Programme for Municipal Waste Characterisation Surveys




Final Report

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GLOSSARY AND ABREVIATIONS

AER:	Annual Environmental Report
BB/RC;	Bring Bank and Recycling centres
BB:	Brown Bin – a bin for collecting organic waste such as food and garden waste
Bulky waste:	Includes items such as furniture, carpets etc. that will not fit in the household waste bin. It is generally delivered to Recycling Centre or collected by a dedicated collection.
C & D waste:	Construction & Demolition waste
Clean weight:	Weight of a clean, dry sample
Composite Liquid Packaging:	Containers such as Tetra-Pak milk and fruit juice cartons
CSO:	Central Statistics Office
CTC:	Clean Technology Centre
DTD:	Door-To-Door collection.
EWC:	European Waste Catalogue – a list of waste types that facilitates a standardised classification of waste types across the EU.
HDPE:	High Density Polyethylene. Also referred to as PE in the Waste Characterization Survey sheets
ICI waste:	Waste from Industrial/Commercial, Institutional activities
INPMW:	Industrial Non-Process Municipal Waste
MDR:	Mixed Dry Recyclables – household recycling services typically collect co-mingled recyclables in this fashion in bins or in bags
MRW:	Mixed Residual Waste – the typical household 'black bin' or 'black bag' waste
MS:	Characterisation of Non-Household Municipal Waste in Ireland (2000-MS-7). Report written by CTC on behalf of the EPA
MSW:	Municipal Solid waste
NACE code:	A pan-European classification system that groups organisations according to their business activities. It assigns a unique 5 or 6 digit code to each industry sector

NWD:	National Waste Database -. Report on Irish waste management published by the EPA every two years
NHMW:	Non-Household Municipal Waste
PET:	Polyethylene Terephthalate – most plastic soft-drinks and water bottles are made from this material
Random sampling:	A sampling procedure that assures that each element in the *population* has an equal chance of being selected
Regression Models:	Regression models are used for studying how changes in one or more variables will change the value of another variable
Primary Waste Category:	A broad waste category, e.g. Paper, Plastic, Metal etc.
Secondary Waste Category:	A more specific waste category within a Primary Waste Category, e.g. Mixed Flexible Plastic, Ferrous Metal etc.
Sample Waste composition sheets:	The sheets on which the raw weights were recorded during the characterisation surveys.
SME:	Small-to-Medium Enterprise
Social Class:	The entire population is classified, by the CSO, into one of the following social class groups, which are defined on the basis of occupation. Accordingly social class ranks occupations by the level of skill required on a social class scale ranging from 1 (the highest) to 7 (the lowest): 1 Professional workers, 2 Managerial and Technical, 3 Non-manual, 4 Skilled manual, 5 Semi-skilled, 6 Unskilled, 7 All others gainfully occupied and unknown
SWA-Tool:	Solid Waste Analysis Tool – an EU Commission project to develop a standardised methodology to enhance the precision and comparability of solid waste analysis data across the EU.
WEEE:	Waste Electrical and Electronic Equipment

EXECUTIVE SUMMARY

BACKGROUND

In order to measure progress towards national waste prevention, reduction, and recycling goals, it is important that detailed, accurate and up-to-date information regarding the composition of municipal waste is maintained.

The Environmental Protection Agency has commissioned this report to improve the level of knowledge available on municipal waste, and to advance the methodology used for measuring waste composition in the future. This national study was carried out between August 2004 and May 2005 by a consultancy team of RPS-MCOS and CTC. The study was carried out under the auspices of the National Waste Prevention Programme.

The project builds upon the Municipal Waste Characterisation methodology developed by the EPA in 1996, and upon surveys carried out since then in various sectors across Ireland. Account has been taken of the changing nature of municipal waste management in Ireland, most notably the switch to recycling, the introduction of use-related charging, and the increasing importance of non-household municipal waste generated by commerce and industry.

OBJECTIVES

Three main objectives of the project are as follows:

1. To develop an updated methodology for the sampling of municipal waste, bearing in mind the evolution in waste management and collection
2. To carry out waste characterisation surveys employing this methodology, and to report on the findings
3. To develop a “scale-up” methodology to enable a national profile to be developed for household and non-household municipal waste, using the results of surveys.

LITERATURE REVIEW

The project team reviewed experience since 1996 in Ireland and internationally regarding the characterisation of municipal waste. The findings assisted in developing the updated sampling methodology. In general there are more studies published regarding household waste sampling compared to non-household sectors. There is relatively little published in relation to scaling-up of survey results to provide national profiles. Methods to assess statistical validity of waste sampling have been developed and these have been applied in this project.

While waste characterisation studies have taken place in Ireland in recent years, the review found there was variability in the level of data presented and the accuracy achieved. Overall co-ordination of the surveys needs to be improved.

METHODOLOGY FOR SURVEYS

A distinction was made between *household waste* and municipal waste from *non-household* sectors (namely commerce, and industrial non-process municipal waste). Separate methodologies were applied to these elements.

Household Survey Methodology

The household methodology is derived mainly from the existing (1996) EPA Methodology, but has been expanded to account for the use of separate collection of household waste. Surveys were grouped according to two strata: *location type* (city, town, and rural) and *collection system type* (whether one, two or three bins).

The local authorities to be surveyed were selected based on the geographical spread provided (with reference to density of population), the collection systems available, and the availability of suitable project partners and premises. Within the local authority, survey routes were selected that were representative of the county profile in terms of social class. The survey level remains the refuse collection vehicle – i.e. one sample is a combination of household waste produced by 50-250 households. Where separate recycling bins are used, the survey included each of these. The methodology also accounts for waste delivered for recycling to Bring Banks and Recycling Centres. With the introduction of use-related charges and alternating waste collections, a method to estimate the average waste/ household/ week is now required – this draws on the annual total waste generated in the local authority area.

Non-Household Survey Methodology

The methodology devised during MS-7 – Characterisation of Non-Household Municipal Waste in Ireland and the Development of an Approach to Tracking Municipal Waste Composition – was used and further refined during this project. This methodology is based on the segregation of the relevant waste streams as close to their generation source as possible. This methodology ensures that the components of this waste stream are measured accurately.

The methodology takes a sectoral approach to waste characterisation, and requires surveying the entire waste generation in a given premises over a *week-long* period, with separation and measurement of waste within the premises prior to waste collection. Sector specific waste characterisation 'fingerprints' are thus generated and applied to produce a national commercial waste characterisation.

SURVEY WORK PROGRAMME

A programme of surveys was carried out on municipal waste to determine the current composition. Surveys were carried out in two stages: October 2004 and March 2005.

Household Surveys

Household surveys were carried out by RPS-MCOS in nine local authority areas, and included a total of 37 separate survey events. Locations were surveyed twice (October/ March). Surveys were carried out by trained and supervised staff, and took place at an authorised waste facility in each case.

Table A – Household Survey Locations

	1 bin	2 bins	3 bins	No. of Samples
Cities	Fingal County Council	Fingal County Council Cork City Council	Galway City Council	13
Towns	N/A	Limerick County Council	Waterford County Council	10
Rural areas	N/A	Limerick County Council Longford County Council	Waterford County Council	14
	1	18	18	37

Non-Household Surveys

Non-Household Surveys were carried out by CTC in 12 separate enterprises, 4 of which are in the industrial sector. Locations were chosen to provide maximum information across the various sectors and to fill gaps identified in earlier reports.

Table B – Non Household Survey Locations

Date of Survey	Business Sector	Business Name	Business Address	No. of Employees
Commercial Surveys				
Oct '04	Financial	AIB	Cork	204
Nov '04	Communications	RTE	Dublin	1,200
Mar '05	Communication	Eircom	Galway	170
Nov '04	Hotel	Carrigaline Court Hotel	Co. Cork	170
Dec '04	Restaurant	Jacobs on the Mall	Cork	40
Mar '04	Wholesale	Musgraves	Cork	650
Apr '05	Supermarket	Dunnes Stores	Cork	310
Apr '05	Retail	Dunnes Stores	Cork	90
Industrial Surveys				
Oct '04	Pharmaceutical	Pfizer Drug Product Plant	Co. Cork	242
Nov '04	Electronics	EMC	Co. Cork	1,500
Feb '04	Food & Beverage	Heineken	Cork	204
Feb '04	Electronics	Ship Company	Co. Cork	21

SURVEY RESULTS

Household waste characterisation results are summarised below.

Table C – Results of Household Surveys

Clusters	2-BIN RURAL	3-BIN RURAL	2-BIN TOWN	3-BIN TOWN	1-BIN CITY	2-BIN CITY	3-BIN CITY
kg / household / week*	24.87	27.11	24.27	24.08	18.55	22.57	17.37
Primary Waste category							
Organics	26%	25%	28%	22%	25%	37%	28%
Paper	19%	19%	29%	19%	15%	21%	20%
Cardboard	8%	5%	7%	5%	8%	5%	5%
Composites	3%	1%	1%	1%	2%	1%	2%
Textiles	11%	9%	7%	8%	10%	5%	7%
Plastic	13%	12%	13%	10%	13%	12%	10%
Glass	5%	5%	6%	6%	12%	7%	9%
Metal	3%	4%	2%	6%	4%	4%	3%
Wood	1%	1%	0%	1%	5%	1%	0%
Special municipal waste	2%	2%	0%	1%	0%	1%	1%
Unclassified Combustibles	0%	1%	0%	2%	1%	0%	1%
Unclassified incombustibles	1%	3%	2%	3%	1%	1%	2%
Fines	5%	10%	4%	12%	2%	3%	11%
Bulky waste+WEEE	3%	2%	0%	2%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Survey results for the non-household sector are presented according to the sector under investigation. A summary of the main waste material streams within the sectors examined are shown overleaf.

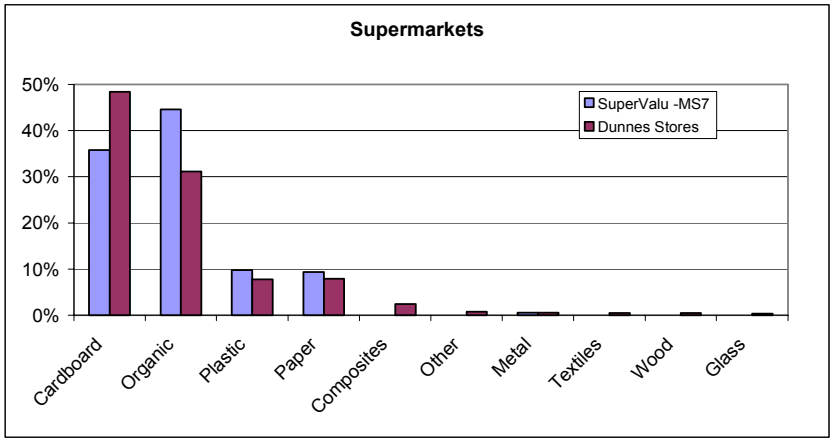
Table D – Results of Non-Household (Commercial) Surveys

	Commercial Surveys							Industrial Surveys			
	Financial	Hotel	Supermarket	Retail	Transport & Communication	Restaurant	Wholesale	Electronics	Electronic - SME	Food & Beverage	Pharmaceutical
Organics	35.7%	49.8%	31.1%	0.2%	20.5%	48.7%	22.8%	48.2%	15.6%	7.4%	39.9%
Cardboard	13.6%	7.5%	48.4%	83.8%	14.1%	11.2%	26.9%	14.2%	28.0%	26.3%	6.3%
Paper	36.2%	10.8%	7.9%	0.9%	31.5%	5.2%	14.1%	10.3%	33.6%	24.2%	7.6%
Plastic	10.0%	4.6%	7.7%	14.6%	8.9%	4.8%	25.2%	10.9%	5.9%	13.3%	7.1%
Glass	1.0%	21.5%	0.3%	0.0%	1.4%	24.4%	1.5%	7.1%	0.4%	6.7%	19.5%
Others	1.6%	2.5%	0.7%	0.2%	9.8%	2.2%	1.9%	1.9%	1.1%	15.5%	11.9%
Metal	1.4%	1.1%	0.5%	0.0%	6.2%	0.9%	1.7%	3.4%	10.3%	1.2%	0.9%
Composites	0.4%	1.1%	2.4%	0.0%	1.6%	0.4%	4.8%	3.2%	1.9%	2.4%	3.3%
Wood	0.1%	0.0%	0.5%	0.0%	5.4%	2.0%	0.8%	0.6%	0.0%	1.9%	2.4%
Textiles	0.3%	1.0%	0.5%	0.2%	0.6%	0.3%	0.4%	0.2%	3.3%	1.2%	1.6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Figure D – Results of Non-Household (Commercial) Surveys

Due to the diverse nature of the commercial and industrial sectors patterns are not as obvious as in the household surveys. These are discussed in the full report. Where possible, the current survey results are compared with previous surveys to determine what pattern is emerging. An example of the sectoral result is provided in Figure A below. In most sectors, there was a reasonable degree of consistency between surveys completed in 2003 (as part of the MS-7 project) and the recent surveys.

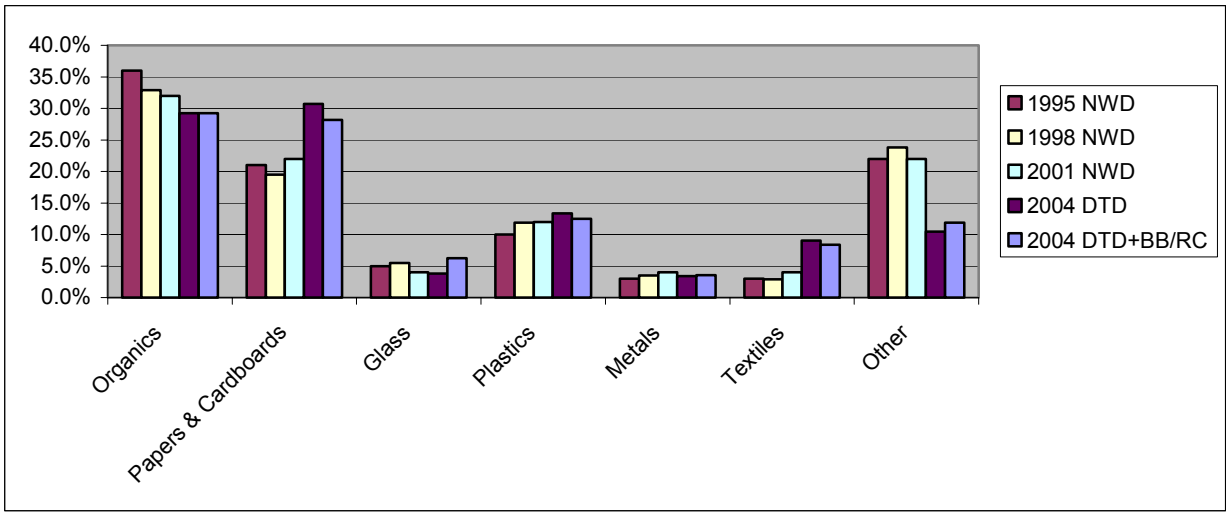
Figure A– Example of results from the Supermarket Survey



NATIONAL PROFILE OR "SCALE-UP"

For the household sector, the national household waste composition is developed by multiplying the results for city, town and rural areas by the proportion of the population living in these areas. Materials delivered to Bring Banks (BB) and Recycling Centres (RC) were added to the total collected in Door-to-Door (DTD) systems. Variations and patterns in the results compared to previous data reported in the National Waste Database (NWD) for 1995,1998, and 2001 are summarised in Figure B below.

Figure B: 2004 Household Composition Results compared with Previous Results



The current household surveys show general consistency with previous surveys. Some trends are emerging which are discussed in the report – e.g. increase in paper/ cardboard, decrease in organics. These surveys provide a more detailed and reliable dataset, as indicated by the reduction in the 'other' category.

In the non-household sector, the scale-up is carried out employing two different techniques (following a procedure developed in MS-7). These are:

'Sectoral **Share**' – this method combines the results of the National Waste Database with sectoral sizes to determine the quantity of waste produced by each relevant sector. Then by applying the findings of the ***individual sectoral surveys (fingerprints)*** a national profile can be determined.

'Sector Specific **Factors**' – this method is based exclusively on sectoral specific information. Sector specific ***factors*** are calculated based on information that is pertinent to that sector. For example, in the hotel sector the waste generated per bed night sold is used while in colleges/schools waste generated per student is used. Relevant factors are applied to the various sectors to generate a national profile.

The results generated by both scale-up methods are summarised in Table E. For many of the sectors there is a clear consistency between the findings (finance, hotels, supermarkets, hospitals). These consistencies can be attributed to:

- Accurate determination of sector size
- Good data set – included MS-7 results which broadened the depth and accuracy of information
- Improved scale-up procedures and statistical data

There were however some notable discrepancies. There is no consistent explanation for these discrepancies as they can be attributed to:

- Possible inaccurate sectoral size determination by waste contractors (restaurants, wholesale)
- Limited data for scale-up factors (education, transport & communication, restaurants)
- Incomplete set of sectoral surveys (primary and secondary schools, pubs, nursing homes, fast food restaurants)

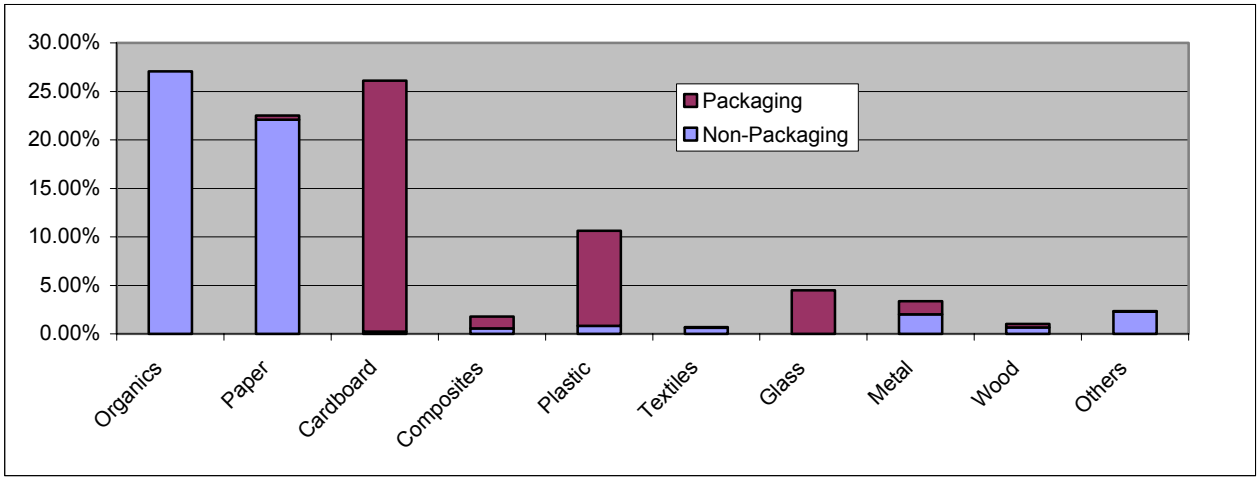
Table E – Results of scale-up for Non-Household (Commercial) waste using both scale-up methods

Sector	National Waste Generated (tonnes)	
	Based on Sectoral Factors	**Based on NWD and Sectoral Size**
Finance	58,952	62,613
Restaurants	103,076	53,315
Hotels	101,677	90,668
Wholesale	83,704	37,587
Supermarkets	166,807	121,273
Retail	147,481	89,849
Education	15,853	43,850
Public Offices	24,132	49,769
Hospitals	33,830	37,245
Transport & Communication	50,053	92,033
Total	***785,568***	***678,206***

The results obtained during this study for the commercial waste sector were relatively consistent with results obtained during MS-7, though there were some differences (for example the results in this survey shows an increase in cardboard but a decrease in paper). In order to obtain the best possible picture of current national waste character the results produced from this survey were combined with the results from MS-7. This allows characterisation of 89% of the national non-household waste be determined using the results from 17 surveys. The accuracy of both scale–up methodologies can only be improved by identification of areas where miscalculation may occur and by taking measures to remove such miscalculation.

The national profile of non-household (commercial) waste as determined by the 'Sectoral Share' Method is shown in Figure C below.

Figure C – National Commercial Waste Profile using 'Sectoral Share' method



The results of household and non-household scale-ups are combined in Table F below, which provides a national municipal waste profile.

Table F National Municipal Waste Profile

	Household		Commercial		Municipal	
Waste categories	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**	**%**
Organic	460,236	29.2%	183,632	27.1%	643,868	28.6%
Paper	339,432	21.6%	152,726	22.5%	492,158	21.9%
Cardboard	104,176	6.6%	177,012	26.1%	281,188	12.5%
Composites	27,503	1.7%	12,079	1.8%	39,582	1.8%
Plastic	196,723	12.5%	72,137	10.6%	268,860	11.9%
Textiles	131,896	8.4%	4,740	0.7%	136,636	6.1%
Glass	98,499	6.3%	30,385	4.5%	128,884	5.7%
Metal	55,925	3.6%	22,739	3.4%	78,664	3.5%
Wood	13,370	0.8%	6,972	1.0%	20,342	0.9%
Others	146,035	9.3%	15,784	2.3%	161,819	7.2%
Total	**1,573,795**	**100%**	**678,206**	**100%**	**2,252,001**	**100%**
Packaging	**447,534**	**28.4%**	**295,642**	**43.6%**	**743,176**	**33.0%**

PACKAGING CONTENT

In the household sector, the packaging content is 28%. This means that the weight of packaging is relatively stable considering packaging waste was 25% in the 1998 NWD (and that excluded packaging from bring banks). This does not take into account corrections attributable to contamination.

In the non-household (commercial) sector, packaging made up 44% of the waste in this round of surveys.

MEASUREMENT OF CONTAMINATION

This study examined what impact contamination – for example dirt, moisture or 'left-over' material in a piece of packaging – has on waste composition. A methodology was developed with reference to published international studies. Studies were completed on several categories of packaging in both the household and non-household waste streams. The results are summarised below.

