43,660.00	2.81	1,226.85	2.50	1,091.50	1.97	860.10	1.73	755.32	0.73	318.72	0.66	288.16	36.87	16,097.44
Donegal Co Co	22,845.20	3.02	689.93	1.76	402.08	2.40	548.28	1.51	344.96	0.62	141.64	0.25	57.11	27.44	6,268.72
Drogheda U.D.C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dublin Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dundalk U.D.C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dun Laoghaire - Rathdown C.C.	800.00	5.26	42.08	3.96	31.68	3.06	24.48	3.06	24.48	1.35	10.80	0.90	7.20	29.09	232.72
Fingal Co Co	10,297.14	3.50	360.40	2.29	235.80	2.04	210.06	2.04	210.06	0.91	93.70	0.25	25.74	35.35	3,640.04
Galway Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Galway Co Co	28,800.63	3.02	869.78	1.76	506.89	2.40	691.22	1.51	434.89	0.62	178.56	0.25	72.00	27.44	7,902.89
Kerry Co Co	13,691.56	2.97	406.64	2.24	306.69	2.08	284.78	1.75	239.60	0.55	75.30	0.15	20.54	23.36	3,198.35
Kildare Co Co	16,947.63	5.26	891.45	3.96	671.13	3.06	518.60	3.06	518.60	1.35	228.79	0.90	152.53	29.09	4,930.07

LOCAL AUTHORITY	Rural Waste Arisings	METALS				FERROUS METALS				ALUMINIUM				ORGANICS	
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Kilkenny C.C. & Kilkenny Corp	12,823.80	3.18	407.80	1.85	237.24	1.50	192.36	1.50	192.36	0.62	79.51	0.34	43.60	20.92	2,682.74
Laois Co Co	10,192.00	3.16	322.07	3.01	306.78	2.03	206.90	2.03	206.90	0.70	71.34	0.55	56.06	23.37	2,381.87
Leitrim Co Co	3,760.00	3.02	113.55	1.76	66.18	2.40	90.24	1.51	56.78	0.62	23.31	0.25	9.40	27.44	1,031.74
Limerick Corporation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limerick Co Co	20,100.00	2.81	564.81	2.50	502.50	1.97	395.97	1.73	347.73	0.73	146.73	0.66	132.66	36.87	7,410.87
Longford Co Co	4,768.58	3.02	144.01	1.76	83.93	2.40	114.45	1.51	72.01	0.62	29.57	0.25	11.92	27.44	1,308.50
Louth Co Co	2,549.78	3.50	89.24	2.29	58.39	2.04	52.02	2.04	52.02	0.91	23.20	0.25	6.37	35.35	901.35
Mayo Co Co	8,510.62	3.02	257.02	1.76	149.79	2.40	204.25	1.51	128.51	0.62	52.77	0.25	21.28	27.44	2,335.31
Meath Co Co	19,488.00	3.50	682.08	2.29	446.28	2.04	397.56	2.04	397.56	0.91	177.34	0.25	48.72	35.35	6,889.01
Monaghan Co Co	8,950.00	3.50	313.25	2.29	204.96	2.40	214.80	1.51	135.15	0.91	81.45	0.25	22.38	35.35	3,163.83
Offaly Co Co	8,050.00	3.16	254.38	3.01	242.31	2.03	163.42	2.03	163.42	0.70	56.35	0.55	44.28	23.37	1,881.29
Roscommon Co Co	5,164.60	3.02	155.97	1.76	90.90	2.40	123.95	1.51	77.99	0.62	32.02	0.25	12.91	27.44	1,417.17
Sligo Co Co	8,218.56	3.02	248.20	1.76	144.65	2.40	197.25	1.51	124.10	0.62	50.96	0.25	20.55	27.44	2,255.17
South Dublin Co Co	2,195.95	5.26	115.51	3.96	86.96	3.06	67.20	3.06	67.20	1.35	29.65	0.90	19.76	29.09	638.80
Tipperary Co Co (NR)	11,322.00	2.08	235.50	2.02	228.70	1.63	184.55	1.63	184.55	0.46	52.08	0.39	44.16	29.97	3,393.20
Tipperary Co Co (SR)	13,222.00	2.08	275.02	2.02	267.08	1.63	215.52	1.63	215.52	0.46	60.82	0.39	51.57	29.97	3,962.63
Waterford Co Co	7,276.50	3.18	231.39	1.85	134.62	1.50	109.15	1.50	109.15	0.62	45.11	0.34	24.74	20.92	1,522.24
Westmeath Co Co	7,175.51	3.87	277.69	3.68	264.06	3.37	241.81	3.37	241.81	0.50	35.88	0.32	22.96	27.29	1,958.20
Wexford Co Co	14,238.00	3.18	452.77	1.85	263.40	1.50	213.57	1.50	213.57	0.62	88.28	0.34	48.41	20.92	2,978.59
Wicklow Co Co	12,989.10	5.26	683.23	3.96	514.37	3.06	397.47	3.06	397.47	1.35	175.35	0.90	116.90	29.09	3,778.53
Totals	**348,556.24**	**3.21**	**11,202.45**	**2.36**	**8,211.69**	**2.18**	**7,609.27**	**1.88**	**6,549.63**	**0.73**	**2,559.79**	**0.41**	**1,416.78**	**29.17**	**101,689.70**

D1.2: URBAN HOUSEHOLD WASTE CHARACTERISATION

LOCAL AUTHORITY	Urban Waste Arisings	GLASS				PAPER				PLASTIC				TEXTILES			
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Carlow Co Co	4,256.00	9.35	397.94	9.35	397.94	22.39	952.92	6.47	275.36	7.99	340.05	7.52	320.05	1.47	62.56	0.00	
Cavan Co Co	1,124.05	5.07	56.99	5.07	56.99	24.18	271.79	9.11	102.40	10.24	115.10	9.73	109.37	2.77	31.14	0.03	0.34
Clare Co Co	10,136.88	8.82	894.07	7.35	745.06	19.36	1,962.50	8.33	844.40	10.05	1,018.76	10.05	1,018.76	1.72	174.35	0.00	
Cork Corporation	42,000.00	4.43	1,860.60	4.26	1,789.20	22.40	9,408.00	6.24	2,620.80	15.01	6,304.20	15.01	6,304.20	2.85	1,197.00	0.00	
Cork Co Co	30,340.00	4.43	1,344.06	4.26	1,292.48	22.40	6,796.16	6.24	1,893.22	15.01	4,554.03	15.01	4,554.03	2.85	864.69	0.00	
Donegal Co Co	5,854.80	5.07	296.84	5.07	296.84	24.18	1,415.69	9.11	533.37	10.24	599.53	9.73	569.67	2.77	162.18	0.03	1.76
Drogheda U.D.C.	6,650.00	4.21	279.97	4.21	279.97	16.37	1,088.61	5.22	347.13	12.64	840.56	11.56	768.74	0.00	0.00	0.00	
Dublin Corporation	143,500.00	5.02	7,203.70	4.90	7,031.50	21.09	30,264.15	5.34	7,662.90	8.79	12,613.65	8.58	12,312.30	2.32	3,329.20	0.00	
Dundalk U.D.C.	8,970.00	4.21	377.64	4.21	377.64	16.37	1,468.39	5.22	468.23	12.64	1,133.81	11.56	1,036.93	0.00	0.00	0.00	
Dun Laoghaire - Rathdown C.C.	49,200.00	5.40	2,656.80	5.40	2,656.80	26.50	13,038.00	6.20	3,050.40	8.10	3,985.20	8.10	3,985.20	1.80	885.60	0.00	
Fingal Co Co	88,713.86	5.40	4,790.55	5.40	4,790.55	26.50	23,509.17	6.20	5,500.26	8.10	7,185.82	8.10	7,185.82	1.80	1,596.85	0.00	
Galway Corporation	25,000.00	4.43	1,107.50	4.26	1,065.00	22.40	5,600.00	6.24	1,560.00	15.01	3,752.50	15.01	3,752.50	2.85	712.50	0.00	
Galway Co Co	4,114.38	5.07	208.60	5.07	208.60	22.40	921.62	6.24	256.74	10.24	421.31	9.73	400.33	2.39	98.33	0.00	