Table G - Summary of contamination results on packaging waste

Household packaging (residual waste bin)		Non-household packaging	
Primary Category	**Contamination**	**Material**	**Contamination**
Paper	25.9%	Paper	11 %
Cardboard	21.5%	Cardboard	14 %
Plastic	22.4%	PET	51 %
Glass	3.2%	PE	29 %
Metals	23.0%	Plastic film	22 %
Composites	16.3%	Ferrous Tin	19 %

RECOMMENDATIONS

The study has enabled the methodology for conducting surveys to be updated and has developed a methodology for scaling-up the results to give a National profile. Looking to the future, a number of recommendations are made to provide an ongoing flow of waste composition data and improved systems for reporting and managing waste data. The following summarises the recommendations of the study.

Update the 1996 EPA Waste Characterisation Methodology

It is recommended to update the existing 'Manual' produced by the EPA in 1996 to respond to three overall issues:

- the changing nature of household waste collection
- the new methodology developed specifically for non-household waste characterisation
- the need to formalise the methodology for scaling-up household and non-household results to form a national profile

The methodology can be updated in line with the methodology presented in this Report.

Programme to Deliver Ongoing Waste Characterisation Surveys

An on-going campaign of waste characterisation is required so that the data is continuously updated and improved. It is recommended that a rolling programme of surveys be carried out under the guidance of the EPA.

For **household waste surveys**, each of the 34 Irish local authorities should carry out 2 surveys every 2 years. These 68 surveys will give a precision of 10% at 95% confidence level for Irish household

waste. This will include mandatory characterisation of mixed residual waste samples and characterisation of mixed dry recyclables and organic separate collections where the service is available.

Table H – Proposed household waste characterisation programme

Target Areas	Samples Required	Local Authorities	Frequency
8 City Local Authorities	1 Sample Houses And 1 Sample Apartments	Cork City, Galway City, Limerick City, Waterford City, Dun Laoghaire Rathdown, Dublin City, Fingal, South Dublin	Four local authorities carry out the surveys in year 1*, and four in year 2
26 Mixed Rural and Urban Local Authorities	1 Sample Rural And 1Sample Town	Carlow, Cavan, Clare, Cork, Donegal, Galway, Kildare, Kilkenny, Kerry, Laois, Leitrim, Limerick Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, North Tipperary, South Tipperary, Waterford, Westmeath, Wexford, Wicklow	13 local authorities carry out the survey in year 1*, and 13 in year 2.

For non-household waste surveys, it is envisaged that by combining additional survey data from future commercial waste characterisation surveys with existing data the overall picture of waste characterisations will improve. As the data set for a particular sector is improved so too should the accuracy of the results (i.e. if a number of separate surveys are performed within a particular sector then the average character will be more representative of that sector than using results from one or two surveys).

Table I: Summary of sectors surveyed to date and sectors recommended for future surveys

Sector	MS-7	2005	Future
Finance	√	√	
Restaurants	√	√	√
Hotels	√	√	
Wholesale		√	√
Supermarkets	√	√	
Retail	√	√	√
Education	√		√
Public Offices	√	(√)	√
Hospitals	√		√
Transport	√		√
Communication		√	

The extension of the data set – to include additional survey findings – should be made with caution. As data from 10 years ago is probably no longer representative of the waste character within a particular sector then it should be omitted. A timeframe for data inclusion should consider the accuracy of that data considering current conditions.

Industrial non-process municipal waste (INPMW) contributes significantly to the overall non-household waste nationally generated (NHMW). This study provides a starting point for future characterisations of this portion of NHMW. Future work should concentrate on the mixed fraction of industrial wastes, since segregated wastes (e.g. paper and cardboard, metallic packaging, etc.) are currently reported using

the established EWC codes. On the assumption that INPMW quantities may be closely related to employee numbers the largest employing NACE codes should be considered initially. Once a statistically sound composition has been estimated this can then be applied to the mixed waste fraction within the EWC chapters 15 and 20.

Technical Support from EPA

In order to ensure the programme as outlined above is adhered to, and in order to ensure a systematic approach to household waste characterisation, we recommend the EPA plays a more active role in co-ordinating and facilitating surveys. The Table below identifies some of the barriers and recommended actions by the EPA to address these barriers.

Barrier to Local Authority Involvement	Recommended EPA Action
Lack of know how – the concept of carrying out a waste survey is daunting unless there is some prior experience	EPA makes available a waste characterisation officer who would be available to local authorities to assist in planning and executing household surveys. This would be a pro-active role.
Lack of equipment – although the individual elements are simple, this is another barrier	EPA purchases and maintains a number of sets of equipment for waste characterisation studies, which can be loaned out to local authorities
Privatisation of waste collection –LA has limited technical resources or input into household waste collection logistics	The survey can be completed in partnership with the private waste collection company as long as there is an involvement by the local authority in ensuring appropriate route selection and the survey methodology is followed
Resources – busy staff may be unlikely to prioritise a waste characterisation study	Availability of the EPA officer, and the revised Waste Characterisation Methodology, will reduce the time resource required.
Cost – for some local authorities the cost may be a deterrent.	A cost of up to €5,000 per survey is anticipated. There are other benefits from the survey e.g. in terms of optimising recycling collections, facilitating waste planning etc.

An alternative to direct EPA staff availability is for the EPA to outsource the resources required to assist the local authorities.

Improvements in Data Management

With some amendments to the current system of data reporting by industry, waste collection companies and Local Authorities, the process of developing a National waste profile can be made more accurate and more straightforward. Six areas are identified for modification, summarised as follows:

Issue or gap identified	Recommendation
Ensure consistent data reporting and recording of waste composition studies	Waste composition surveys to be reported using a standard document (included in the Local Authority Questionnaire). The information received should be input by the EPA in a database and this detailed information made available online.
There is a lack of information on the composition of waste collected by Recycling Centres and Bring Banks, and bulky waste collected.	Further breakdown needs to be provided by increasing the level of detail requested in the EPA Local Authority questionnaire to reflect the secondary categories in waste composition.
Scaling-up commercial waste arisings requires the relative contribution of waste for	Require waste contractors to specify the sectoral sizes that they collect waste from (quantity collected per NACE code) each year in the Annual Environmental Report under Waste

Issue or gap identified	Recommendation
each sector (hotels, offices etc.) to be known	Licence.
Ensure consistent reporting of commercial waste composition by business	Develop an audit system, such as that used in the AIC scheme for solvents, for commercial waste arisings. The AIC scheme involves self auditing (according to a set methodology), followed by independent verification of results.
Inaccurate or over-generalised reporting of wastes by industry in the AERs and waste questionnaires returned to the EPA.	The industrial waste survey questionnaires and AERs should be amended to include a better description of the 'mixed wastes' as described in EWC codes 15 and 20 such that the information submitted is more useful for waste characterisations. Provide training and guidance for companies in completing AERs and questionnaires.
Difficulty in calculating scale-up factors based on employment, turnover etc. in commercial and industrial sectors.	In some cases information available is not detailed enough for subsequent calculations e.g. employee numbers are available for the various NACE codes but a breakdown for the various subcategories is not. These needs should be communicated to the CSO.

Contamination Assessment

If correction factors for contamination are applied to our National waste statistics, there will be important implications for national compliance with the EU Packaging Directive and the EU landfill Directive.

A more in-depth examination of contamination is recommended. The actual measurement of contamination can be carried out according to the methodology developed in this report.

The main implications for contamination measurement is at the level of landfill disposal, therefore a survey programme that focuses on the municipal landfill waste stream is required. As well as enabling an accurate estimation of packaging and biodegradable content, the results will be useful in modelling landfill gas and leachate generation. The level of contamination in the recovery waste stream should also be examined at the end point in the recovery waste flow (e.g. output from MRF).

Areas for Further Research or Intervention

A number of areas for further study and research are identified in the Report.

- Research on seasonal variations in household waste
- Surveying at the level of an individual household
- Research of wastes not included in the survey programme
  - *Home Composting Activities*
  - *Burning of Waste*
  - *Litter and Street Cleaning Waste*
- The use of Macerators to manage organic waste
- Compliance with the Packaging Regulations

1 INTRODUCTION

1.1 BACKGROUND

In order to measure progress towards national waste prevention, reduction, and recycling goals, it is important that detailed, accurate and up-to-date information regarding the composition of municipal waste is maintained.

The Environmental Protection Agency commissioned this report to improve the level of knowledge available on municipal waste, and to advance the methodology used for measuring waste composition. This national study was carried out between August 2004 and May 2005 by a consultancy team of RPS-MCOS and CTC. The study was carried out under the auspices of the National Waste Prevention Programme.

A steering committee drawn from the EPA, the Department of Environment Heritage and Local Government, and Local Authorities has guided the work.

The project builds upon the Municipal Waste Characterisation methodology developed by the EPA in 1996, and upon surveys carried out since then in various sectors across Ireland. In 2003 a research project was carried out on the composition of non-household municipal waste under the ERTDI funded programme. Account has been taken of the changing nature of municipal waste management in Ireland, most notably the ongoing switch to recycling, the introduction of use-related charging, and the increasing importance of non-household municipal waste generated by commerce and industry.

1.2 OBJECTIVES

Three main objectives of the project are as follows:

1. To develop an updated methodology for the sampling of municipal waste, bearing in mind the evolution in waste management and collection
2. To carry out waste characterisation surveys employing this methodology, and to report on the findings
3. To develop a “scale-up” methodology to enable a national profile to be developed for household and non-household municipal waste, using the results of surveys.

Additional tasks within the brief included:

Packaging Waste – enabling an accurate update of the quantities and types of packaging waste generated in the municipal sector.

Measurement of Contamination - Contamination, though not formally defined, is an important factor in waste characterisation. To date, no studies on contamination have been carried out in Ireland. This study developed a sampling and testing methodology and applied this to a number of categories of packaging waste.

1.3 STUDY TEAM AND WORK PROGRAMME

RPS-MCOS managed the surveying of household waste sector, while CTC focused on the commercial and industrial sectors.

The project team completed the tasks below:

- Inception Report
- Literature Review
- Methodology Development
- First Survey campaign (October/November)
- Second Survey campaign (March/ April 2005)
- Final Report

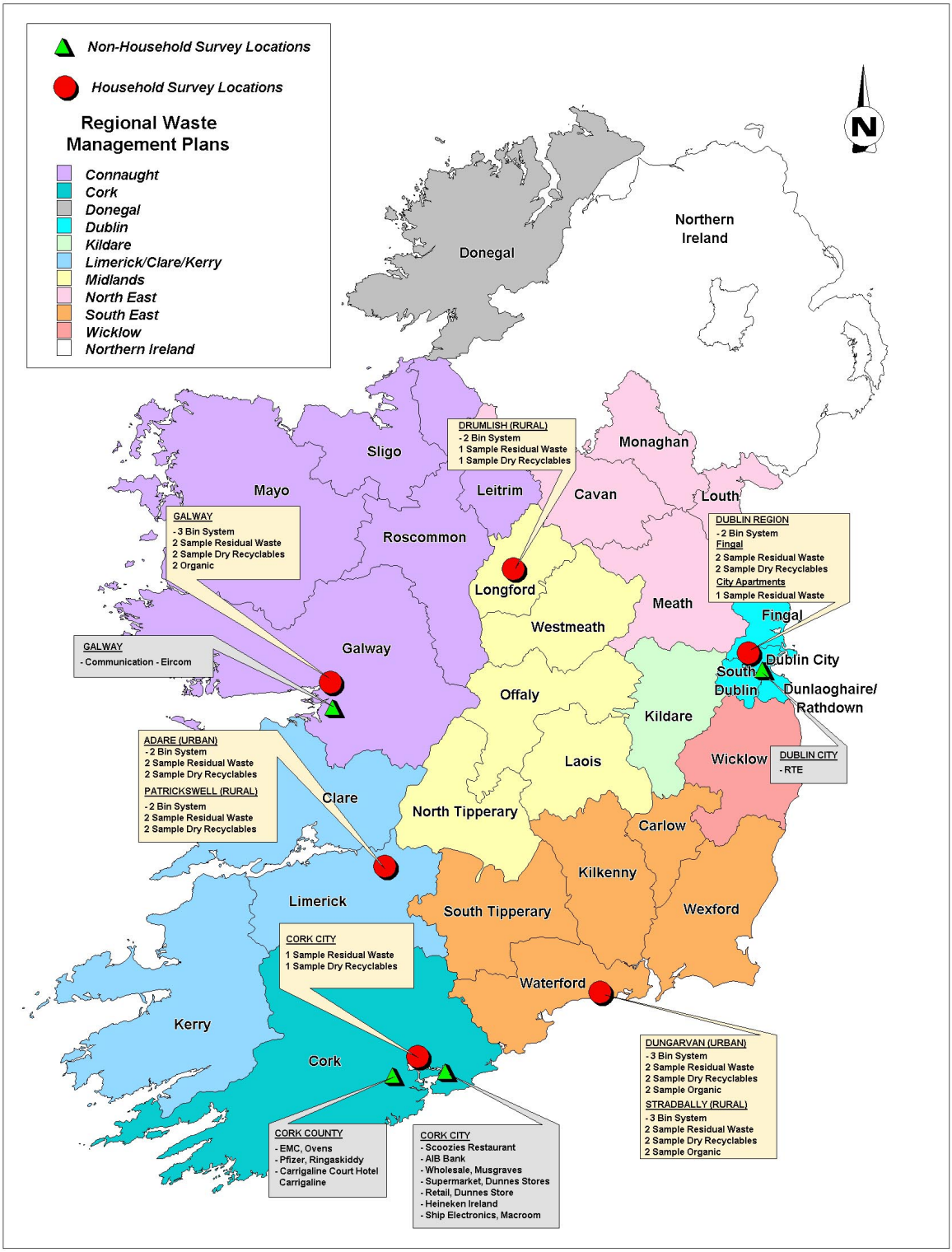
1.4 PROJECT PARTNERS

The project was carried out with the co-operation of a number of local authorities, private waste collection companies, commercial and industrial employers. The project partners are listed in Table 1.1 and the locations of the surveys are shown in Figure 1.1.

Table 1.1: Project Partners

Household Surveys	Non Household Surveys
Cork City Council	AIB
Dublin City Council	Carrigaline Court Hotel
Fingal County Council	Eircom
Galway City Council	EMC
Mr Binman Ltd. (Limerick)	Dunnes Stores
Mulleady's Ltd. (Longford)	Heineken
Oxigen Ltd. (Dublin)	Jacobs on the Mall
Waterford County Council	Musgraves
	Pfizer Drug Product Plant
	RTE
	Ship Company

Figure 1.1: Household and Non-household Waste Survey Locations



1.5 BENEFITS TO NATIONAL WASTE STATISTICS REPORTING

The main beneficiary to this project will be the National Waste Database, which is the central resource for waste management data in Ireland. The NWD will play an increasingly important role for Ireland in providing information for the two-yearly reporting requirements of the EU Waste Statistics Directive (EC, 2150/2002). Data on waste composition is a key input to the National Waste Database.

The data collected and methodologies employed will also be useful in relation to:

Waste Prevention and Minimisation - an important step in any programme to reduce waste is to determine first of all what type and quantities of waste are being generated. This will enable target waste streams to be identified for action, and will enable the effects of prevention and minimisation policies to be measured.

EU Landfill Directive and **National Biodegradable Waste Strategy Targets** – the % biodegradable waste landfilled is a key parameter in meeting Directive targets. Its calculation requires accurate waste characterisation results.

Packaging Waste Recovery – national targets must be met for recycling and recovery of packaging waste. In order to measure our performance the composition of waste being landfilled and sent for the recovery must be established.

Waste Management Planning – accurate and up-to-date information on the waste being generated is essential for forward planning of waste management on a national, regional or local authority level.

Development of Waste Management Infrastructure – identification of waste stream composition for facilities such as recycling MRFs, composting plants and waste-to-energy plants is an important consideration in their design and operation.

Performance of Waste Collection Systems – data presented, particularly in relation to the 2-bin and 3-bin recycling systems, will provide a useful benchmark for the development of these systems across Ireland.

Company Specific and Sector Specific Waste Campaigns – in the commercial and industrial sectors, the improved data available will be useful to individual sectors (or companies) in targeting areas for improved waste management.

2 METHODOLOGY

2.1 LITERATURE REVIEW

2.1.1 Household Surveys

2.1.1.1 Review of International Methodologies

There have been a number of household waste composition studies conducted abroad. Generally the methodology for these studies is based on manual sorting of residual waste. The household studies were sometimes conducted in conjunction with commercial waste surveys or on a mixed load. A summary of the different international methodologies is presented in Appendix A.

From the examination of the literature available on Waste Composition Surveys, it can be concluded that there is no single standard method of measuring waste composition in use, and this makes the results, at local, national and international level, obtained from the differing survey methods, difficult to compare. The SWA tool, whose development was funded by the European Commission (2001), set about to develop a set of standardised methodologies to assist in the formulation and implementation of waste analyses throughout Europe, so that accurate and comparable results would be obtained from all the Member states.

The most common method used to characterise household waste is the analysis of waste in bulk from a Refuse Collection Vehicle (RCV), even though this method increases contamination due to mixing. Most of the characterisation results to date are for municipal waste sent to landfill. Relatively little data on the composition of separately collected waste exists.

The importance of the number of samples is particularly relevant to the statistical validity of the field results, even though the minimum numbers of samples required vary according to the studies. A 90-95% confidence level and 10 - 20% level of accuracy is judged appropriate. The criteria of variability appear to be different in the various studies; this reflects local and national conditions (e.g. in a wet country like China the type of container used is a more significant source of variability than in drier Mexico). It appears that measurement of the variability is best studied with regression models (Parfitt, 2002), which highlights the importance of recording background information on the sample for further analysis.

Waste from Recycling Centres and Bring Banks are generally characterised separately through surveys and the use of national figures. Most of the existing information has been collected in the UK. Methodologies such as MODECOM (ADEME, 1998) were reviewed - no significant new information was provided in such methodologies, which deal with the characterisation of random samples of mixed household waste from Refuse Collection Vehicles. They did not offer any insight into the scaling-up of waste analysis results on a national level.

2.1.1.2 Irish Waste Composition Studies

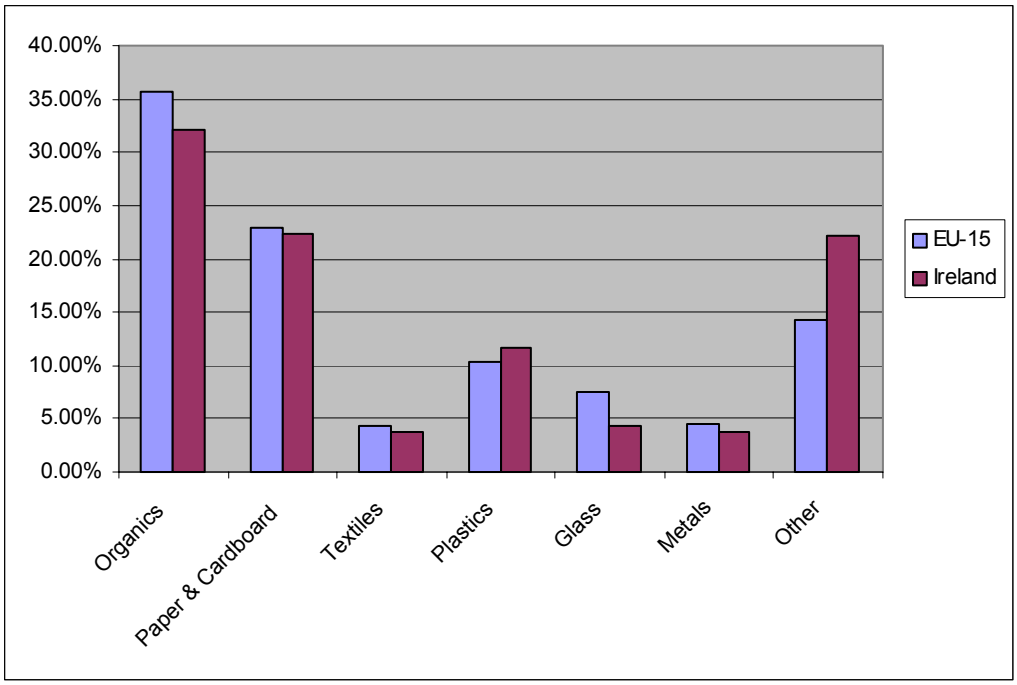
The first comprehensive set of Irish household waste compositional data was published in 1995 in the report “Information and Methodology Study to Assist Improved Management of Solid Wastes” prepared by MCOS as part of an EPA research contract. The sampling methodology used was essentially based on the European Recovery and Recycling Association (ERRA) Waste Analysis procedure dated March 1993 for 12 surveys and the draft EPA procedure for 20 surveys. Counties without surveys were paired with counties similar in term of urban/rural population and waste

generation and composition data for these counties was generated. 32 surveys were completed (the last 20 of which employed the draft Irish methodology)

In 1996, the EPA published a methodology for carrying out waste characterisation surveys, which has been the methodology followed in Ireland to date. The methodology is based on the premise that households of similar socio-economic characteristics are likely to have similar behavioural, purchasing and lifestyle characteristics, which will be reflected in the quantity and composition of waste they produce or recycle.

The EPA National waste database 1998 generated another national profile using the same scale-up method employed in 1995. Only 10 local authorities carried out household waste compositions in 2001 and 2002, following the 1996 EPA Methodology. The previous pairing procedure was used to generate data for the missing local authorities. The average Irish household waste composition published by the EPA in the National Waste Database Reports is similar to the EU average (see Figure 2.1 below). The approach of 'pairing' local authorities with similar characteristics for the purpose of scaling up survey results appears to have been reasonably successful, but there is more variation between counties in terms of collection systems (frequency, number of bins, charging mechanisms etc.) compared to 1995 when the method was introduced. With one exception (1998, REMECOM Project), there is a lack of consistency in the surveys carried out since 1995 in Ireland, and limitations in the extent of the datasets. The current approach is towards one-off single-season surveys on an intermittent basis. A more co-ordinated approach with defined sample numbers and frequencies is required to improve the situation. There appears to be an over-reliance on a 'catch-all' category 'Others' rather than detailed breakdown of this fraction. The development of a central database to record all relevant survey details will also be beneficial.