Kerry Co Co	5,219.44	5.36	279.76	5.36	279.76	25.79	1,346.09	10.02	522.99	10.06	525.08	9.67	504.72	4.44	231.74	0.00	
Kildare Co Co	22,742.37	8.24	1,873.97	7.36	1,673.84	15.99	3,636.50	6.57	1,494.17	9.04	2,055.91	9.04	2,055.91	2.39	543.54	0.00	

LOCAL AUTHORITY	Urban Waste Arisings	GLASS				PAPER				PLASTIC				TEXTILES			
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Kilkenny C.C. & Kilkenny Corp	4,576.20	8.49	388.52	8.49	388.52	31.42	1,437.84	9.74	445.72	10.98	502.47	10.98	502.47	6.91	316.22	0.00	
Laois Co Co	3,808.00	4.88	185.83	3.54	134.80	16.46	626.80	6.77	257.80	12.62	480.57	12.53	477.14	5.26	200.30	0.19	7.24
Leitrim Co Co	240.00	5.07	12.17	5.07	12.17	24.18	58.03	9.11	21.86	10.24	24.58	9.73	23.35	2.77	6.65	0.03	0.07
Limerick Corporation	24,000.00	4.43	1,063.20	4.26	1,022.40	22.40	5,376.00	6.24	1,497.60	15.01	3,602.40	15.01	3,602.40	2.85	684.00	0.00	
Limerick Co Co	6,700.00	4.43	296.81	4.26	285.42	22.40	1,500.80	6.24	418.08	15.01	1,005.67	15.01	1,005.67	2.85	190.95	0.00	
Longford Co Co	1,384.43	5.07	70.19	5.07	70.19	24.18	334.75	9.11	126.12	10.24	141.77	9.73	134.70	2.77	38.35	0.03	0.42
Louth Co Co	594.22	4.21	25.02	4.21	25.02	16.37	97.27	5.22	31.02	12.64	75.11	11.56	68.69	0.00	0.00	0.00	
Mayo Co Co	2,035.38	4.92	100.14	4.92	100.14	21.04	428.24	12.71	258.70	14.17	288.41	14.17	288.41	3.08	62.69	0.13	2.65
Meath Co Co	8,512.00	4.88	415.39	3.54	301.32	16.46	1,401.08	6.77	576.26	12.62	1,074.21	12.53	1,066.55	5.26	447.73	0.19	16.17
Monaghan Co Co	3,550.00	4.88	173.24	3.54	125.67	16.46	584.33	6.77	240.34	12.62	448.01	12.53	444.82	5.26	186.73	0.19	6.75
Offaly Co Co	4,450.00	4.41	196.25	4.41	196.25	16.48	733.36	4.35	193.58	7.72	343.54	7.72	343.54	1.99	88.56	0.00	
Roscommon Co Co	1,035.40	5.07	52.49	5.07	52.49	24.18	250.36	9.11	94.32	10.24	106.02	9.73	100.74	2.77	28.68	0.03	0.31
Sligo Co Co	4,011.44	4.92	197.36	4.92	197.36	21.04	844.01	12.71	509.85	14.17	568.42	14.17	568.42	3.08	123.55	0.13	5.21
South Dublin Co Co	57,154.05	5.40	3,086.32	5.40	3,086.32	26.50	15,145.82	6.20	3,543.55	8.10	4,629.48	8.10	4,629.48	1.80	1,028.77	0.00	
Tipperary Co Co (NR)	5,678.00	3.55	201.57	3.55	201.57	34.59	1,964.02	10.66	605.27	11.55	655.81	11.55	655.81	2.94	166.93	0.00	
Tipperary Co Co (SR)	8,778.00	3.55	311.62	3.55	311.62	34.59	3,036.31	10.66	935.73	11.55	1,013.86	11.55	1,013.86	2.94	258.07	0.00	
Waterford Corporation	16,650.00	7.10	1,182.15	7.10	1,182.15	24.52	4,082.58	11.13	1,853.15	10.81	1,799.87	10.81	1,799.87	5.81	967.37	0.00	
Waterford Co Co	2,623.50	7.10	186.27	7.10	186.27	24.52	643.28	11.13	292.00	10.81	283.60	10.81	283.60	5.81	152.43	0.00	