Figure 2.1: Comparison of Household Waste Composition in the EU and in Ireland (2003)



Source: EPA National Waste Database 2003 and ESTO: Scenarios of household waste generation in 2020, 2003

To date the REMECON project is the biggest waste characterisation project undertaken in Ireland: 63 samples were characterised over an 18 months period over 1996 – 1997 for Dublin City Council. This fed into a European research project co-ordinated by ADEME in France. Bulky wastes and waste deposited at bring centres were not taken in account. The sampling was undertaken in accordance with the methodology published in the EPA Waste Characterisation Manual, 1996 while the samples were sorted using the MODECOM (ADEME, 1998) methodology.

In general in Ireland, it is difficult to form an overall view of household waste generation and composition based on the surveys that have been carried out to date. This is due to the limited number of survey completed, and the lack of sufficient details on background information in the surveys completed. It is also difficult to integrate results from surveys on residual waste with the surveys carried out on Recycling Centres and Bring Banks as the catchment's of these can be harder to define and relate back to the areas where the residual waste surveys have been carried out.

2.1.1.3 Factors Affecting Waste Composition

The literature review examined the numerous factors that create variation in the amount and the type of waste produced by households. These are summarised in Table 3.1.

Table 2.1: Waste composition Factors and Effects

Factor	Effects
Seasonal variation	Production of certain types of waste vary according to the season (e.g. garden waste in summer, increased purchasing at Christmas, etc.)
Type of house	Whether detached, terraced, apartments, etc. There are growing numbers of apartment dwellers – (e.g. no garden waste coming from apartments, smaller household size etc.)
Age of householders	The age of the household occupants will affect the purchasing and lifestyle behaviour (e.g. young couples spending buying more convenience food than older couples, or young families producing more nappies).
Level of income	It is generally accepted that waste production is linked to level of income. Efforts are being made to try to decouple economic growth from waste production.
Size of the family	Research has shown that the average single-person household in the UK consumes twice as much items per capita as a household with three or more members, and creates 50% greater packaging arisings per capita.
Level of education	The level of education has a direct effect on the level of environmental awareness and the focus on waste prevention and recycling.
Ethnicity	Different ethnic groups have different purchasing and cooking habits (e.g. oriental groups would buy rice in bulk (40-50kg bags) instead of smaller packs).
Recycling collections	Separate collections are now commonly implemented. These systems remove paper, card, packaging etc. from the residual waste bin. The household waste generation and composition will be a compilation of the waste composition of different bins.
Collection system, Bin type	Provision of wheelie-bins instead of bags generally causes an increase in waste generation due to the bigger size and the improved resistance of the container (e.g. more objects and bulky waste can be accepted)
Environmental charges	Variable charging systems (e.g. tag-a-bag, pay-by-weight) are reducing the frequency of waste presentation and moving waste materials towards free collection recycling systems. A possible secondary effect may be an increase in contamination (presence of non-wanted materials) of waste collected by separate collection. A nationwide changeover to use-related charges will be completed during the period 2004-2005 in Ireland.
Bye-laws on waste presentation	Some local authorities have introduced bye-laws prescribing the source separation of targeted elements from the municipal waste stream. (e.g. banning the inclusion recyclable waste (glass bottles and jars) in mixed residual waste).
Provision of recycling facilities	The proximity and convenience of recycling facilities (Recycling Centres, Bring-Banks) may increase the diversion of recyclables from the mixed residual wheelie bin at a localised level.

Waste composition and generation can be affected at national level by government policies and regulations (e.g. plastic bag levy) or replacement of a packaging material by another for economic or

practical reason (e.g. replacement of milk glass bottles by plastic or tetrapak containers). This should not create any spatial variation within the country.

Other factors described in Table 2.1 may vary within the country (e.g. number of detached houses between rural and urban areas) and influence waste generation and composition. A distinction must be made between factors shown that will affect the quantity and composition of waste *generated* and factors that affect the quantity and composition of waste *presented for collection*.

- Waste generation depends mainly on socio-economic factors such as: type of housing, household structure (e.g. young family/ retired persons), income, purchasing power, educational level, size and status of family (e.g. number of children), social class, ethnicity.
- Waste presented for collection depends on the collection system, environmental charges, provision of recycling facilities, local bye-laws and attitudes/environmental motivation.

Seasonal variation influences both generation rates and composition.

2.1.2 Non-Household surveys

2.1.2.1 International Studies

There have been a large number of waste characterisation studies conducted in the commercial sector internationally. These surveys have tended to examine the Industrial, Commercial and Institutional (ICI) sector, often with the surveys done in conjunction with household surveys. Typically these surveys have examined waste disposal only rather than waste generation, as the surveys have been conducted at landfill sites rather than at specific industrial/commercial locations. Effectively these could be classed as disposal based audits rather than waste arising surveys.

Generally, the methodology for these studies has been based on either visual inspection or manual sorting of waste loads at landfills or waste depots (via the coning and quartering method). The surveys were typically conducted during a weeklong period at a selection of landfill sites in the participating areas. It was found during many of these surveys that the variation in the Industrial/Commercial, Institutional (ICI) sector was greater than in the residential sector. Additionally, cardboard/paper was usually the main waste stream identified with the other waste streams varying depending on the origin of the wastes.

Further detail on each of these studies is presented below in Table 2.2:

Table 2.2: International Non-Household (Commercial) Waste Composition Surveys

Waste Category	Minnesota State, USA	Pennsylvania State, USA	Oregon State, USA	Wisconsin State, USA	Sydney, Australia	Honolulu, Hawaii	Helsinki, Finland
Sector Composition Determined	No	No	No	No	No	No	No
Paper	34.7%	35.8%	30.95%	25.8%	16%	24.9%	37.5%
Organics	28.9%	31.5%	40.34%	20.9%	7%	27.5%	26%
Plastic	12.4%	12.4%	12.96%	14.6%	9%	7.3%	7.9%
C&D Waste	-	8.1%	-	15.5%	14%	-	1.9%
Metal	5.2%	5.1%	8.27%	6.8%	4%	8.0%	8.5%
Glass	2.5%	2.4%	3.04%	2.4%	1%	1.4%	1.0%
Hazardous	0.4%	0.3%	0.50%	0.7%	<1 %	-	-
Wood/Timber	-	-	-	-	15%	18.7%	5.0%
Textile/Rags	-	-	-	-	4%	-	1.0%
Other Materials	15.8%	4.4%	3.93%	13.3%	31%	12.1%	11.3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

2.1.2.2 Irish National Studies

The first commercial waste characterisation studies in Ireland were conducted by four local authorities and the results were utilised for the 1998 Waste Database Report. For the 2001 waste database report an additional six waste commercial surveys were conducted and results from an EPA research project (Characterisation of Non-Household Municipal Waste in Ireland (2000-MS-7)) were also included in this report. Since then a number of independent surveys have been conducted at a local level.

Characterisation of Non-Household Municipal Waste in Ireland (2000-MS-7)[1]

This study was completed in 2003. For the first time sectoral breakdowns were taken and applied to national waste figures to produce a National Commercial Waste Composition profile. During this study the 10 most significant waste producing sectors (as determined by the quantities of wastes collected by waste contractors) were identified and subsequently evaluated. These sectors were hotels, supermarkets, shopping centres, offices, colleges, schools, restaurants, hospitals and other retailers, as shown in Table 2.3.

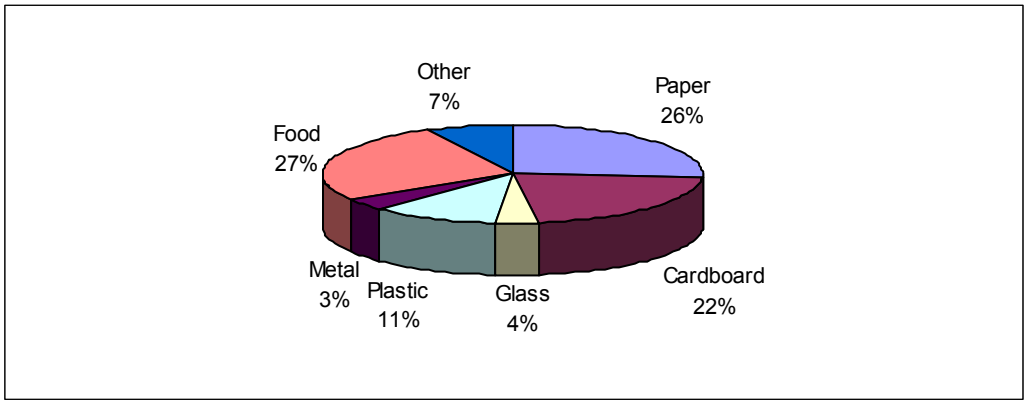
[1] Characterisation of Non-Household Municipal Waste in Ireland (2000-MS-7), EPA, 2004
http://www.epa.ie/EnvironmentalResearch/ReportsOutputs/

Table 2.3: Waste Composition in the Major Commercial Sectors (%)

Waste Category	Hotels	Supermarket	Transport/ Communication	Financial Services	Colleges	Restaurants	Hospitals	Public Offices	Wholesale Distribution	Other Retailers
Paper & Cardboard	18.06	45.12	50.21	89.12	26.39	30.62	46.11	68.73	80.10	61.96
Glass	12.01	-	8.57	0.12	1.05	0.30	6.63	0.60	-	0.03
Plastic	3.92	9.76	12.33	5.60	9.35	12.75	15.22	4.86	11.00	27.42
Metal	2.53	0.55	2.16	0.68	28.33	6.03	0.22	1.52	-	1.39
Organic Waste	59.31	40.01	23.61	4.48	20.24	45.91	15.32	23.63	4.00	3.42
Textiles	0.78	-	-	-	-	-	5.76	-	-	3.73
Wood	1.67	-	-	-	6.92	-	-	-	-	0.27
Composites	0.67	-	3.12	-	6.88	4.39	3.16	0.66	-	1.78
Special/ Irregular Waste	1.05	4.56	-	-	0.84	-	7.58	-	4.90	-
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

The main findings of this study are summarised in Figure 2.2.

Figure 2.2: National Commercial Waste Composition 2002.



Prior to the MS-7 report the standard national methodology for commercial waste characterisation was outlined in the EPA document 'Municipal Waste Characterisation'[2]. A number of concerns with this methodology were identified and, bearing these factors in mind, the Clean Technology Centre developed a new methodology that dealt with these inadequacies. The new methodology was based on detailed segregation of individual waste streams at source and included all recycled materials.

[2] EPA, 1996,'Muncipal Waste Characterisation'

The characterisation conducted in MS-7 did not include industrial non-process municipal waste. During this study, the importance of industrial non-process municipal waste became apparent. Industrial non-process municipal waste consists of waste generated at industrial facilities that does not arise from industrial activities or processes. Typical examples include canteen waste, office waste and packaging waste from material deliveries.

While process-related industrial wastes are largely classified according to specific EWC codes, industrial non-process municipal wastes may be classified according to a number of general EWC codes in Chapter 15 and 20. In recent years a significant segment (~50%) of this waste has been classified as 20 03 01 (mixed municipal waste) and further characterisation of these wastes was deemed necessary. This was investigated during the current project.

Recent National Studies

Since 2000-MS-7 two other commercial characterisations have been completed. Both of these took place in Dublin and concentrated on a selected number of sectors – primarily in the hospitality and retail sectors. The methodology, which was designed and carried out by Friends of the Earth, involved a preliminary interview and questionnaire for participants. This determined relevant data and ensured that separation of the relevant waste streams was carried out at source. The businesses were required to separate waste into the agreed categories and these were subsequently weighted and the figures used to generate compositional percentages for each sector. A summary of their findings is given in Table 2.4.

The categorisation of wastes in this study did not follow the breakdown used in other projects referred to above.

Table 2.4: Summary of Individual Commercial Waste Composition Surveys

	Swords / Fingal			Temple Bar	
	Hospitality	**Retail**	**Office**	**Hospitality**	**Retail**
Cardboard	13.5%	41.5%	7%	4%	32%
Paper	1.2%	25.6%	73.8%	1%	21%
Food	20%	6.8%	N/A	33%	11%
Glass	31.8%	0.4%	N/A	52%	-
Plastic	1%	8.3%	0.2%	-	-
Other	32.5%	17.4%	19%	10%	36%
Total	100%	100%	100%	100%	100%

2.1.2.3 International Scale-up Methodologies

In many of the international commercial waste characterisation studies mentioned previously, calculation of waste composition for specific sectors was ignored. Rather, figures taken from landfill surveys were used to generate profiles for the commercial sector as a whole. For example, in the 2003 Pennsylvania study (Pennsylvania department of Environmental Protection, 2003), it was estimated that the total waste sent for disposal, treatment and/or recycling was split between residential and commercial waste in a 54: 46 ratio. This breakdown of municipal waste was based on the following methodology:

- Compile residential waste disposal rates by demographic sector;
- Project aggregate residential waste disposal based on the residential waste disposal rates;

- Statistically analyse and adjust county-level waste disposal totals (as reported in the Facility Reports); and
- Calculate disposed commercial waste by netting out residential waste from county-level totals.

A cautionary note is added stating "Based on this methodology used to allocate State-wide disposed waste totals; we estimate that approximately 54 percent of the Commonwealth's disposed waste comes from residential generators, with 46 percent from commercial generators. This breakdown is in line with other composition and generation studies across the country that has attempted to evaluate the split between residential and commercial waste. Note that these numbers are estimates only, and that there are sources of both statistical and data-source error inherent in the estimates."

Such methodologies are common practice and clearly fail to allocate generated wastes directly to the specific sectors. Of the other studies mentioned the Honolulu (City and County of Honolulu Dept. of Environmental Services, 1999) and California (California Integrated Waste Management Board, 1999) studies provide excellent sectoral breakdowns. Both, however, fail to include recycled quantities (their studies were conducted at landfills rather than at the actual sites) and neither generates local or regional profiles based on scale-up methodologies (though both apply percentages to totals landfilled to estimate total fractions disposed of).

However there are a number of studies that use scale up factors and these are summarised here.

Finland

A Waste characterisation study carried out in the Helsinki Metropolitan Area in 2004. The study methodology divides commercial sectors into similar NACE codes to those used in MS-7 and in this study, as outlined in Table 2.5.

Table 2.5: Non Household Municipal Waste Arisings in Helsinki

Sector	No. of samples	Total kg/employee	Employees	Total tonnes	% of total
Commercial Sectors					
Wholesale and retail, total	188		78,000	138,421	
Wholesale distribution	22	1,679	43,200	72,533	27
Supermarkets and grocery shops	70	4,935	6,600	32,571	12
Vehicle sales and repair	46	1,286	9,300	11,960	4
Other retailers	50	1,130	18,900	21,357	8
Hotels, restaurants and catering, total	21		16,700	36,932	
Hotels	5	1,326	2,200	2,917	1
Restaurants	13	2,167	12,900	27,954	10
Catering	3	3,788	1,600	6,061	2
Transport, storage and communication	34	380	47,300	17,974	7
Public offices	17	184	38,000	6,992	3
Education	17	311	33,500	10,419	4
Health care and social services	35	514	59,200	30,429	11
Recreational and sporting	19	340	9,600	3,264	1
Other commercial sectors	42	214	124,600	26,664	10
				271,095	100

Commercial enterprises in the Helsinki Metropolitan Area are required, by the local authority, to keep a records of total waste produced and to categorise this waste in terms of recycled waste streams, mixed waste, demolition waste and waste for incineration as outlined in Table 2.6. Based on the return

of information from the commercial enterprises it was possible for authorities to determine the weight of waste produced per employee for each sector. While the authority did not receive a return of information from all businesses it was possible to scale up the total quantity of waste arising from each sector based on the information supplied on weight per employee and statistics on employees per sector.

While the information supplied by Helsinki business is very useful for the scale up method the local authority has expressed concern that data provided is not very reliable especially with regard to hotels and restaurants. These figures will be used in conjunction with findings from the MS-7 project during the scale up process.

Table 2.6: Breakdown of Various Non-Household Municipal Wastes per Commercial Sector in Helsinki (tonnes per annum)

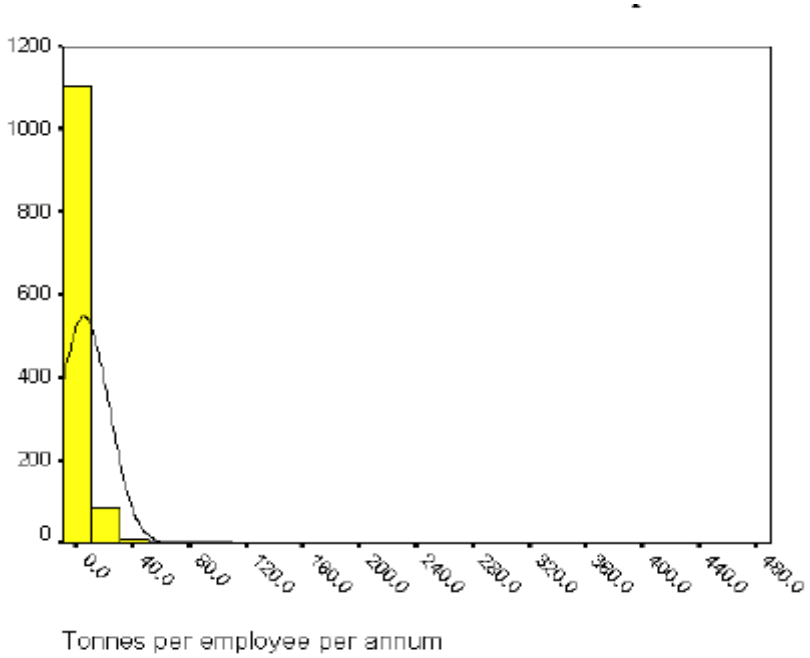
Sector	Mixed waste	Combustibles	C&D	Paper	Cardboard	Organics	Wood	Metals	WEE	Glass	Plastics	Other recyclables
Wholesale distribution	19,877	5,313	321	4,030	12,000	11,954	8,381		183	0	3,160	46
Supermarkets and grocery shops	11,552	4,047	0	14	12,979	6,383	0	36	0	14	0	14
Vehicle sales and repair	3,391	578	69	715	980	157	98	5,596	29	59	10	921
Other retailers	5,706	3,532	1,338	502	7,712	3,511	1,024	355	84	21	21	21
Hotels	1,258	48	0	354	114	988	7	26	2	112	0	7
Restaurants	18,760	210	14	336	1,764	4,942	42	28	0	378	0	42
Catering	3,728	318	2	627	392	125	20	51	0	380	9	33
Transport, storage and communication	5,651	2,222	483	2,657	2,367	290	3,140	1,208	242	0	0	48
Public offices	3,596	85	508	2,200	423	423	212	212	127	0	0	0
Education	7,448	157	274	2,783	392	784	39	39	235	39	0	0
Health care and social services	24,075	777	141	2,753	1,836	2,683	212	353	71	565	0	71
Recreational and sporting	3,234	227	494	1,277	371	474	350	227	82	21	0	247
Other services	9,411	1,107	2,214	9,273	3,183	2,491	554	415	830	138	0	0

Northern Ireland[3]

This study, conducted in 2001, examined municipal waste arisings for all of Northern Ireland. The commercial/industrial sector was examined separately. Data collation was done via desktop survey rather than hands on survey.

The survey returns were used to estimate an annual tonnage of municipal waste per employee. It was found that 81% of companies generated 5 tonnes of MSW per employee per year and 1% of companies generated 40 tonnes per employee per year (these results are depicted in Figure 2.3).

Figure 2.3: Tonnes per Employee per Annum in Northern Ireland



Applying these figures to the total number of employees generated a total annual commercial/industrial waste figure of approximately 700,000 tonnes per annum. The estimates from landfill and waste contractor returns indicate that there was between 389,000 and 676,000 tonnes generated.

Further analysis was performed based on economic sectors. From the results it was noted that four economic sectors were responsible for nearly 50% of the waste produced (this reflects the importance of the state sector in Northern Ireland). These are:

- Public administration, defence and social security - produces 10.5% of the total,
- Health and social work - produces 13.6% of the total,
- Retail trade - produces 9.8% of the total, and
- Education - produces 9.5% of the total.

[3] Industrial, Commercial and Municipal Waste Arisings, Survey for Northern Ireland, Environment and Heritage Service, Department of Environment, 2001

2.1.2.4 Key Issues for Non-Household Municipal Waste (NHMW) Methodologies

- Prior to MS-7, compositional data on commercial waste was limited and did not reflect the character of commercial waste produced nationally, because the data presented was limited to a number of commercial sectors. The MS-7 study concentrated on the most significant commercial sectors and increased the amount of data available. However, there are a significant number of sectors which do not have waste compositional data – communication, wholesale, restaurants, etc.). Furthermore, waste compositions that have been produced to date need to be verified by repeating studies on the sectors analysed to date.
- In studies prior to MS-7, the data provided produced a reasonably accurate breakdown of waste composition for the sample date. However, the extrapolation of the data to a longer period of time (for example, a year) was not reliable. The methodology developed in MS-7 requires that the study is carried out over a 5-day period to account for variations in commercial waste composition which arise from changes in business activity during the working week.
- Waste characterisation data was generated in MS-7 for ten of the most significant commercial waste producing sectors. These ten sectors were determined to represent more than 80% of commercial waste arisings. The process of determining the most significant sectors using data from waste contractors needs to be repeated to verify this information.
- While the coning and quartering technique may be appropriate for household waste which consists of small waste items this is less feasible for commercial waste which consists of large bulky items such as pallets and cardboard. Quartering such a waste stream will lead to uneven division of material types and to inaccurate characterisation.
- For commercial waste characterisation it is best to separate materials at source, where possible. Commercial waste is often segregated at source into a number of waste types. It does not make any sense to combine these waste streams so that one can attempt to segregate them again for characterisation purposes. Combining dry waste streams with wet waste streams, such as food waste, results in the dry waste materials becoming contaminated with wet waste. Once this occurs it is difficult to accurately determine individual waste material weights and thus characterisation is impossible. For residual waste that cannot be separated at source a characterisation needs to be conducted for a fraction of this waste as outlined in the new methodology developed in MS-7.
- The characterisation conducted in MS-7 did not include industrial non-process municipal wastes. industrial non-process municipal wastes may be classified according to a number of general EWC codes in Chapter 15 and 20. In recent years a significant segment of this waste has been classified as 20 03 01 (mixed municipal waste) and further characterisation of these wastes is deemed necessary.