Westmeath Co Co	5,918.49	2.10	124.29	2.10	124.29	10.68	632.09	3.28	194.13	5.71	337.95	4.65	275.21	4.25	251.54	0.23	13.61
Wexford Co Co	6,762.00	7.10	480.10	7.10	480.10	24.52	1,658.04	11.13	752.61	10.81	730.97	10.81	730.97	5.81	392.87	0.00	
Wicklow Co Co	16,870.90	8.24	1,390.16	7.36	1,241.70	15.99	2,697.66	6.57	1,108.42	9.04	1,525.13	9.04	1,525.13	2.39	403.21	0.00	
Totals	**633,153.76**	**5.33**	**33,768.06**	**5.16**	**32,667.93**	**22.93**	**145,212.28**	**6.49**	**41,088.49**	**10.28**	**65,083.36**	**10.17**	**64,419.37**	**2.51**	**15,885.28**	**0.01**	**54.52**

LOCAL AUTHORITY	Rural Waste Arisings	METALS				FERROUS METALS				ALUMINIUM				ORGANICS	
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Carlow Co Co	4,256.00	3.17	134.92	3.17	134.92	2.51	106.83	2.51	106.83	0.65	27.66	0.65	27.66	4.64	197.48
Cavan Co Co	1,124.05	3.87	43.50	2.36	26.53	2.26	25.40	2.26	25.40	0.31	3.48	0.10	1.12	34.93	392.63
Clare Co Co	10,136.88	2.33	236.19	1.96	198.68	0.74	75.01	0.74	75.01	1.59	161.18	1.23	124.68	33.95	3,441.47
Cork Corporation	42,000.00	2.93	1,230.60	2.73	1,146.60	1.58	663.60	1.53	642.60	1.07	449.40	0.93	390.60	38.27	16,073.40
Cork Co Co	30,340.00	2.93	888.96	2.73	828.28	1.58	479.37	1.53	464.20	1.07	324.64	0.93	282.16	38.27	11,611.12
Donegal Co Co	5,854.80	3.87	226.58	2.36	138.17	2.26	132.32	2.26	132.32	0.31	18.15	0.10	5.85	34.93	2,045.08
Drogheda U.D.C.	6,650.00	5.89	391.69	5.89	391.69	5.63	374.40	5.63	374.40	0.26	17.29	0.26	17.29	13.61	905.07
Dublin Corporation	143,500.00	3.70	5,309.50	3.07	4,405.45	2.78	3,989.30	2.60	3,731.00	0.83	1,191.05	0.47	674.45	45.62	65,464.70
Dundalk U.D.C.	8,970.00	5.89	528.33	5.89	528.33	5.63	505.01	5.63	505.01	0.26	23.32	0.26	23.32	13.61	1,220.82
Dun Laoghaire - Rathdown C.C.	49,200.00	3.30	1,623.60	2.30	1,131.60	1.90	934.80	1.90	934.80	0.70	344.40	0.40	196.80	47.70	23,468.40
Fingal Co Co	88,713.86	3.30	2,927.56	2.30	2,040.42	1.90	1,685.56	1.90	1,685.56	0.70	621.00	0.40	354.86	47.70	42,316.51
Galway Corporation	25,000.00	2.93	732.50	2.73	682.50	1.58	395.00	1.53	382.50	1.07	267.50	0.93	232.50	38.27	9,567.50
Galway Co Co	4,114.38	3.87	159.23	2.36	97.10	2.26	92.98	2.26	92.98	0.31	12.75	0.10	4.11	34.93	1,437.15
Kerry Co Co	5,219.44	3.39	176.94	2.51	131.01	0.62	32.36	0.00	0.00	2.05	107.00	1.79	93.43	17.05	889.91
Kildare Co Co	22,742.37	2.97	675.45	2.36	536.72	2.20	500.33	2.20	500.33	0.33	75.05	0.16	36.39	34.02	7,736.95

LOCAL AUTHORITY	Rural Waste Arisings	METALS				FERROUS METALS				ALUMINIUM				ORGANICS	
		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL		PACKAGING CONTENT		TOTAL	
	(tonnes/ annum)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)	%	(tonnes)
Kilkenny C.C. & Kilkenny Corp	4,576.20	5.59	255.81	0.00	0.00	5.59	255.81	0.00	0.00	0.00	0.00	0.00	0.00	15.88	726.70
Laois Co Co	3,808.00	5.84	222.39	4.13	157.27	3.42	130.23	3.42	130.23	1.15	43.79	0.71	27.04	23.32	888.03
Leitrim Co Co	240.00	3.87	9.29	2.36	5.66	2.26	5.42	2.26	5.42	0.31	0.74	0.10	0.24	34.93	83.83
Limerick Corporation	24,000.00	2.93	703.20	2.73	655.20	1.58	379.20	1.53	367.20	1.07	256.80	0.93	223.20	38.27	9,184.80
Limerick Co Co	6,700.00	2.93	196.31	2.73	182.91	1.58	105.86	1.53	102.51	1.07	71.69	0.93	62.31	38.27	2,564.09
Longford Co Co	1,384.43	3.87	53.58	2.36	32.67	2.26	31.29	2.26	31.29	0.31	4.29	0.10	1.38	34.93	483.58
Louth Co Co	594.22	5.89	35.00	5.89	35.00	5.63	33.45	5.63	33.45	0.26	1.54	0.26	1.54	13.61	80.87
Mayo Co Co	2,035.38	3.23	65.74	3.23	65.74	2.04	41.52	2.04	41.52	1.19	24.22	1.19	24.22	27.37	557.08
Meath Co Co	8,512.00	5.84	497.10	4.13	351.55	3.42	291.11	3.42	291.11	1.15	97.89	0.71	60.44	23.32	1,985.00
Monaghan Co Co	3,550.00	5.84	207.32	4.13	146.62	3.42	121.41	3.42	121.41	1.15	40.83	0.71	25.21	23.32	827.86
Offaly Co Co	4,450.00	3.81	169.55	3.30	146.85	2.96	131.72	2.96	131.72	0.74	32.93	0.24	10.68	25.13	1,118.29
Roscommon Co Co	1,035.40	3.87	40.07	2.36	24.44	2.26	23.40	2.26	23.40	0.31	3.21	0.10	1.04	34.93	361.67
Sligo Co Co	4,011.44	3.23	129.57	3.23	129.57	2.04	81.83	2.04	81.83	1.19	47.74	1.19	47.74	27.37	1,097.93
South Dublin Co Co	57,154.05	3.30	1,886.08	2.30	1,314.54	1.90	1,085.93	1.90	1,085.93	0.70	400.08	0.40	228.62	47.70	27,262.48
Tipperary Co Co (NR)	5,678.00	3.08	174.88	1.85	105.04	1.37	77.79	1.37	77.79	1.71	97.09	0.48	27.25	33.77	1,917.46
Tipperary Co Co (SR)	8,778.00	3.08	270.36	1.85	162.39	1.37	120.26	1.37	120.26	1.71	150.10	0.48	42.13	33.77	2,964.33
Waterford Corporation	16,650.00	4.68	779.22	3.06	509.49	0.00	0.00	0.00	0.00	3.23	537.80	0.00	0.00	18.39	3,061.94
Waterford Co Co	2,623.50	4.68	122.78	3.06	80.28	0.00	0.00	0.00	0.00	3.23	84.74	0.00	0.00	18.39	482.46
Westmeath Co Co	5,918.49	1.72	101.80	1.50	88.78	1.17	69.25	1.17	69.25	0.55	32.55	0.34	20.12	18.07	1,069.47
Wexford Co Co	6,762.00	4.68	316.46	3.06	206.92	0.00	0.00	0.00	0.00	3.23	218.41	0.00	0.00	18.39	1,243.53
Wicklow Co Co	16,870.90	2.97	501.07	2.36	398.15	2.20	371.16	2.20	371.16	0.33	55.67	0.16	26.99	34.02	5,739.48
Totals	**633,153.76**	**3.48**	**22,023.11**	**2.72**	**17,217.06**	**2.11**	**13,348.92**	**2.01**	**12,738.43**	**0.92**	**5,846.00**	**0.52**	**3,295.39**	**39.56**	**250,469.07**

D1.3: COMMERCIAL WASTE CHARACTERISATION

Waste Category	Commercial Outlet						
	Building Society	Newsagents	Butcher	Fruit & Veg Shop	Hardware	Chiropractic Clinic	Photo Lab.