Many of the international waste characterisation methodologies have not focused on commercial sector waste composition. The trend in recent years has been to conduct studies and report on combined commercial waste characterisation surveys. Therefore the data generated in these studies has a limited use in an Irish context.

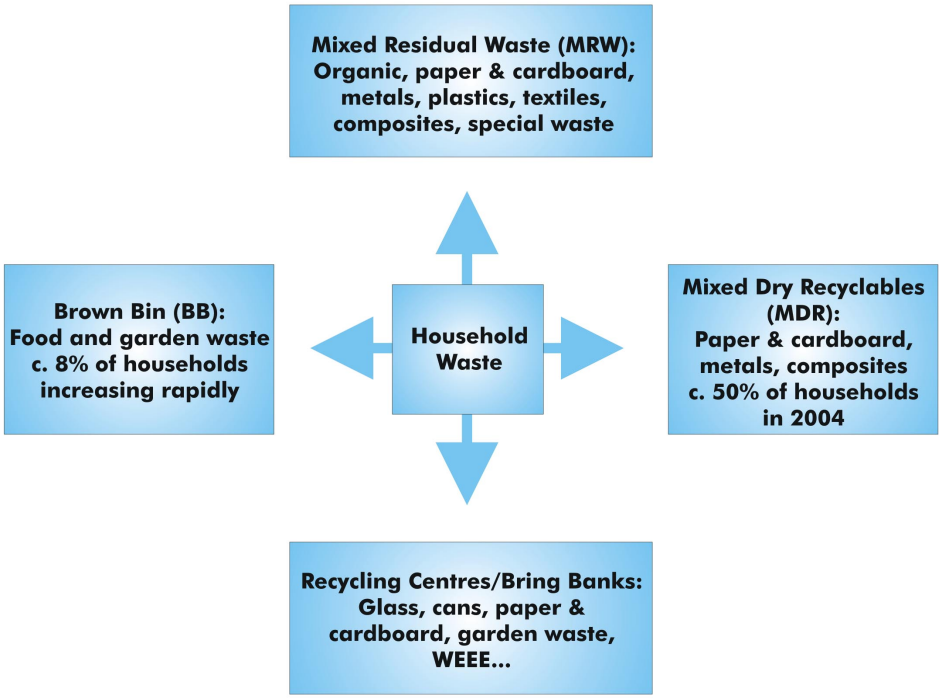
2.2 METHODOLOGY ADOPTED

2.2.1 Household Surveys

While the EPA Waste Characterisation Manual 1996 has proven useful in determining waste composition in a particular local authority area, it does not fully address the need to arrive at a national waste profile. Waste collection systems have also evolved significantly in the last decade increasing the workload needed to generate comprehensive results (see Figure 2.4 below). The changes are three fold:

Increase in recycling: In 1995-1996 the main waste management option was landfilling of residual household waste. Since then we have seen an introduction of waste collection by separate fractions, as shown in Figure 2.2. The percentage of household waste diverted from landfill has grown from 4.3% in 1995 to 13.1% in 2003 and consequently the composition of the residual waste stream has also changed. This increase in recycling is expected to continue. It is not enough to analyse the residual waste stream to obtain a complete picture of what is generated by a household.

Figure 2.4: Pathways for Household Waste Collection



Use-related charges: In 2004 the Department of Environment Heritage and Local Government, requested Local Authorities to implement use-related charging for household waste in their areas by January 1st 2005. The impacts of use-related charging for household waste are:

- It provides an impetus for reduction of waste, by changing shopping and lifestyle habits. Householders also have an incentive to recycle as much waste as possible;
- Some negative side effects may occur when use-related charging is introduced. Householders may be tempted to reduce waste bills by inappropriate use of recycling bins, or illegal dumping or burning of waste.

- It also affects the presentation rate (how often a bin is put out for collection), making it more difficult to collect a sample of waste from a predetermined number of households on any one week.

Privatisation of waste collection: Local authorities have been transferring more and more of their household waste collection duties to private operators. This led to the situation of having, in some areas, multiple operators collecting on the same area, and less direct control by local authorities on waste collection and waste data.

As result a re-examination of the existing methodology was deemed necessary.

The updated methodology, whose main elements are shown in Figure 2.5, aims to be cost-effective, easily replicable and capable of providing the required waste management information.

Figure 2.5: Overall Approach to the Household Methodology Development

2.2.1.1 Project Planning

Figure 2.6 provides an overview of the steps taken during the project planning phase.

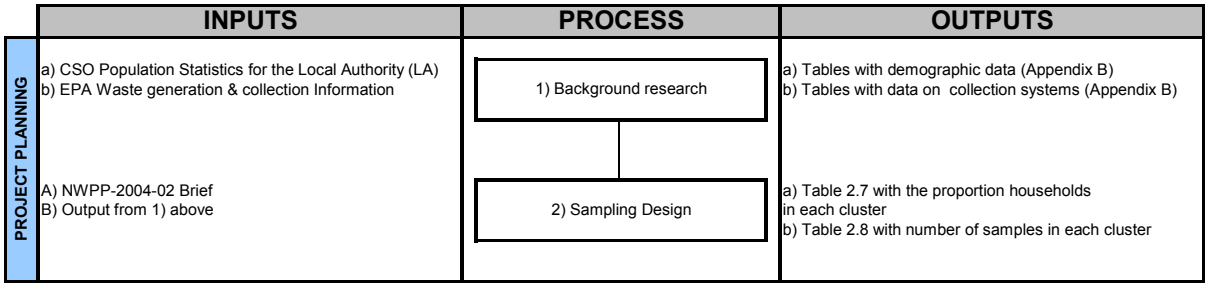


Figure 2.6: Step by step Approach to Project Planning

Step 1: Background Research

Prior to engaging in any sampling design, background information was collected from the EPA and CSO for each local authority on Ireland's population statistics, waste management systems and existing information on waste composition. Results were input in a spreadsheet and are summarised below.

Example 1: Summary of Background Information Required

For Dublin City, in 2003, it is possible to gather the information presented in the tables below:

Demographics:

Total Population	Surface Area (km^2)	Density Pop/km2	Urban %	Rural %	% Population per Social Class		
					A%	B%	C%
495,781	118	4,215	100%	0%	38%	38%	24%

Housing types:

Ave. no. of persons per private household			Total Households	Sub-total House	Sub-total flats/Appt
Agg. Rural	Agg. Urban	Total			
0	2.59	2.59	180,852	68%	29%

Waste arisings:

Household Waste 2002	kg/ hh /year	Household Waste 2003	kg/hh /year	Recycling Centres (RC)	RC Tonnes Collected	Bring Banks (BB)	BB Tonnes Collected	% Waste Collected by RC+BB
247,653	1,369	215,610	1,192	1	22,215	73	4,856	15%

Waste collection:

Kerbside	Kerbside Tonnes collected	Number of household serviced	Containers bags/ WB	Environmental Charges
Residual	164,785	180,852	Wheelie Bin	Fixed
Recyclable	14,252	123,000	Wheelie Bin	Free

Step 2: Sampling Design

The objective of a good sampling design is to select representative samples that will generate reliable results with a minimum error. Further explanation of the statistical terms used in this report is presented in Appendix C.

Type of sampling and Stratification:

Non-probability or quota sampling was used based on how the samples represent the nation as a whole. As the survey was being designed in advance to fulfill specified criteria and parameters, the selection of units for waste analysis was not considered to be truly "random" [4]. In quota sampling, the population is segmented into mutually exclusive sub-groups, called strata. The number of units selected will be proportional to how they represent the population as a whole.

[4] A Random Sampling gives each unit in the population the same probability of being selected.

Stratification criteria are specific parameters that might have an influence on waste composition and waste arisings (e.g. factors affecting waste composition presented in Table 2.1 of the Literature Review Section). Given the requirements of the project brief, the following stratification criteria were used in the project:

- The first stratum is ***urbanisation level*** (city, town, and rural)
- The second stratum ***collection system type*** (whether one, two or three bins).

Due to the timing of the waste characterisation (October 2004 and March 2005) seasonal effects were judged to be minimal.

The subset formed when two strata are combined is called *a cluster* (e.g. cluster 1-bin City comprises all households in a city area that are serviced by a bin only).

Using information on population from the Central Statistics Office and on waste collection systems from the EPA (see Appendix B) the total number of households for each cluster was calculated.

The percentage of households in each Stratum is presented in Table 2.7.

Table 2.7: Percentage of Household in each Stratum and Cluster

	1-bin	2-bin	3-bin	Stratum Collection System Total
Cities	6%	26%	3%	36%
Towns	2%	20%	3%	24%
Rural areas	3%	29%	8%	40%
Stratum Urbanisation Level Total	11%	75%	14%	100%

For optimum results, the number of surveys in each group should be proportional to the sub-population size.

Level of Sampling:

The level of sampling is concerned with the position along the waste management process (e.g. point of generation, point of collection, point of disposal) at which samples are taken for subsequent characterisation. There are three principal levels at which sampling may take place, namely:

- Inside the household
- Outside the household from an individual bin,
- Refuse collection vehicle (RCV): The bins or bags of households collected in the selected street or area are indiscriminately mixed in the RCV.

For practical purposes and to ensure consistency with previous methodology the sampling took place at the Refuse Collection Vehicle level.

Compositional information from Recycling Centres and Bring Banks was assessed using information submitted to the EPA by the local authorities in the national waste database returns.

Number of Samples Required:

While time and cost considerations often influence the number of samples analysed in a waste composition study, if the number of samples is not sufficient to provide a relatively precise estimation of the population waste composition, the reliability of the survey is questionable.

The number of samples required to achieve the desired level of accuracy is a function of the component under consideration (e.g. waste category) and the desired confidence level (generally 90% to 95%). The number of samples required depends on two main criteria:

- The heterogeneity of the waste, expressed by the variation coefficient (see Appendix C for further information). This variation coefficient is generally unknown and has to be estimated on the basis of results from past waste analyses.
- The desired accuracy of the results.

In the early stages of the project, it was not possible to use this technique to determine the number of samples required as a limited amount of waste composition data was available at the time. But, following completion of this project, it will be possible to recommend the number of surveys required to reach the desired accuracy of the results at 95% confidence levels. This analysis is presented in section 3.3.

Based on US experience[5], in the project submission, it was proposed to carry out waste analysis on 18 samples in October 2004 and 18 in March 2005.

Initially it was planned to allocate the number of samples proportionally to the number of households in a cluster, but due to the evolution of the waste collection systems towards a 3-bin collection system it was decided to increase the number of samples collected in the 3-bin collection system group. A minimum of 3 samples (mixed residual waste, mixed dry recyclables and separate organic kerbside) collected on the same route is necessary to assess waste composition and arisings at household level (plus waste collected by Bring Bank/Recycling Centres).

To gain knowledge on seasonal variation, it was also decided to use the results of 8 Mixed Residual Waste samples and 3 Mix Dry Recyclables samples analysed by RPS MCOS in Dublin City during summer 2004 on behalf of the Dublin Local Authorities.

The '1-bin collection system' cluster in towns and rural areas were not allocated with any samples due to their low estimated representation in Table 2.8.

Following the first survey campaign it was decided to replace the 1-bin collection system survey samples (as results were consistent with the earlier 1-bin city surveys) with a 2-bin city survey in Cork City.

A summary of the sampling allocation is presented in Table 2.8.

[5] R.W.BECK, Minnesota Waste Characterisation Plan Study, 2000 For each waste stream in the analysis, a minimum of 15 to 20 (and a maximum of 30) samples is recommended to develop meaningful, statistically defensible estimates of the composition of waste stream. Taking more than 30 samples is generally not recommended, as confidence intervals and variances improve only marginally once the number of samples increases above 30.

Table 2.8: Sample Allocations in each Stratum

	1-bin	2-bin	3-bin	Stratum Collection System Total
Cities	1 (MRW)	3 (MRW) 3 (MDR)	2 (MRW) 2 (MDR) 2 (BB)	13
Towns	0	2 (MRW)+ 2 (MDR)	2 (MRW) 2 (MDR) 2 (BB)	10
Rural areas	0	4 (MRW) 4 (MDR)	2 (MRW) 2 (MDR) 2 (BB)	14
Stratum Urbanisation Level Total	1	18	18	37

Sample Size and Sampling Unit:

It is only possible to survey a small percentage of households. The sample size was reduced to a manageable size, by choosing a district within the local authority which is representative of the local authority as a whole. The assumption was made that each route selected had to be representative and that each local authority was represented by its cluster.

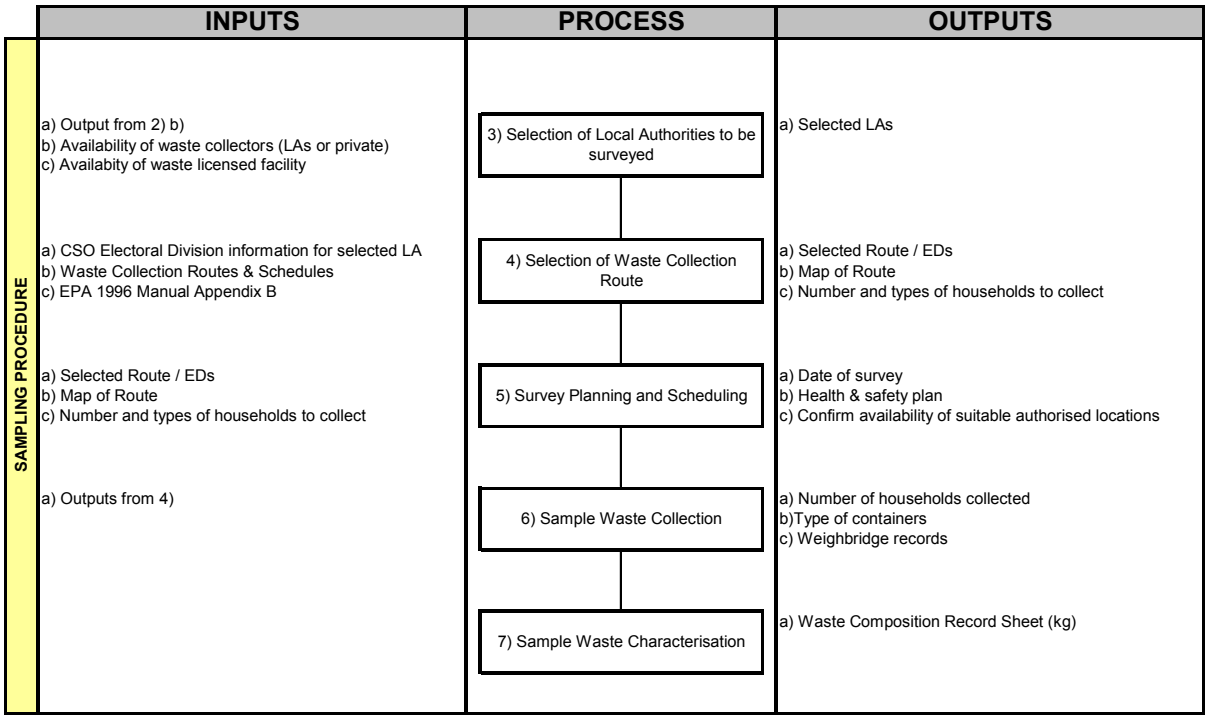
Sampling units are the smallest sub groups of the parent population which are separately selected, collected and analysed, and for which separate analysis results are produced. In this case this is the waste collected from the households in the selected areas/routes.

The size of the sampling unit, namely how many households need to be collected, is dependent on the number of households in the sampling area. As very little information was available on how the size of the sampling unit was calculated in other methodologies it was decided use the graphs in Appendix B of the EPA Municipal Waste Characterisation Manual, 1996 which recommend the number of households to be surveyed.

2.2.1.2 Sampling Procedure

Figure 2.7 provides an overview of the steps taken during the Sampling Procedure phase.

Figure 2.7: Step by step Approach to the Sampling Procedure



Step 3: Selection of Local Authorities to be Surveyed

Using the Table in Appendix B local authorities were matched with the different groups in each stratum. The main criteria used for the selection were population density, type of housing, percentage rural/ urban areas. The socio-demographics characteristics were consistent in each group.

Once the potential local authorities are selected on their match with the cluster profile, it was necessary to find project partners to carry out the surveys. This required finding an authorised waste collector and suitable authorised premises in each location.

The selected waste survey areas are presented in Table 2.9.

Table 2.9: Survey Locations

Strata	1 bin	2 bins	3 bins
Cities	Fingal County Council	Fingal County Council Cork City Council	Galway City Council
Towns	N/A	Limerick County Council	Waterford County Council
Rural areas	N/A	Limerick County Council Longford County Council	Waterford County Council

Step 4: Selection of Waste Collection Route

Once a local authority was selected to be surveyed, further analysis was carried out to identify an area representative of the local authority, from which the samples would be collected.

Within the same county, household waste composition may vary due to the following factors: user charges, type of containers, presentation of waste for collection, proximity to Recycling Centres, Bring Banks, type of heating system, social class correlated with affluence and type of housing.

To be able to delineate smaller areas within a local authority, it is required to use the smallest unit where statistical information can be compiled. Detailed statistics are available from the Central Statistic Office for Electoral Divisions[6]. Information on the following variables can be provided: social class, type of housing, household size (i.e. number of occupants), and age structure.

In the Irish context, it is convenient to use information from social classes, as it is consistent with the current (1996) methodology. There is also some correlation between the different factors (i.e. social class will have an effect on type of housing etc). A list of Electoral Divisions with similar social class profile as the local authority can be short-listed. This list can be discussed with the waste collection operator to identify any particular features to be considered.

Calculations related to the number of households and the breakdown of social classes is detailed in the pages 9-10 and in Appendix B of the EPA Municipal Waste Characterisation Manual, 1996. The minimum number of households to be included is 50. This will result in approximately 1,000 kg, assuming a generation rate of 20 kg per week[7]. For practical purposes, the weight of the sample should be kept below 5,000 kg, which is roughly equivalent to the waste collected from 250 households. The recommended range for survey therefore, is, 50-250 households.

[6] Detailed statistics are available from the CSO on Small Area of Population or Electoral Division. http://www.cso.ie/census/saps.htm

[7] In reality the quantity collected will depend on the type of waste (e.g. residual waste, recyclables, source separated organic) and the presentation rates, which is affected by waste charges.

Example 2: Representative Sample Selection

We want to select a sample representative of Dublin City. In order to facilitate the sampling selection we decided to look at social class breakdown and type of housing. Information from each of the 162 electoral divisions in Dublin City was compiled and filtered (custom filter 35%<Social Class A<41% and 35%<Social Class B<41%). As the table below shows, only 5 EDs matched the query:

Location	% Population per Social Class			Total	Sub-total House	Sub-total flats/Appt
	A%	B%	C%			
Dublin City Total	38%	38%	24%	180,852	68%	29%
Inns Quay A	37%	35%	28%	805	65%	32%
Arran Quay E	37%	38%	25%	1385	80%	15%
Ashtown A	42%	43%	15%	2214	95%	4%
Ashtown B	42%	39%	19%	1004	87%	11%
Ayrfield	28%	51%	21%	1522	96%	3%

From the 5 EDs shortlisted, Inns Quay A is the ED most similar to the local authority social class breakdown and type of housing, and should be selected as the preferred representative sample

Using Appendix B of the EPA Municipal Waste Characterisation Manual, 1996, the minimum number of households to be included in the survey is 80 households

Step 5: Survey Planning and Scheduling

This step includes consultation with the waste collection company on the selected sampling route and the scheduling of the collection.

- It is also necessary to consult with the Manager of the waste licensed or permitted facility where the waste composition analysis will take place.

Health& Safety:

A risk assessment should be carried out on the operations required to complete the waste composition analyses and the site specific risks (traffic, trip hazards etc) identified. An example of the risk assessment form is presented in Appendix D.

It is also necessary to make provision of personal protective equipment such as:

- Disinfectant, overalls, reflective vests, gloves, eye protection, masks, boots
- First aid kit

Other Equipment:

The following equipment is required to sort the waste sample:

- One 60 kg precision scale (minimum precision 10g)
- A 3 kg precision scale (minimum precision 0.1 g) if contamination measurement takes place onsite
- One table with 2 trays, the top tray being pierced with 20 round mesh holes and the bottom tray used for fine collection.
- Containers (box and bags) for storing and weighing separated fractions. 10-litre buckets are appropriate for mixed residual waste, but bigger containers such as 140 or 240 litres wheelie bins are necessary for mixed dry recyclables to materials such as cardboard, PET bottle etc..
- Magnet (for distinguishing between ferrous and non-ferrous metals)
- The 240-litre wheelie bin can be used for bulk density analysis. Dues to the high density of organic waste, a 140-litre wheelie bin will be required for bulk density analysis of organic waste from separate collection.

Recommended personnel:

The typical man-hours requirement to sort between 100 to 200 kg of waste is as follows:

- Mixed Residual Waste: 6 people for 6 hours
- Mixed Dry Recyclables: 4 people for 6 hours
- Organic Separate Collection: 4 people for 3 hours

Step 6: Sample Collection

It is required to have a separate vehicle RCV to collect households from the selected sampling route on the day of regular collection.

The vehicle should be inspected to make sure that no waste from a previous collection was left inside. The vehicle should be weighted prior to collecting the sample and the weight recorded.

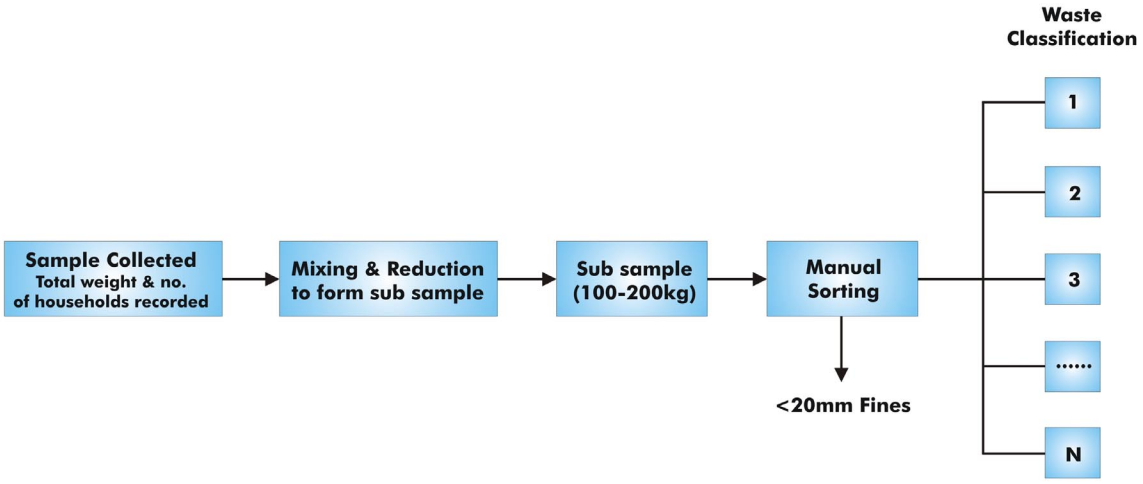
A member of the waste characterisation team equipped with a map of the area should accompany the collection crew and instruct where to collect the sample. This person will have planned in advance the locations and the number of households to collect in each location. The number and the type of houses collected must be recorded.

Having collected the sample, the RCV must be weighted prior to tipping the load and the weight recorded. If the collection vehicle is a split vehicle and a dual collection of samples has been carried out, it will be necessary to weigh twice: once full and once when one of the compartments has been emptied.

Step 7: Sample Waste Characterisation

Once the waste collected from the sampling route has been tipped, the steps described in Figure 2.8 take place.

Figure 2.8: Sorting Procedure for Household Waste Samples



The team comprises a supervisor and the sorting staff.

Prior to carrying out the waste characterisation it is important that the sorting staff have been trained to recognise the different waste categories (Examples of materials present in each category are provided in Appendix E). The supervisor will also ensure the quality control of the sorted material, by checking the material placed in each bucket.

Reducing the sample

The sample was initially mixed to ensure a more homogenous composition. This can be done using a JCB or Bobcat. When bags were present, they should be opened (using knives and rakes) to enable through mixing. The sample obtained should then be reduced to a more manageable size to facilitate the actual classification. This was achieved by utilising the Coning and Quartering technique described in the EPA, Municipal Waste Characterisation Manual, 1996. This process was repeated, with further mixing between sample reduction rounds, until a representative sub sample of between 100 – 200 kg remains.

Waste Sorting

The sorting and analysis of samples was carried out in accordance with the existing 1996 EPA Methodology except that the Sorting Classification was updated.

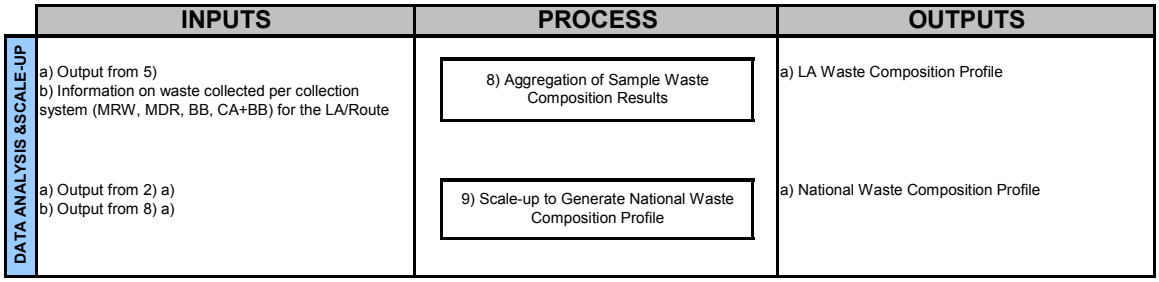
The sub-sample was sorted on the sorting table according to secondary waste categories (subdivision of primary waste categories such as PET plastic packaging, Garden waste). Examples are contained in Appendix E.

The weights of each category were recorded on a waste record sheet (paper copy).

2.2.1.3 Data Analysis and Scale-up

Figure 2.9 provides an overview of the steps taken during the data analysis and scale-up phase.

Figure 2.9: Step-by-Step Approach to the Data Analysis and Scale-up



Step 8: Aggregations of Samples Waste Composition Results

Combination of waste composition results for waste collected door-to-door:

Waste composition results for Mixed Residual Waste, Mixed Dry Recyclables and Organic Separate Collection samples should be combined to obtain a waste composition for the total waste collected door-to-door. The average waste collected per household for each waste stream will be used to calculate the weighted mean waste composition.

It is necessary to look at one year of waste tonnage collected in the local authority in order to calculate the weekly average quantity presented in each bin type. This step was not necessary when all bins were collected weekly. With the introduction of variable charging system, the pattern of waste presentation has changed. The only way to estimate an average presentation / households is to examine the total waste over a longer period.

Example 3: Galway City –Combining date from 3-bins

There are 22,390 households (out of a total of 24,186) availing of Door-To-Door waste collection services in Galway City in 2003. The data on 2003 quantity is obtained from the 2004 NWD Questionnaire return completed by the local authorities, and from the waste composition surveys carried out in 2004 and 2005.

Type of Collection	Mixed Residual Waste	Mixed Dry Recyclables	Organic separate Collection	Total Door-to – door Collections
Quantity collected in 2004 (tonnes)	10,047	3,814	4,945	18,806
Number of households serviced	22,390	22,390	22,390	22,390
Average quantity collected per household per week (kg)	8.63	3.28	4.25	16.15
Paper content	13%	52%	14%	
Quantity of paper collected per household week (kg)	1.11	1.72	0.59	

The average quantity of paper collected per kerbside per household in Galway City in 2004 is (13%*8.6)+(52%*3.3)+(4.2*14%)=3.42 kg per week.

The weighted mean waste composition for the paper category is 3.42/(8.63+3.28+4.25)=21%

The same exercise is repeated in a spreadsheet for all categories.

Combination of waste composition results for waste collected door-to-door and delivered to Recycling Centres and Bring banks:

The weighted mean waste composition of the primary waste categories can also be combined with waste quantities collected by drop-off collection systems.

Example 4: Galway City combination of waste collected door-to-door and delivered to Recycling Centres and Bring banks

For example we consider glass collected by Bring Banks in Galway City. The quantity collected is 1,492 tonnes. We assumed that all households in Galway City (24,186) could avail of the service.

Type of Collection	Kerbside weighted mean waste composition	Glass delivered to Bring banks and Recycling Centres	Combined waste Composition for glass
Quantity collected in 2004 (tonnes)	18,806	1,492	20,298
Quantity collected per household per week (kg)	16.15	1.18	17.33
Glass content	2.5%	100%	9%
Quantity of glass collected	0.40	1.18	1.58

The average quantity of glass collected per household in Galway City in 2004 is (2%*16.15)+(1.18*100%)=1.58 kg per week.

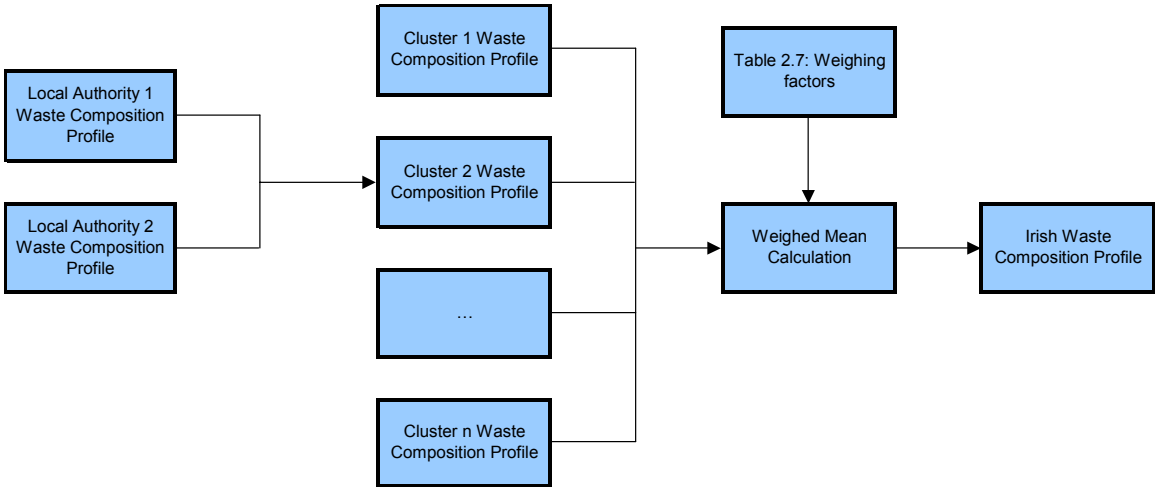
The weighted mean waste composition for the glass category is 1.6 /(1.18+16.15)=9%

If household wastes are collected by other (e.g. through Recycling Centres, Bulky Waste Collection), the same exercise has to be repeated for all primary categories collected by those means.

Step 9: Scale-up to Generate National Waste Composition Profile

The result from each local authority is combined to calculate the national profile as per Figure 2.10.

Figure 2.10: Generation of the National Household Waste Composition Profile



Calculation of Cluster Waste Composition

A cluster is made of local authorities or part of local authorities with the same profile of waste collection (1,2 or 3-bin collection system) and the same level of urbanisation (city/town/rural).

When more than one survey was carried out for the same cluster, an unweighted mean waste composition and generation was calculated for the cluster from each survey results (e.g. surveys from the 2-bin collection system in Cork and Dublin were combined to get the average result for the cluster). Use of the weighted average using number of households in the survey area was tested but discarded as it did not bring significant difference and increased the complexity of the calculation.

Calculation of National Waste Composition Profile

The National Waste Composition Profile is the weighted mean of each cluster waste composition profile (from the waste composition report or combination of waste composition reports from the same cluster) using the proportion of households in each cluster as the weighing factor (as shown in Table 2.7).

2.2.2 Non-Household Surveys

In line with its previous work[8], the CTC used a similar methodology for the characterisation of Non Household Municipal Waste (NHMW) during this current project. This methodology was devised and tested during MS-7 and was found to be an effective and acceptable method for the characterisation of national commercial waste data. It was expanded to incorporate industrial non-process municipal waste and was further refined during the course of the project.

[8] 2000-MS-7 or (MS-7)

2.2.2.1 Introduction

Prior to MS-7 the standard methodology for commercial waste characterisation was outlined in the EPA document '*Municipal Waste Characterisation*'[9]. A number of concerns with this method were identified in the previous study and, bearing these factors in mind, the Clean Technology Centre proposed a new methodology that attempted to overcome these weaknesses.

The methodology used during MS-7 has been further refined during the course of the current project and is described in more detail in Section 2.2.2.3 and Appendix F.

2.2.2.2 Municipal Waste Sectors

Background

The Waste Management Act 1996 defines municipal waste as '*household waste as well as commercial and other waste which, because of its nature or composition, is similar to household waste'*.

In Ireland, there is has been a dearth of information on non-household municipal waste (NHMW). The composition of NHMW is more varied than household waste as it includes waste from supermarkets, offices, hotels, restaurants, shops, hospitals, schools, cinemas, etc., as well as industrial non-process municipal waste, each of which has a unique waste composition.

Industrial non-process municipal waste consists of waste generated at industrial facilities that does not arise from industrial activities or processes, for example canteen waste, office waste and packaging waste from material deliveries. The distinction between 'non-process industrial waste' and 'industrial waste' is not always clear and there is often overlap between these datasets.

The current study has continued with this commercial waste characterisation as initiated by MS-7, while also tackling the issue of non-process industrial waste for the first time.

Municipal Commercial and Industrial Waste

Municipal waste can be regarded as coming from three sources. These can be identified by NACE codes. The three sources are:

- Household waste (NACE codes P and Q).
- Non Process Industrial Waste (mainly EWC chapters 15 and 20 from NACE codes A-E)
- 'Commercial ' waste (NACE codes G-O)

These three categories should be characterised individually and combined to give the total national characteristic for municipal waste. The main methods employed to date for the characterisations are:

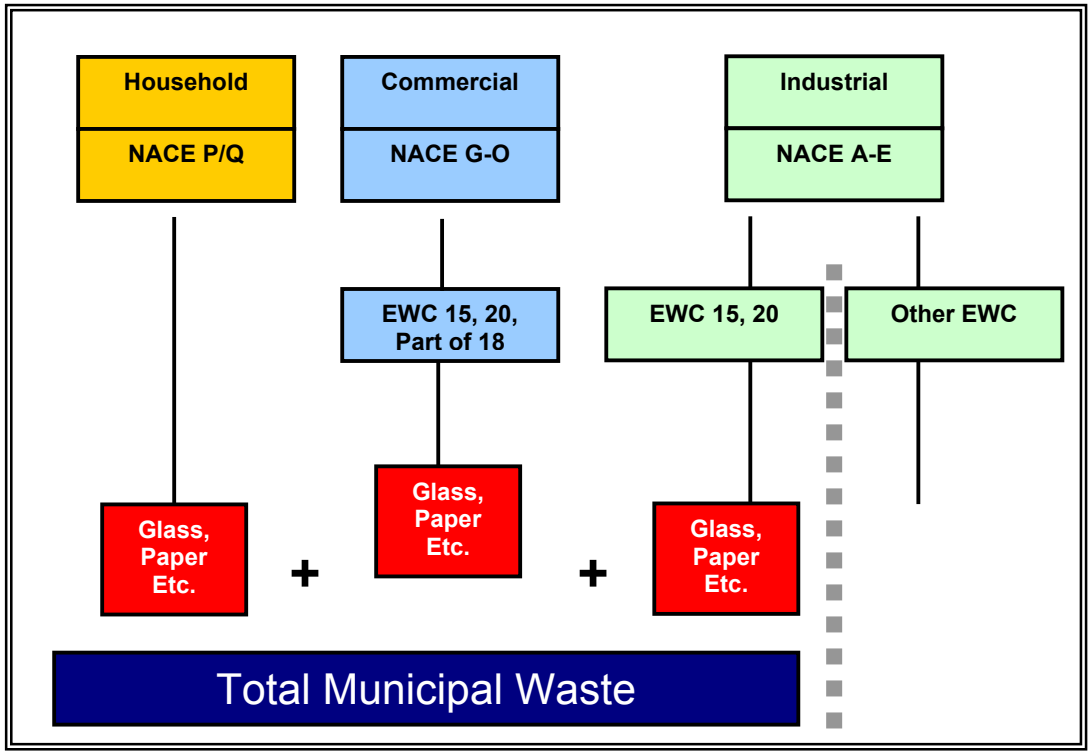
- Household waste: characterisation studies

[9] EPA, 1996,'Muncipal Waste Characterisation'

- Industrial non-process municipal waste: EPA questionnaire returns from IPC and non-IPC companies
- Commercial waste: characterisation studies

Figure 2.11 illustrates the sub-divisions of the waste stream fractions within each of the main municipal waste sources. This current programme is devoted to the characterisation of the all of these sectors independently. NACE code F (Construction and demolition waste) is not considered for characterisation in this study.

Figure 2.11: Definition of Municipal Waste



2.2.2.3 Proposed NHMW Methodology

Commercial and Industrial Waste Characterisation

The method developed for commercial characterisations during MS-7 was retained and refined for the current study. This study again characterised commercial waste on a sectoral basis. Some work in this study endeavoured to verify results from MS-7, particularly in the most significant waste generating sectors (e.g. hotels, supermarkets) where more than one survey is deemed necessary, i.e. broaden the information base to generate more accurate sectoral profiles. Other sectors were surveyed for the first time and these, combined with the other results, will generate a more thorough and accurate picture of national commercial waste arisings.

The methodology, as developed in MS-7, is summarised here:

(a) Sub-contract a number of the large waste contractors to measure their collected waste based on NACE sectors and sub-sectors.

(b) Based on the information obtained in step (a) select sectors for study. These should represent a large proportion of the waste (at least 80%-90%). Applying the Pareto principle (80:20) will result in a diminishing return on resource investment after this point.

(c) Carry out a waste characterisation survey at the enterprise level following the methodology outlined in this MS-7 report (Appendix F). Ensure that enough samples are taken to give a reasonable degree of confidence in the results.

(d) From the information gleaned in (c) produce a "Fingerprint" of the enterprise. Where more than one enterprise is surveyed, produce a "Fingerprint" of the sector – unless results are at variance, in which case it may be better to work in sub-sectors.

(e) From the "Fingerprint" of each sector scale up to a national level. This can be performed in two ways, as outlined in (f) And (g) below.

(f) Using National Waste Database figures and the percentage contributions obtained from step (a) above, determine the quantity of waste arising from each sector. Combine this with the various "Fingerprints" obtained in step (e) above. The accuracy of this technique depends on the accuracy of both the 'Total' waste figure and the reliability of the sectoral contributions. The two sets of information must, at least, be consistent in their scope.

(g) Using statistical and demographic data deduce a scale-up parameter. The accuracy of this parameter will depend on the quality of statistical information available, and on the establishment of a good correlation between the scale-up parameter and waste produced. An example of a reliable scale-up parameter is found in the hotel sector, where waste arisings correlate very well with number of bed nights sold, and where the number of bedroom nights is known with a good degree of accuracy.

(h) Good correspondence between results obtained from the methods described under (f) and (g) above, would lead to a high degree of confidence in the overall result.

It is strongly recommended that the method described under (f) above be the primary method. Waste contractors generally keep precise records of how much waste they collect from their customers. From these records, it is possible to obtain a good estimate of the total waste produced by a sector.

2.2.2.4 Non Process Industrial Municipal Waste

In the 2001 EPA survey of industrial waste generators (represented by NACE codes C, D and E), data was obtained from 307 IPC licensed companies and 159 non-IPC licensed companies. 'Industrial non-process municipal waste' was reported under EWC Chapter 20 and Chapter 15. Using data collected by the EPA it is estimated that 275,012 tonnes of waste was generated under EWC Chapter 20 and 220,540 tonnes was generated under EWC Chapter 15. This is a total of 495,552 tonnes of industrial non-process municipal waste generated in 2001.

If 1,156,732 tonnes of NHMW was generated in 2001[10] it can be deduced that 43% of NHMW arises from the industrial sector. To date there have not been any detailed waste characterisation studies carried out on this sector. While a certain amount of information on the specific character of this waste can be determined from some EWC codes, large quantities are classified under ambiguous headings. For example EWC code 15 may provide information on the quantity of plastic packaging but it does not detail the exact type of packaging involved. More importantly, EWC code 20 03 01 which represents 50% of industrial non-process municipal waste describes general municipal waste with no further characterisation data.

[10] EPA National Waste Database 2001, Table 4.7.

During this study non-process industrial municipal waste from a number of different industrial sectors was thoroughly analysed. These results are used to explore possible scale up methodologies for generating a national profile for this element of municipal waste.

Some of the benefits accrued from industrial waste surveys are:

- Results from the current surveys can be compared to the actual figures used in 2001 (and more recently, 2004 figures which are currently being compiled). This will facilitate the EPA in confirming their results or point to anomalies that may have occurred.
- Some changes in the EPA questionnaire and AERs have been suggested to provide a better characterisation of NHMW than is currently available.

2.2.2.5 Survey sectors/locations

Extending from the previous commercial characterisation study CTC identified the most significant waste producing sectors in Ireland as:

- Hotels
- Supermarkets
- Transport/ Communication
- Financial Services
- Colleges
- Restaurants
- Hospitals
- Public Offices
- Wholesale Distribution
- Other Retailers

Based on the relative contributions of these sectors, the following sites were chosen for investigation;

1. **Transport/ Communication. - Locations surveyed; RTE , Dublin; Eircom, Galway**
   This significant sector is diverse and consists of a number of sub-sectors. In MS-7 one element of the transportation sector was characterised. During the current surveys the RTE facility – a broadcasting facility - in Donnybrook and Eircom offices in Galway – a telecommunications facility - were surveyed.

2. **Financial Services. –Location; AIB, South Mall , Cork**
   Financial services are a significant commercial waste sector in all cities. The AIB bank on the South Mall, Cork was surveyed. This large bank contained an on-site canteen and is typical of large financial services in Ireland.

3. **Supermarkets. –Location; Dunnes stores, Bishopstown , Cork**
   The supermarket sector was identified as a major one during MS-7. There are supermarkets in towns all over the country and the supermarket surveyed here represents the larger chain type supermarkets.

4. **Retail. –Location; Dunnes stores, Bishopstown , Cork**

The retail sector is very diverse and needs a good deal of investigations. In the current study a busy department retail store was examined. This provides a profile of these ever growing types of retail units in the country.

5. **Restaurants. –Location; Jacobs on the Mall, Cork**
   Restaurants are a significant commercial waste sector. However restaurants can be subdivided into a number of different sub-sectors with associated variations in waste composition. While fast food restaurants and canteens were addressed in MS-7 data on other types was deemed necessary. Jacobs is an upmarket restaurant.

6. **Wholesale. –Location; Musgraves, Cork**
   Wholesale is a very diverse sector and during this study a food wholesaler was examined. This Musgraves site provides for the Centras and Supervalus throughout South west Munster.