	% of Total						
Organic waste	9.52	0.66	6.45	65.18	2.94	0.00	7.74
Papers	66.67	61.18	3.23	2.47	8.82	67.57	65.99
Cardboards	3.17	22.04	58.06	19.19	45.59	0.00	12.79
Composites	1.59	0.33	0.00	0.00	0.00	0.00	0.00
Textiles	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Health care textiles	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plastic	12.70	8.06	8.06	3.09	9.56	10.81	12.79
Unclassified combustibles	0.00	0.00	0.00	10.07	0.00	0.00	0.00
Glass	3.17	0.00	0.00	0.00	19.12	16.22	0.00
Metals	3.17	6.41	0.00	0.00	3.68	5.41	0.34
Unclassified incombustible	0.00	1.32	0.00	0.00	0.00	0.00	0.00
Special municipal waste	0.00	0.00	0.00	0.00	10.29	0.00	0.34
Components smaller than 20mm round mesh	0.00	0.00	24.19	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	Commercial Outlet						
	First National	Newsagents	Butcher	Fruit & Veg Shop	Hardware	Chiropractic Clinic	Photo Lab.
Number of Employees	4.50	1.50	2.00	3.75	2.50	2.00	2.00
Average weight of waste (kg) produced per employee/week	1.75	30.40	9.30	42.10	8.16	0.46	22.28
Average weight of waste (tonnes) produced per employee/annum	0.09	1.58	2.19	0.42	0.02	0.02	1.12
Percentage packaging in total waste	20.64	23.52	66.12	32.30	58.09	32.43	25.58

D2: CONSTRUCTION AND DEMOLITION WASTE CHARACTERISATION

EWC code	Waste Categories	Weight (kg)	% of Category	% of Total
17 00 00	**Construction & Demolition Waste (including road construction)**			
17 01 00	*Concrete, bricks, tiles, ceramics, and gypsum based materials*			
17 01 01	concrete	1689.10	96.26	37.88
17 01 02	bricks	43.90	2.50	0.98
17 01 03	tiles and ceramics	21.70	1.24	0.49
17 01 04	gypsum based construction materials	0.00	0.00	0.00
17 01 05	asbestos based construction materials	0.00	0.00	0.00
	Total	**1754.70**	**100.00**	**39.35**
17 02 00	*Wood, glass and plastic*			
17 02 01	wood	82.70	97.75	1.85
17 02 02	glass	3.40	4.02	0.08
17 02 03	plastic	1.90	2.25	0.04
	Total	**84.60**	**100.00**	**1.90**
17 03 00	*Asphalt, tar and tarred products*			
17 03 01	asphalt containing tar	70.80	100.00	1.59
17 03 02	asphalt (not containing tar)	0.00	0.00	0.00
17 03 03	tar and tar products	0.00	0.00	0.00
	Total	**70.80**	**100.00**	**1.59**
17 04 00	*Metals (including their alloys)*			
17 04 01	copper, bronze, brass			
17 04 02	aluminium	7.00	6.70	0.16
17 04 03	lead	0.00	0.00	0.00
17 04 04	zinc	0.00	0.00	0.00
17 04 05	iron and steel	30.10	28.80	0.67
17 04 06	tin	0.00	0.00	0.00
17 04 07	mixed metals	66.50	63.64	1.49
17 04 08	cables	0.90	0.86	0.02
	Total	**104.50**	**100.00**	**2.34**
17 05 00	*Soil and dredging spoil*			
17 05 01	soil and stones (*>20 mm mesh*)	835.20	36.65	18.73
17 05 01	soil and stones (*<20 mm mesh*)	1443.70	63.35	32.37
	Total	**2278.90**	**100.00**	**51.10**
17 06 00	*Insulation materials*			
17 06 01	insulation materials containing asbestos	0.00	0.00	0.00
17 06 02	other insulation materials	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**