7. **Hotels. –Location; Carrigaline Court, Carrigaline, Cork**
   Hotels are another significant contributor to commercial waste in Ireland. This sector was investigated during MS-7 and this further survey should provide a comprehensive overview of that sector.

In addition waste characterisation surveys on non-process industrial municipal waste at four industrial locations, which have reported their waste arisings to the EPA, were performed. The sites chosen were;

1. **Pfizer Tablet Plant , Loughbeg, Ringaskiddy, Co. Cork**
   Pharmaceutical Sector

2. **EMC^2, Ovens, Co. Cork**
   Electronics Sector

3. **Ship Company LTD, Ovens, Co. Cork**
   Electronics Sector - SME

4. **Heineken, Cork City**
   Food & Beverage Sector

3 HOUSEHOLD WASTE SURVEYS

3.1 PROGRAMME

In total, 37 household waste samples were analysed. This consisted of ten surveys at separate locations. The sampling was carried out in two campaigns in October/November 2004 and March/April 2005. Four locations were sampled during only one campaign.

A summary of the relevant details are given in Table 3.1 below.

Table 3.1: Summary of Non-Household Surveys

Collection system	Proposed Area	Mixed residual waste (traditional collection)	Mixed dry recyclables (separate collection)**	Organics (separate collection)
3-bin-system in a City	Galway City	2 samples	2 samples	2 samples
3-bin-system in a Town	County Waterford	2 samples	2 samples	2 samples
3-bin-system in a Rural area	County Waterford	2 samples	2 samples	2 samples
2-bin system in a City	County Fingal Castleknock	1 sample	1 sample	None
	County Fingal Swords	1 sample	1 sample	None
	Cork City	1 sample	1 sample	None
2-bin system in a Town	County Limerick	2 samples	2 samples	None
2-bin system in a Rural area	County Longford	2 samples	2 samples	None
	County Limerick	2 samples	2 samples	None
1-bin in a City	County Fingal	1 sample	None	None
Total		16	15	6

3.2 RESULTS

3.2.1 City 3-bin Collection System: Galway City

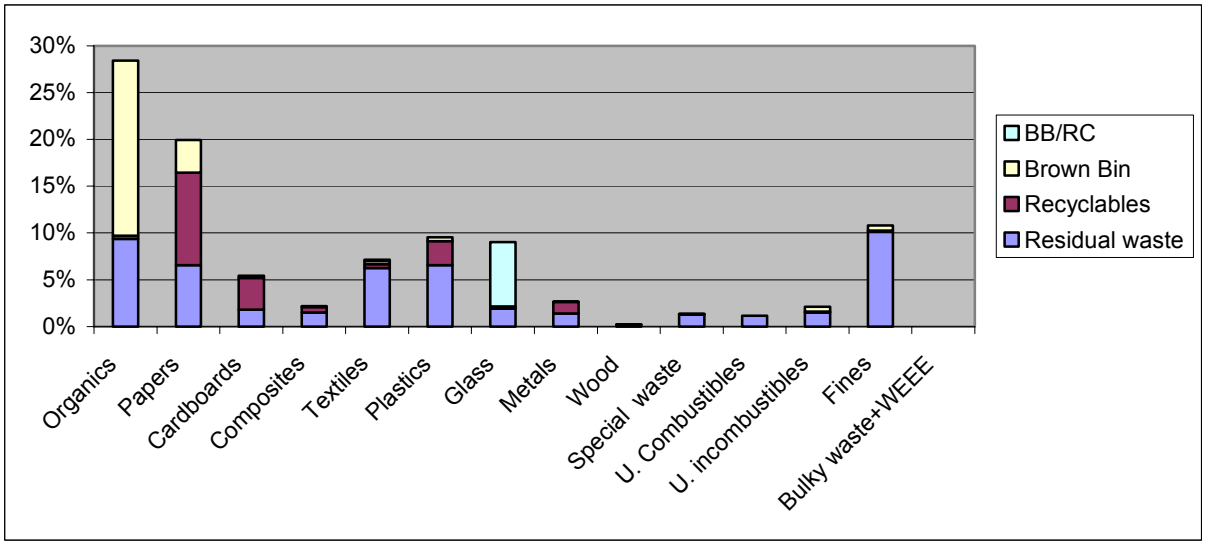
Background Information:

Galway City generated 18,825 tonnes of household waste in 2004, which represents 286 kg/person/year or 17.4 kg/household/week. Approximately 50% of household waste is separately collected, with 9% of this collected by Bring Banks (BB) and recycling Centres (RC), the main material being glass (1,301 tonnes in 2003). The mixed dry recyclables collection started in 2002, and the brown bin collection started in 2001.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3.1. The overall packaging content was 28%.

Figure 3.1: City 3-bin (Galway City): Composition of Household Waste Collected



Comments:

The quantity of waste generated per household per week (17.4kg) seems very low when compared with other local authorities. No explanation for this was identified in the project.

There is a high quantity of ash reflected in the high proportion of fines. This indicates that a large proportion of the houses collected include the ash from open fires.

Seasonal variation was evident in the composition of the brown bin; with a higher proportion of garden waste present in the survey conducted in November in comparison with the survey in March. This may be explained by the presence of leaves or other garden waste in the sample.

3.2.2 City 2-bin Collection System: Fingal County Council

Background information:

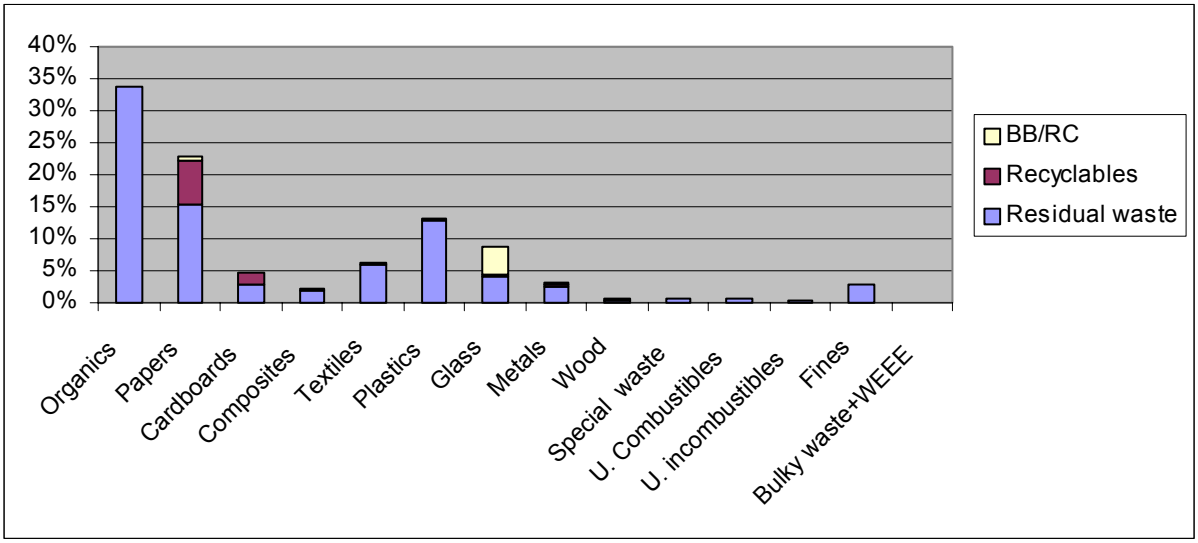
There was 85,203 tonnes of household waste in generated in the Fingal County Council area in 2003, which represents 433 kg/person/year or 26.9 kg/household/week. Approximately 16% of household waste is separately collected, of which 6% is collected by Bring Banks, the main material being glass. A Pay-by-Lift charging system operates for residual waste collection since 2003.

The mixed dry recyclable collection began in 2001.

Waste Composition:

Detailed results can be found in Appendix C and a summary of the primary categories is presented in Figure 3.2. The overall packaging content was 30%.

Figure 3.2: City 2-bin (Fingal): Composition of Household Waste Collected



Comments:

In the mixed residual waste stream, the quantity of kitchen waste was lower in the second campaign. The quantities of textiles rose by 4%, and the main component in this increase was the presence of nappies. Fines (< 20mm) were also up by 5% in the second campaign.

In the mixed dry recyclables waste stream, there were significant changes with regard to the quantities of paper and cardboard between the October 2004 and March 2005 surveys. Paper levels decreased from 81% to 54%. This was largely due to a decrease in the quantities of newspapers and brochures being disposed of. Cardboard increased by 22%.

3.2.3 City 2-bin Collection System: Dublin Region Summer Surveys

These surveys were carried out on behalf of the four local authorities in the Dublin Region. Eight mixed residual waste samples were analysed in August 2004 (2 for each of the 3 social classes A, B and C, and 2 for apartments that was used in the 1-bin city cluster calculation) and 3 mixed dry recyclables samples for each social class were analysed in September 2004. Householders availing of residual waste collection paid a flat fee at the time of the surveys.

Background information:

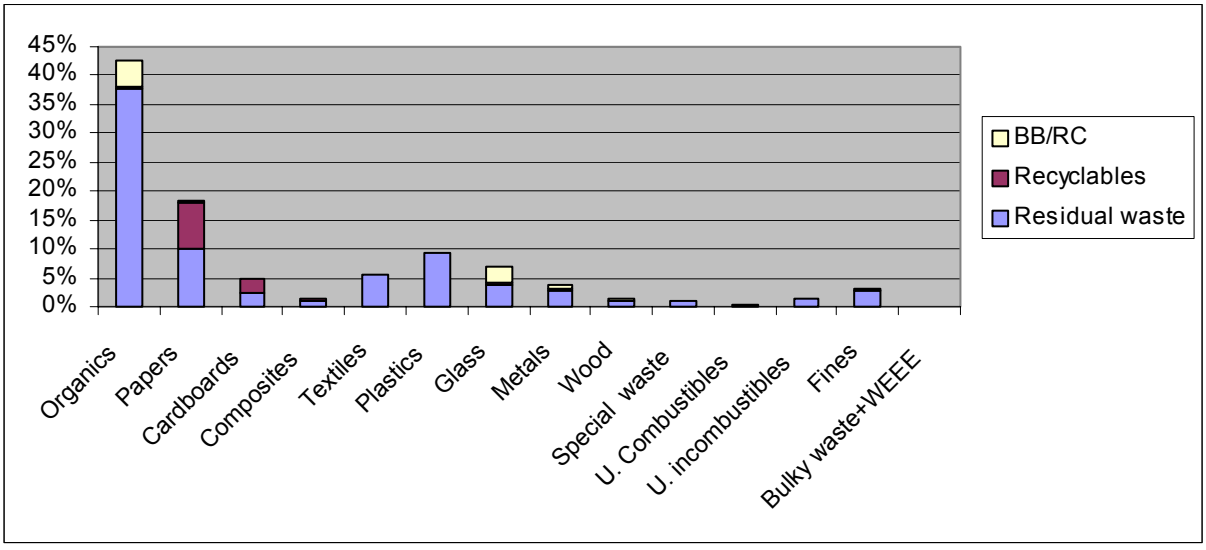
The Dublin Region generated 459,282 tonnes of household waste in 2003, which represents 409 kg/person/year or 23.3 kg/household/week. Approximately 16% of household waste is separately collected, of which 7% of household waste is collected from Bring Banks and Recycling Centres (BB/RC) the main material being glass and garden waste (12,752 tonnes and 20,539 tonnes respectively in 2003).

The mixed dry recyclable collection began in 2001.

Waste Composition:

Detailed results can be found in Appendix E and a summary of the primary categories is presented in Figures 3.3. The overall packaging content was 26%.

Figure 3.3: City 2-bin (Dublin City): Composition of Household Waste Collected



Comments:

There is a high percentage of garden waste in the overall waste stream (>22%); which is consistent with a survey conducted in the summer months. Within the sample area in Dublin, Social Class A areas produced more garden waste than the other social classes which reflects the fact that the more affluent areas tend to have larger gardens.

3.2.4 City 2-bin Collection System: Cork City Council

Background Information:

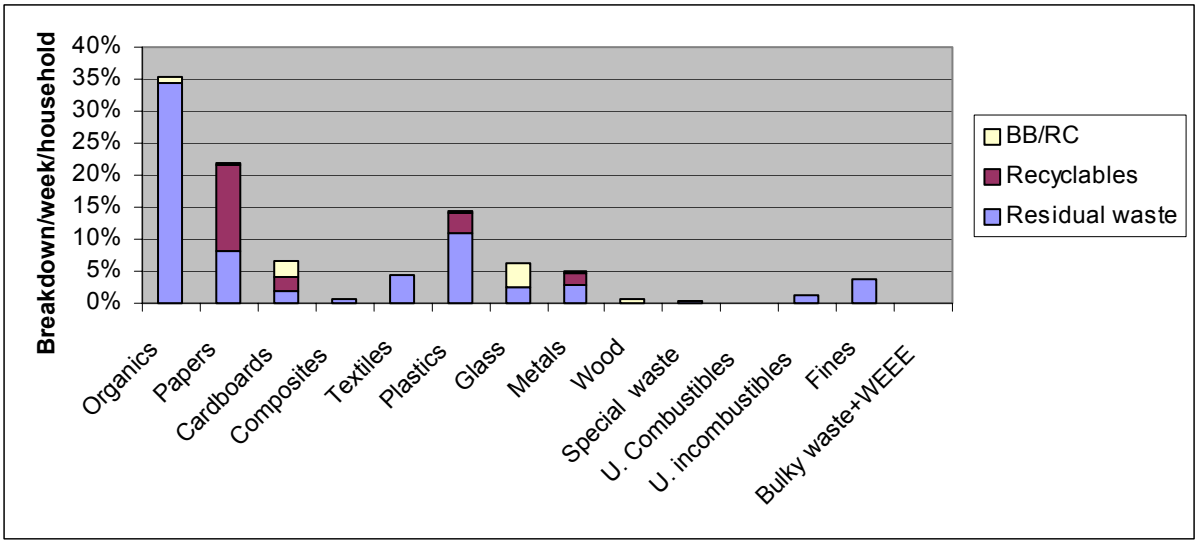
Cork City generated 50,955 tonnes of household waste in 2003, which represents 414 kg/person/year or 22.9 kg/household/week. Approximately 19% of household waste is separately collected. 8% is collected by Bring Banks and Recycling Centres (BB/RC) the main material being glass and cardboard (1,760 tonnes and 1,253 tonnes respectively in 2004).

Pay by Volume/Use was introduced in January 2005 replacing a flat annual fee. The mixed dry recyclables collection started in August 2004 on selected collection routes and has been extended to the whole local authority area.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figures 3.4. The overall packaging content was 31%.

Figure 3.4: City 2-bin (Cork City): Composition of Household Waste Collected



Comments:

The survey was performed at the end of April 2005, which explains the presence of garden waste (11% of sample weight). Only one survey was performed in Cork City so a comparison of results cannot be performed and seasonal variation cannot be examined.

A Pay By Use/Volume Charging System was introduced in January 2005 and the quantities of recyclables presented both in kerbside collection and in bring banks have increased relative to corresponding months in the previous year. This reflects the fact that householders are prepared to alter their behaviour once there is a financial incentive to do so.

3.2.5 City 1-bin Collection System: Dublin City (apartments)

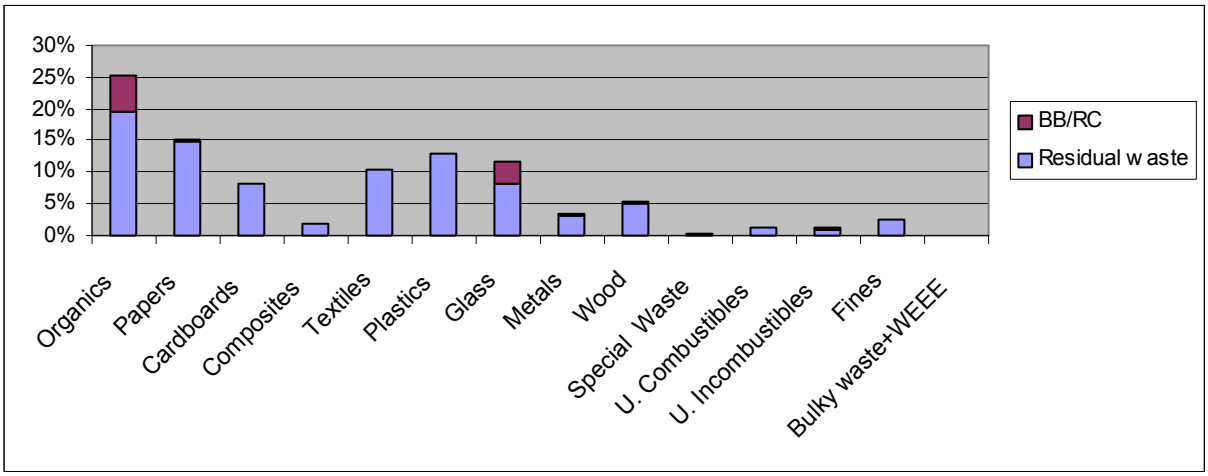
Background Information:

On average 20% of the households in the Dublin region are apartments or flats. Apartments are not typically provided with separate collection services, although the Dublin local authorities have commenced a rollout of a recycling bin to their customers in 2004. Large waste containers are provided for collective use by a number of apartments. Each household has to pay a flat fee to be provided with a waste collection service.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3. 5. The overall packaging content was 35%.

Figure 3.5: 1-bin City (Dublin Apartments): Composition of Household Waste Collected



Comments:

Apartments generate less waste overall that other types of housing.

The proportion of organic waste generated by occupants of apartments is much lower than for other type of housing. There is very little garden waste produced, despite the survey being conducted in the summer.

There was also a high proportion (35%) of packaging waste present.

The results were consistent between the 3 samples.

3.2.6 Town 2-bin Collection System: Adare, Co. Limerick

Background Information:

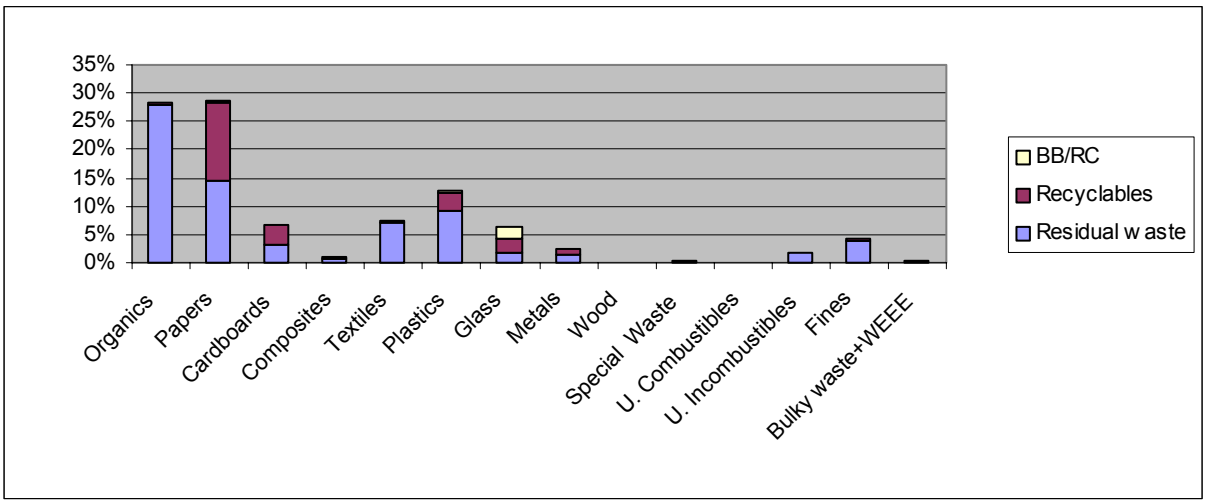
Adare in County Limerick has a population of 1,102. Within Limerick County, 50,668 tonnes of household waste was generated in 2003, which represents 418 kg/person/year, or 25.4 kg/household/week. Approximately 29% of household waste is separately collected, with 3% of this being collected by Bring Banks and Recycling Centres (BB/RC), of which the main constituent is glass (948 tonnes in 2003). A Pay by Weight charging system operates for residual waste and customers must also pay for recycling bags.

The mixed dry recyclables collection started in 2003 in all areas outside of the suburbs of Limerick City. Residual waste and recyclables bags are collected on the same day.

Waste Collection Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3.6. The overall packaging content was 26%.

Figure 3.6: 2-bin Town (Adare): Composition of Household Waste Collected



Comments:

When the two surveys are compared, it can be seen that seasonal variations have greatly affected the composition of the waste collected in urban areas. The amount of garden waste was much greater in the survey carried out on the 19th April 2005, at 17%, up from 1% in the November survey.

The proportion of paper and cardboard decreased in the mixed residual waste in the second campaign. They may have been diverted to the recyclables collection following the introduction of the pay-by-weight scheme in January 2005. The proportion of mixed residual waste did not change significantly.

3.2.7 Town 3-bin Collection System: Dungarvan, Co. Waterford

Background Information:

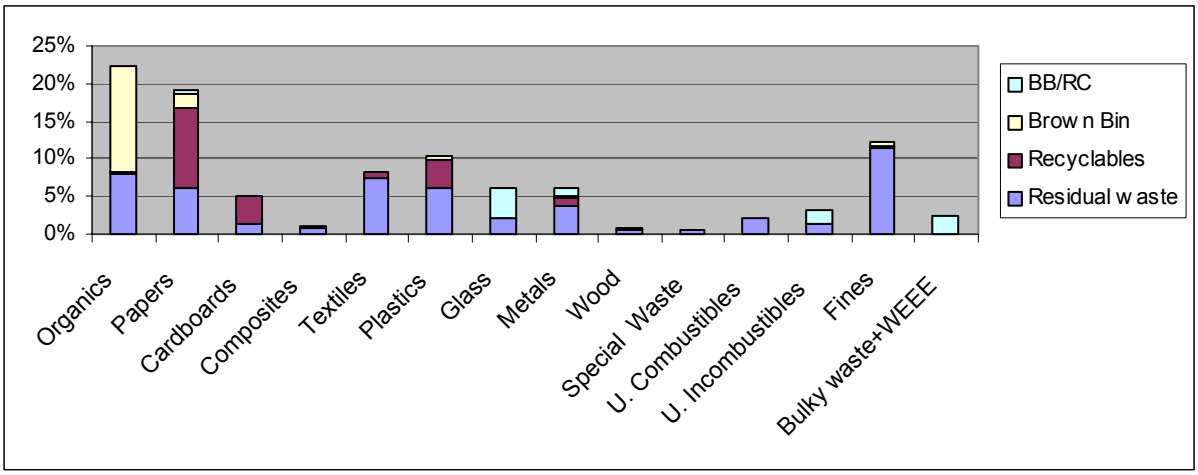
Dungarvan in County Waterford has a population of 7,220. There was 43,165 tonnes of household waste generated in Waterford in 2003, which represents 425 kg/person/year or 24.5 kg/household/week. Approximately 19% of household waste is separately collected, of which 12% is collected by Bring Banks and Recycling Centres (BB/RC), of which the main constituent is soil and stones (1,810 tonnes in 2003).

The mixed dry recyclables collection started in 2001, and the brown bin collection started towards the end of 2004. It must be noted that fees increased between the two survey campaigns.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3.7. The overall packaging content was 24%.

Figure 3.7: 3-bin Town (Dungarvan): Composition of Household Waste Collected



Comments:

In the mixed residual waste stream, the most significant difference was amongst the fines, which increased from 16% in October 2004 to 28% in March 2005. This was probably a consequence of the very cold weather in the days previous to the survey (resulting in more solid fuel ash).

In the mixed dry recyclable stream, paper levels had increased by 12% in the second campaign, Plastic decreased by 6% and textiles decreased by 8%.

The brown bin yielded some variation with respect to the main categories of waste. Kitchen waste increased by 12% whilst the garden waste quantity in the second campaign showed a 26% reduction.

3.2.8 Rural 2-bin Collection System: County Longford

Background Information:

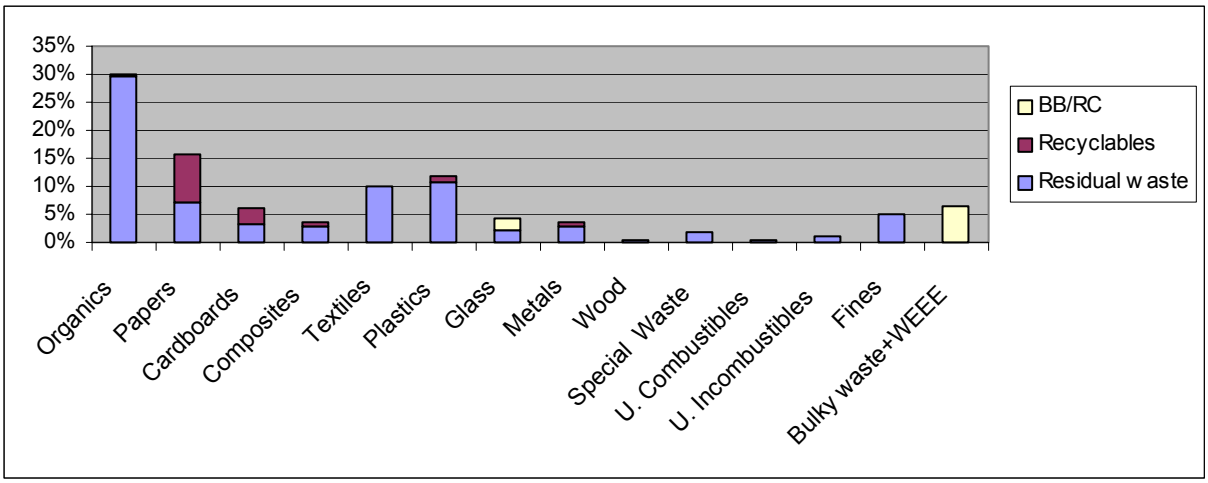
County Longford generated 14,259 tonnes of household waste in 2003, which represents 459 kg/person/year or 26.43 kg/household/week. Approximately 23% of household waste is separately collected. 9% of this is collected by bring banks/civic amenities.

A Pay by Weight Charging System was introduced in January 2005. Each household has to pay a basic fee to be provided with a waste collection service, and is also charged by weight for residual waste presented.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3.8. The overall packaging content was 25%.

Figure 3.8: 2-bin Rural (County Longford): Composition of Household Waste Collected



Comments:

The proportion of fines was relatively high. There was a high quantity of ash within this waste fraction. This would indicate that a large proportion of the houses in the sample area have open fires; this is expected given the predominantly rural nature of the sample area. The proportion of textiles was also relatively high; this was due to the large number of disposable nappies in the sample.

The proportion of paper and cardboard decreased in the mixed residual waste in the second campaign. They may have been diverted to the recyclables collection following the introduction of the pay-by-weight scheme.

3.2.9 Rural 2-bin Collection System: County Limerick

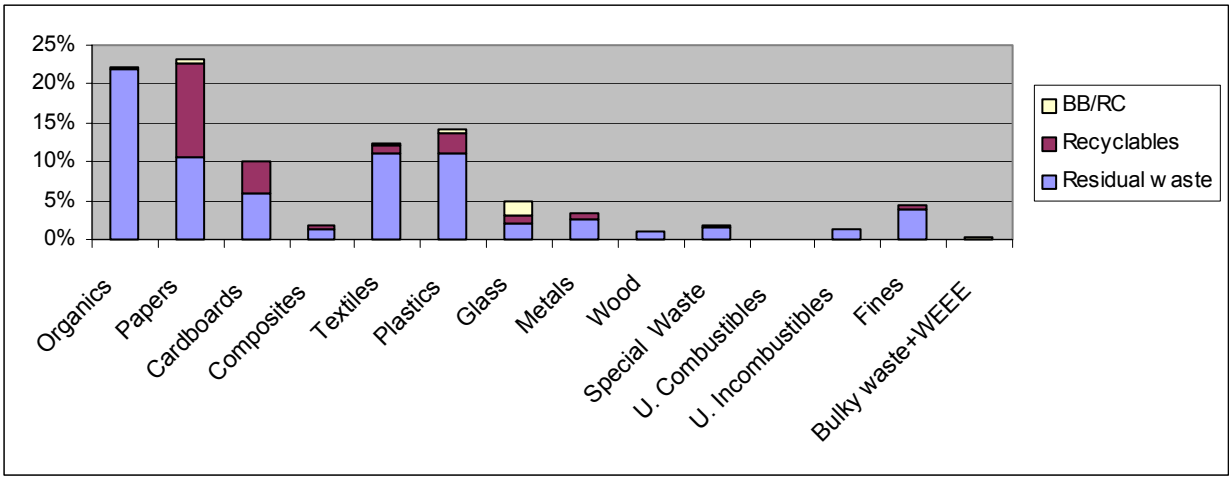
Background Information:

Within Limerick County, as previously mentioned, 50,668 tonnes of household waste was generated in 2003, which represents 418 kg/person/year, and approximately 29% of household waste is separately collected. Again, for rural areas in Limerick, each household has to pay a flat fee to be provided with a waste collection service; a Pay by Weight charging system operates for residual waste and customers must also pay for recycling bags. The mixed recyclables collection was started in rural areas in 2003 in rural areas.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is- presented in Figures 3.9. The overall packaging content was 32%.

Figure 3.9: 2-bin Rural (Limerick County) Composition of Household Waste Collected



Comments:

It was found that the amount of papers in the mixed residual waste had increased to 19% in the April 2005 survey, from 9% in the November 2004 survey. All the other categories remained relatively static. There was no garden waste in the April 2005 survey, compared to the urban areas, which had 19% garden waste for the same period. This shows that in rural areas people are more likely to dispose of this on their own land, having their own compost heap or area where they would place garden clippings and grass cuttings.

3.2.10 Rural 3-bin Collection System: County Waterford

Background Information:

The rural area studied here was between Dungarvan and Stradbally in County Waterford.

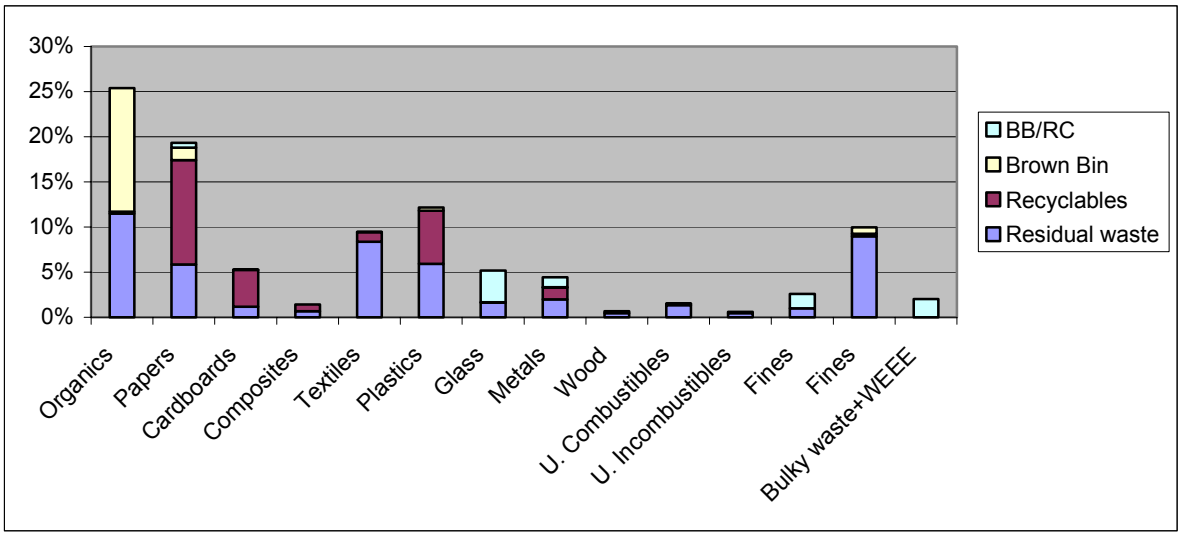
Each household has to Pay-by-Lift to be provided with a waste collection service. The price of the tag for residual waste increased from €10 to €13 between the two campaigns.

The mixed dry recyclables collection started in 2001, and the brown bin collection started towards the end of 2004. These are also charged on a Pay-by-Lift basis, although the tags are less expensive than the residual bin.

Waste Composition:

Detailed results can be found in Appendix G and a summary of the primary categories is presented in Figure 3.10. The overall packaging content was 24%.

Figure 3.10: Stradbally (Rural) Composition of Household Waste Collected



Comments:

In the mixed residual waste stream, the most significant differences between the first and second campaigns were amongst organic waste, plastics and fines. Kitchen waste decreased by 6% between the first and second campaigns, and garden waste decreased by 4%. Plastics also decreased by 6%. Fines increased by 16%.

In the mixed dry recyclable stream, cardboard levels decreased by 4% in the second campaign, Plastics were down by 9% and textiles were down by 7%.

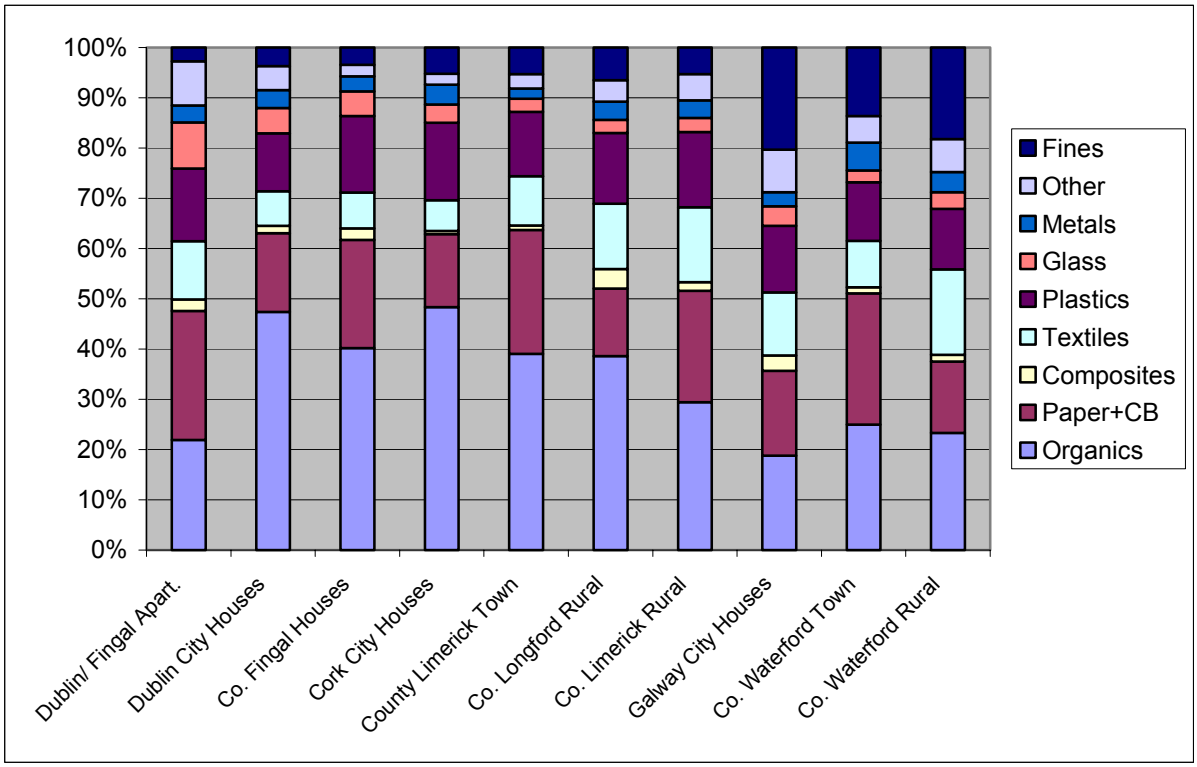
The brown bin data was relatively constant between the first and second campaigns.

3.3 COMPARISON OF RESULTS

3.3.1 Comparison of Mixed Residual Waste Collections

Including eight surveys carried out in the Dublin Region during the summer 2004 by RPS on behalf of the Dublin local authorities, a total of 24 samples were characterised accounting for seven different residual waste collections schemes during the course of the project. There were notable differences in the collection system frequency and charging mechanism. The mean result from each of the survey locations is presented in Figure 3.11 below.

Figure 3.11: Overview of Materials Collected via the Residual Waste Collections

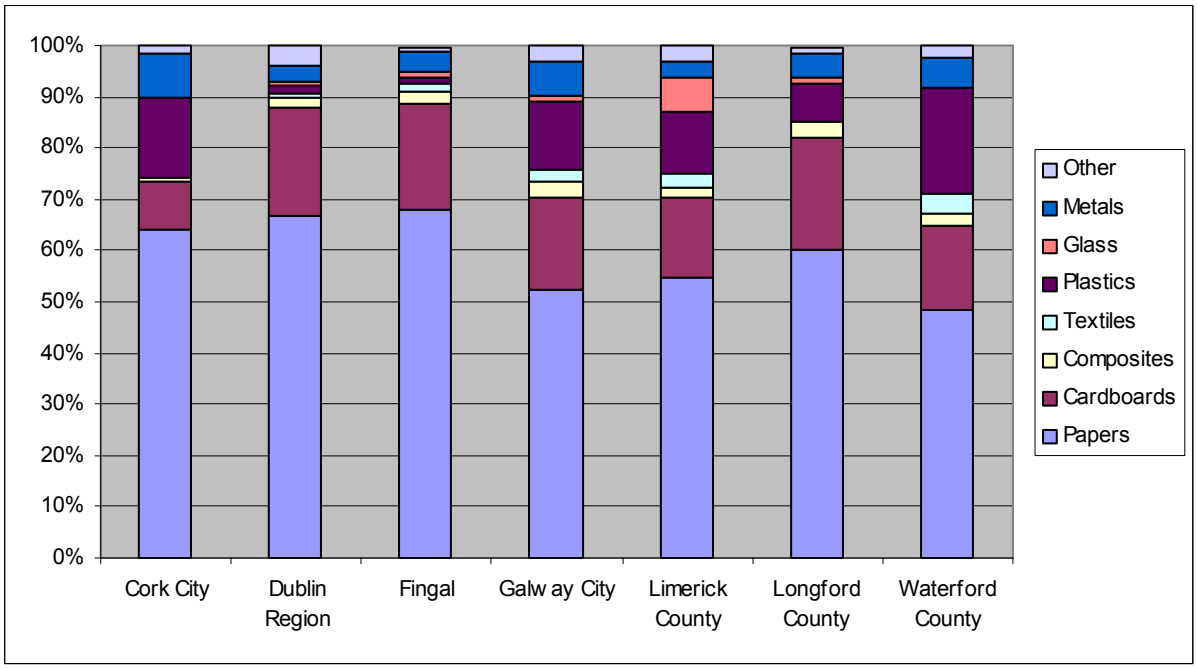


The surveys marked 'Dublin / Fingal Apartments' were only provided with residual waste collection. All other areas surveyed were provided with mixed dry recyclables collection. In addition County Waterford and Galway City households were also provided with organic separate collection The influence of the separate collections on the composition of the residual waste can be seen in the graph.

3.3.2 Comparison of Mixed Dry Recyclables Collections

Including eight surveys carried out in the Dublin Region during the summer 2004,a total 18 samples were characterised accounting for seven dry recyclables collections schemes during the course of the project. There were notable differences in the collection system frequency, charging mechanism, and the materials accepted. The mean result from each of the seven surveys is presented in Figure 3.12 below.

Figure 3.12: Overview of Materials Collected via the Dry Recyclables Collections



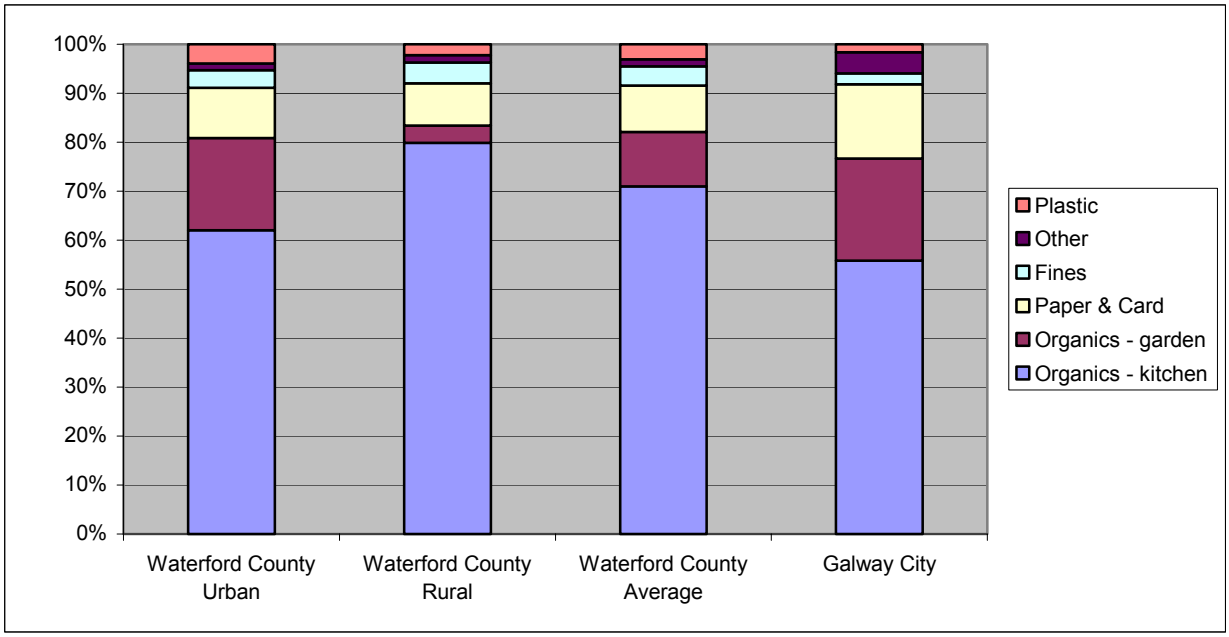
The composition for Dublin and Fingal includes a greater proportion of papers/ magazines and no plastic or textiles since they are not accepted in the Mixed Dry Recyclable collection at present. The only route, which presented glass in any major quantity, was in County Limerick where glass is accepted. In Waterford textiles are collected, and plastics form a substantial part of the composition. The category 'composites' reflects mainly beverage cartons (e.g. Tetra Pak).

3.3.3 Comparison of Organic Separate Collections

Three organic separate collections were surveyed during the course of the project. The results from each are presented in Figure 3.13 below. The organic waste collected in both rural and urban Waterford was decomposed/ aged and this meant sorting it into categories was more difficult. It is most likely due to the Pay-By-Lift charging system, which applies to the brown bin as well as other bins.

Significant quantities of paper (mainly newspaper) are present in all cases, but this is allowed or encouraged in the instructions to householders. At face value, Waterford appears to have slightly less non-conforming material. The Waterford system is relatively new and perhaps the quantities and types of materials collected will evolve over time. In rural Waterford very little green waste was presented.

Figure 3.13: Overview of Materials Collected via the Organics Collections



3.4 DATA ANALYSIS

This section discusses the statistical analysis of the results. The survey was designed to provide results to generate a national profile, rather than to investigate in details how particular factors affect waste composition and arisings. Nevertheless some trends and patterns are identifiable.

The mean waste composition of each cluster was compared to identify significant differences between:

- Each group of the stratum city, town and rural
- Each group of the collection system stratum (1-bin, 2-bin, 3-bin)

Each sample (MRW, MDR and BB) was also analysed to find out if there were significant differences between:

- Each group of the stratum city, town and rural
- Each group of the collection system stratum (1-bin, 2-bin, 3-bin)
- Season (summer, spring and autumn)

Outliers were also tested for differences between seasons, locations (city, town, rural) and collection systems (1-bin, 2-bin and 3-bin) using Minitab's 'Display descriptive statistics' and 'Normality test (Anderson-Darling method)' routines. Once a potential outlier had been identified, the records and calculations from the waste characterisation were checked to ensure that it was a correct value. If the data point was correct, it was included in the statistical analysis, otherwise it was discarded.