17 07 00	*Mixed construction and demolition waste*			
17 07 01	mixed construction and demolition waste	33.20	100.00	0.74
	Total	**33.20**	**100.00**	**0.74**
20 00 00	**Municipal wastes and similar commercial, industrial and institutional wastes**			
	Organic Waste			
20 01 08	Food waste	0.00	0.00	0.00
20 02 01	Garden waste	3.10	100.00	0.07
	Total	**3.10**	**100.00**	**0.07**
	Papers			
20 01 01 01	Packaging	0.00	0.00	0.00
20 01 01 02	Newspapers-Brochures	0.00	0.00	0.00

EWC	Waste Categories	Weight (kg)	% of Category	% of Total
20 01 01 03	Magazines & glossy paper	0.00	0.00	0.00
20 01 01 04	Other papers	4.20	100.00	0.09
	Total	**4.20**	**100.00**	**0.09**
	Cardboards			
20 01 01 05	Flat packaging cardboard	0.00	0.00	0.00
20 01 01 06	Corrugated packaging board	0.00	0.00	0.00
20 01 01 07	Other cardboards	9.40	100.00	0.21
	Total	**9.40**	**100.00**	**0.21**
	Composites			
20 01 01 08	Cardboard composite packaging	0.00	0.00	0.00
20 01 01 09	Liquid packaging Al	0.00	0.00	0.00
20 01 01 10	Liquid packaging Non-Al	0.00	0.00	0.00
20 01 01 11	Disposable nappies	0.00	0.00	0.00
20 01 01 12	Other composite packaging	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**
	Textiles			
20 01 11 01	Packaging	0.00	0.00	0.00
20 01 11 02	Other textiles	20.40	100.00	0.46
	Total	**20.40**	**100.00**	**0.46**
	Health care textiles			
20 01 11 03	Health care textiles	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**
	Plastic			
20 01 03 01	Mixed flexible plastic	20.00	96.15	0.45
20 01 03 02	Clear PVC bottles	0.00	0.00	0.00
20 01 03 03	Clear PET bottles	0.00	0.00	0.00
20 01 03 04	Mixed rigid plastic	0.00	0.00	0.00
20 01 03 05	Opaque PVC jars & bottles	0.00	0.00	0.00
20 01 03 06	Green PET jars & bottles	0.00	0.00	0.00
20 01 03 07	Brown PET jars & bottles	0.00	0.00	0.00
20 01 03 08	PE Bottles	0.00	0.00	0.00
20 01 03 09	Supermarket bags	0.00	0.00	0.00
20 01 03 10	Other plastic packaging	0.00	0.00	0.00
20 01 04	Other plastic waste (*Styrofoam*)	0.80	3.85	0.02
	Total	**20.80**	**100.00**	**0.47**
	Glass			
20 01 02 01	Green glass packaging	0.00	0.00	0.00
20 01 02 02	Clear glass packaging	0.00	0.00	0.00
20 01 02 03	Brown glass packaging	0.00	0.00	0.00
20 01 02 04	Packaging glass other colour	0.00	0.00	0.00
20 01 02 05	Other glass waste	0.00	0.00	0.00
	Total	**0.00**	**0.00**	**0.00**

EWC	Waste Categories	Weight (kg)	% of Category	% of Total
	Metals			
20 01 05 01	Ferrous metal packaging	0.00	0.00	0.00
20 01 05 02	Other ferrous metal waste	0.00	0.00	0.00
20 01 05 03	Aluminium packaging	0.70	100.00	0.02
20 01 05 04	Other aluminium waste	0.00	0.00	0.00
20 01 05 05	Other metal packaging	0.00	0.00	0.00
20 01 06	Other metal waste	0.00	0.00	0.00
	Total	**0.70**	**100.00**	**0.02**
20 01 25	**Miscellaneous Combustibles**	**13.90**	**100.00**	0.31
20 01 26	**Miscellaneous Incombustibles**	**60.20**	**100.00**	1.35
	TOTAL	**4459.40**		**100.00**