3.4.1 Type of Housing

Results from apartments (1-bin city cluster) were compared with results from houses. The composition for houses was obtained by calculating the average of all the clusters excluding the one bin City.

The results show that the average waste arisings for apartments and houses are:

- Apartments: 17.5 kg/household /week
- Houses: 23.9 kg kg/household /week

Table 3.2 compares the arisings and composition of waste from apartments and houses.

Table 3.2: Comparison of Arisings and Composition between Apartments and Houses

	Flats		Houses	
Primary Waste category	% by weight	kg/household/week	% by weight	kg/household/week
Organics	20.81%	3.64	29.59%	7.09
Papers	16.16%	2.82	21.79%	5.22
Cardboards	8.61%	1.50	6.51%	1.56
Composites	2.14%	0.37	1.73%	0.41
Textiles	11.10%	1.94	8.23%	1.97
Plastics	13.83%	2.42	12.41%	2.97
Glass	12.41%	2.17	5.95%	1.42
Metals	3.81%	0.67	3.53%	0.85
Wood	5.77%	1.01	0.61%	0.15
Special Municipal Waste	0.43%	0.08	1.05%	0.25
Unc. Combustibles	1.10%	0.19	0.54%	0.13
Unc.incombustibles	1.23%	0.21	1.52%	0.36
Fines	2.60%	0.45	5.13%	1.23
Bulky Waste+WEEE	0.00%	0.00	1.43%	0.34
Total	**100.00%**	**17.47**	**100.00%**	**23.94**

The main reason for the difference in arisings is likely to be the number of people in the household. The number of people per apartment is generally lower than the number of people per house.

Although it was expected that arisings in garden waste from houses would be higher than apartments, there was no significant statistical differences. The reason for this may be that the results were obtained in months when garden waste generation was minimal (October, March).

The only categories to show a statistically significant difference were glass and non packaging wood.

The higher level of glass in apartments suggests a lesser use of Bring Banks by people living in apartments. This may be due to the difficulty in accessing Bring Banks (further distance to walk, householder may not have a car) and the higher level of rental dwellers in apartments (presenting challenges for waste awareness campaigns).

The main reason for the difference in non-packaging wood in flats and apartments is likely to be the use of 1,100-lt wheelie bins for residual waste collection, which allow householders to dispose more easily of bulky items.

3.4.2 Influence of Collection Systems

1-bin collection systems were discussed in the previous section. In order to show more clearly differences between 2-bin and 3-bin collections systems results were tested again, excluding the 1-bin collection system.

3.4.2.1 At Cluster Level

Very few differences were found between 2-bin and 3-bin collections systems.

Contrary to patterns found in the first round of surveys, there was no difference in waste collected from 2-bin and 3-bin collections systems when all results were combined. This may be not the case if surveys of the two collection systems are carried out in summer, as 3-bin collection systems are likely to capture more garden waste[11].

The statistically significant differences found were that:

- 3-bin collection systems produce more fines and unclassified waste than 2-bin and 1-bin collection systems. This is likely to be the effect of the source separation of organic waste in the 2-bin collection systems, whose moisture generally cause the amalgamation with ash and fines, making them stick to other surfaces.
- 2-bin collection systems produce more Glass than 3-bin collection systems. No explanation was found for this significant difference. These may be related to the locations selected (Galway City, County Waterford) as opposed to the number of bins.

3.4.2.2 At individual Sample Level

Further differences were found between individual samples taken at each location for residual waste and recyclables collection due to the peculiarity of each collection system (charging mechanism, frequency of collection, container type) and the use of the 3rd bin to collect organic waste.

Residual waste in the 2-bin collection systems has a higher organic and biodegradable kitchen waste content than residual waste 3-bin collection systems. This is expected due to the diversion of organic material collected by the organic separate collection.

It was found that the residual waste bin of 3-bin collection systems collect a higher proportion of the following materials: textile and nappies, brown glass and non packaging glass, other metal waste, special municipal waste particularly fluorescent bulbs, other unclassified combustibles and fines. This is also expected as the diversion of organic waste towards the 3rd bin increases the proportion of the other waste categories in the residual waste.

The recyclable bin of 2-bin collection systems has a higher proportion of paper, particularly newspapers waste than the recyclable bin of 3-bin collection systems. This can be explained by the use of newspapers to wrap food waste prior to throwing in the organic bin, which would divert newspapers from the recyclable waste collection.

The recyclable bin of 3-bin collection systems collects more plastic waste (except for PET, PVC and PS) than 2-bin. This is a direct consequence of the newspapers diversion from the recyclable bin, increasing the proportion of other categories. It may also be caused by the absence of plastic in the Dublin (2-bin City cluster) recyclables collection.

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[11] The Open University (2003) Developing Integrated Waste Management Strategies: Information needs and the Role of Locally Based Data; and

Parfitt, J. (2002) Analysis of Household Waste Composition and Factors Driving Waste Increases; WRAP

3.4.3 Level of Urbanisation

3.4.3.1 At Cluster Levels

Although no significant statistical difference was found, the quantity of waste collected in rural area is higher than in towns and cities. This is likely to be due to the difference in household size between urban (2.86 persons/household) and rural area (3.09 persons / household) (Census 2002, CSO).

The following statistical significant differences were found:

- Rural areas produce more textiles and more nappies than other areas. The increased household size is likely to explain this.
- Rural areas also produce more electronic equipment than other areas. The distance to Recycling Centres may explain this.
- Cities produce more paper Packaging than Towns. This may be explained by differing consumerism habits (higher availability of shops in cities and increased visit frequency to shops nearby).

3.4.3.2 At Individual Sample Level

The different materials accepted by the recyclable collection caused most of the significant differences (e.g. the Oxigen green bin collected in Dublin does not accept plastic waste, while it is accepted in rural areas and town collection surveyed).

3.4.4 Seasonal Variations

Waste composition has been shown to vary with the seasons of the year. Table 3.3 shows the evolution of waste composition between different samples taken in the Dublin region over a 9-month period.

Table 3.3: Change in waste composition between seasons in the Dublin region

Waste category	Spring	Summer	Autumn
Kitchen Waste	26%	20%	38%
Garden Waste	4%	22%	3%
Papers & Cardboards	27%	25%	30%
Glass	5%	4%	4%
Plastics	14%	10%	13%
Metals	4%	4%	2%
Textiles	10%	6%	4%
Other	9%	9%	5%
Total	100%	100%	100%

The garden waste category shows an important seasonal variation. The summertime dip in kitchen waste, paper and cardboard percentage is likely to be due to the increase in garden waste. It is also possibly due to school holiday periods, and people spending more time outdoors and less time preparing meals.

Month by month variations in waste arisings can also be detected. Figure 3.14 shows the monthly quantities of household waste received at landfill sites, green waste centres and mixed recyclables collected in 2003 in some local authorities of the Dublin Region.

Figure 3.14: Dublin Region Quantities Delivered at Waste Treatment Sites in 2003

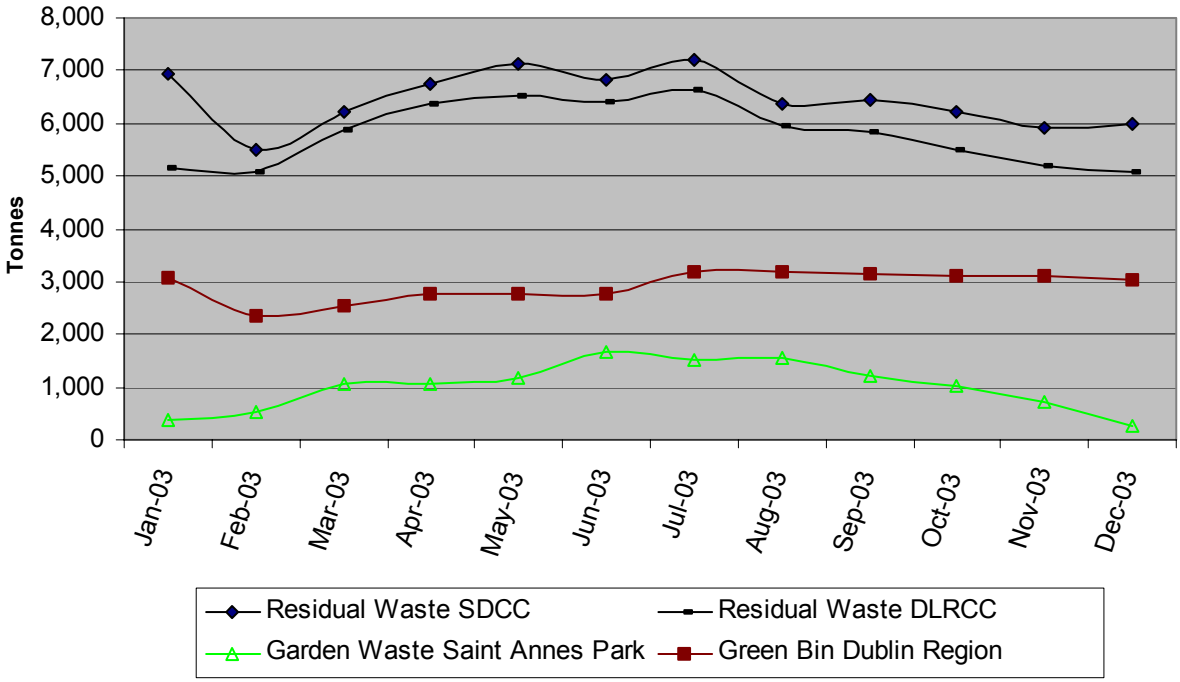
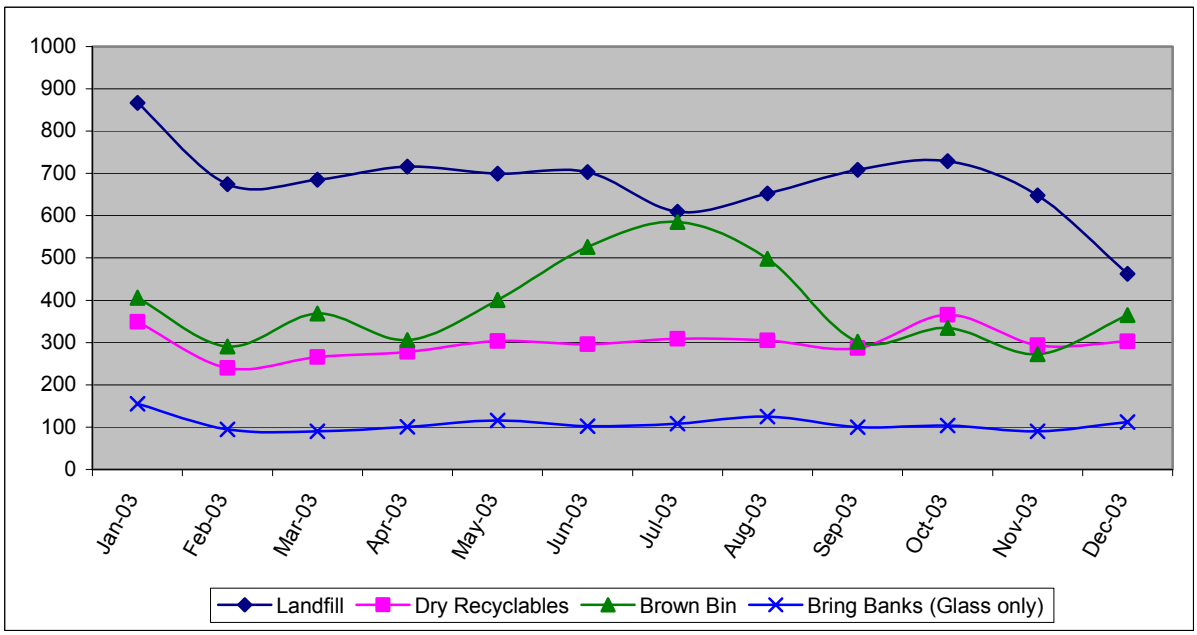


Figure 3.15 shows the evolution of mixed residual waste, mixed dry recyclables, brown bin and glass collected in Galway City in 2003.

Figure 3.15: Galway City Quantities Delivered at Waste Treatment Sites in 2003



In both Galway and Dublin, the mixed dry recyclables and Bring bank tonnages are relatively steady over 12 months. The influence of garden waste is strongest in the period of April to July.

In Galway the brown bin is capturing the peak in garden waste production.

3.4.5 Effects of User Charges

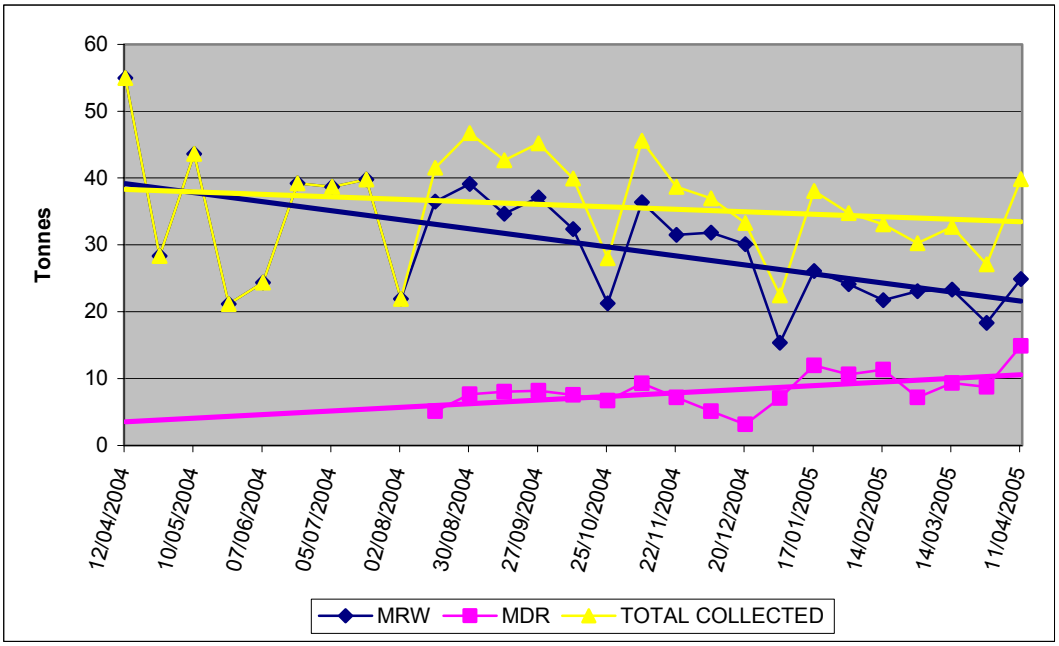
The sampling plan was not designed to investigate the effect of waste user charges on waste composition and arisings. However due to the introduction of variable rates in some locations between the two survey campaigns it was possible to look at the effects of change in user charges on waste composition and arisings.

In two surveys area (Cork City and County Longford) implementing use-related charges had an impact in reducing the tonnage of waste presented for collection. A study of waste user charges in the US found that variable rate programs decrease household waste disposal by about 17% in weight, with 8-11% being diverted to recycling and green waste programmes[12].

The increased diversion of materials to recycling programmes will have an effect on the remaining residual waste composition. This may explain the increase in the proportion paper and cardboard material in the recyclable waste stream in County Longford and its subsequent decrease in the residual waste stream.

Figure 3.16 illustrates the effect of the introduction of the pay-by-weight scheme in Cork City in reducing the total waste collected and the increase in waste diverted to the mixed dry recyclables collection. Pay-by-Weight was introduced in January 2005.

Figure 3.16: Fortnightly Quantities Collected in Cork City in 2004-2005



[12] Variable-Rate or "Pay-As-You-Throw" Waste Management, Reason Foundation, 2002

The trendlines indicate:

1. Reduction in residual waste collected
2. Increase in dry recyclables collection
3. Overall decrease in waste presented

3.4.6 Conclusions

The main significant differences in waste composition and arisings were found between the cluster 1-bin city (apartments) producing less waste (and less organic waste) than the other clusters. In this project it seems that the type of housing (apartments versus houses) is of prime importance.

The influence of the collection system on waste composition and arisings seemed minimal, this may be due to the timing of the surveys, which were mainly carried out when garden waste generation was low and did not encompass the times of extreme generation.

It is likely that seasonal variation is also an important factor of variation, but the timing of our surveys reduced its impact on the results.

Other factors were not investigated in detail but are also of importance: waste user charges and type of container (240 lt. and 1,100 wheelie bin).

3.4.7 Consideration for Future Household Survey Programmes

3.4.7.1 Number of samples required in future programmes

The number of samples required to achieve the desired level of accuracy is a function of the waste category under consideration and the desired confidence level (95% which allows to calculate Z in the Student distribution). They depend on two main criteria:

- The heterogeneity of the waste, expressed by the standard deviation (σ).
- The desired accuracy of the results (Error)

The number of samples (n) required is given by the following formula:

$$n = \frac{Z^2 \sigma^2}{Error}$$

Example 5: Number of samples required to estimate the average organic waste composition of the residual waste stream

Waste composition analysis on several mixed residual waste samples provided the following information:

- Average weekly production per households is 25 kg
- Average organic waste quantity produced is 8.4 kg or 34% of the total residual waste stream.
- The Standard Deviation for organic waste samples is 3.17 kg.
- The desired accuracy is 10% or (8.4* 0.1)= 0.84 kg.
- Using the 'Student Distribution' statistical table for a proposed confidence level of 95%, Z is equal to 1.962.

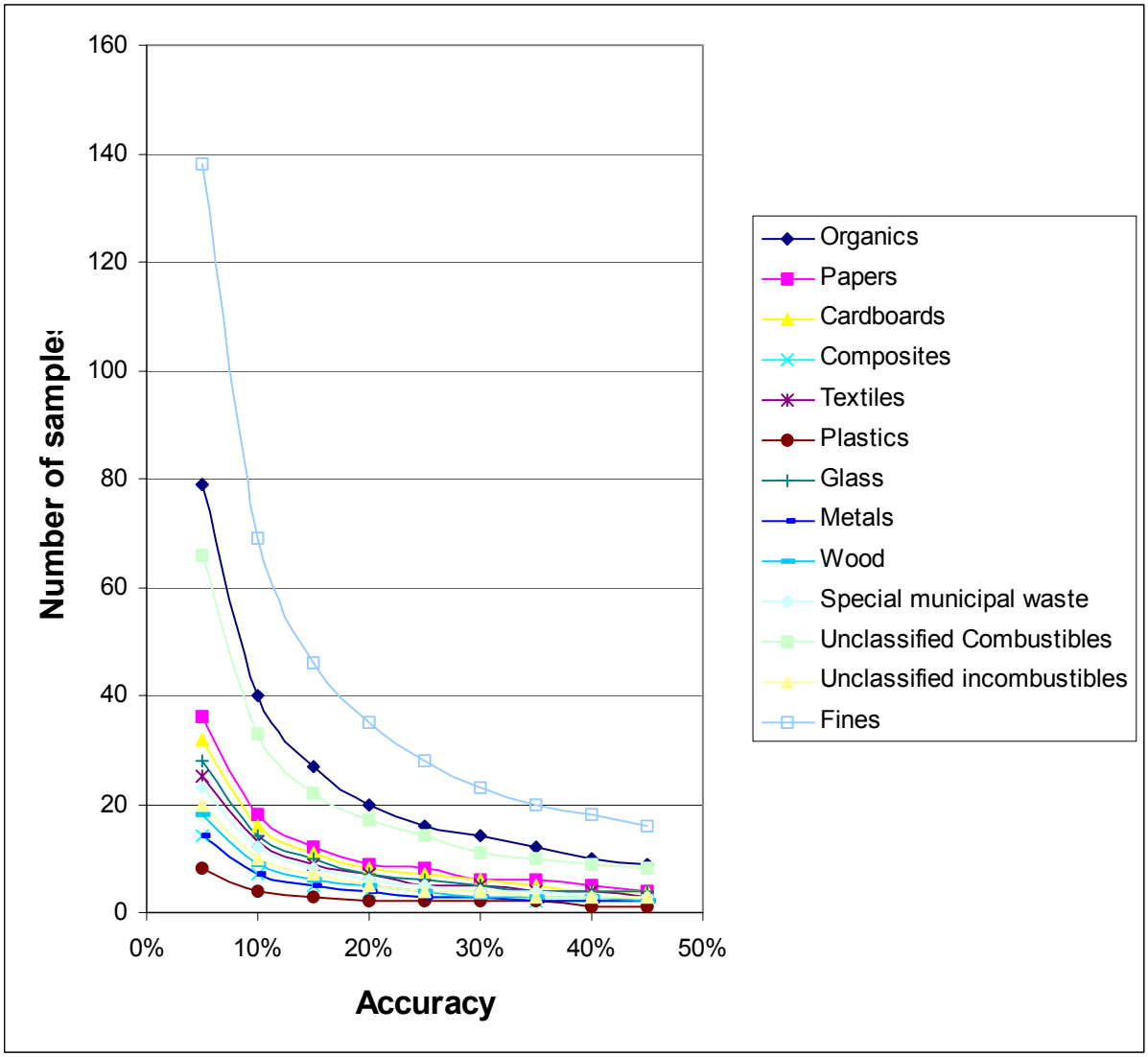
Therefore the number of samples required to estimate the average organic waste composition at 10% accuracy and 95% confidence levels is:

$$n = (1.962)^2 * (3.17)^2 / (0.84)^2 = 58$$

Using waste composition data it was possible to estimate the number of sample required to obtain a certain level of accuracy of results and these numbers are presented in Figure 3.17 for the mixed residual waste and Figure 3.18 for the mixed dry recyclables.

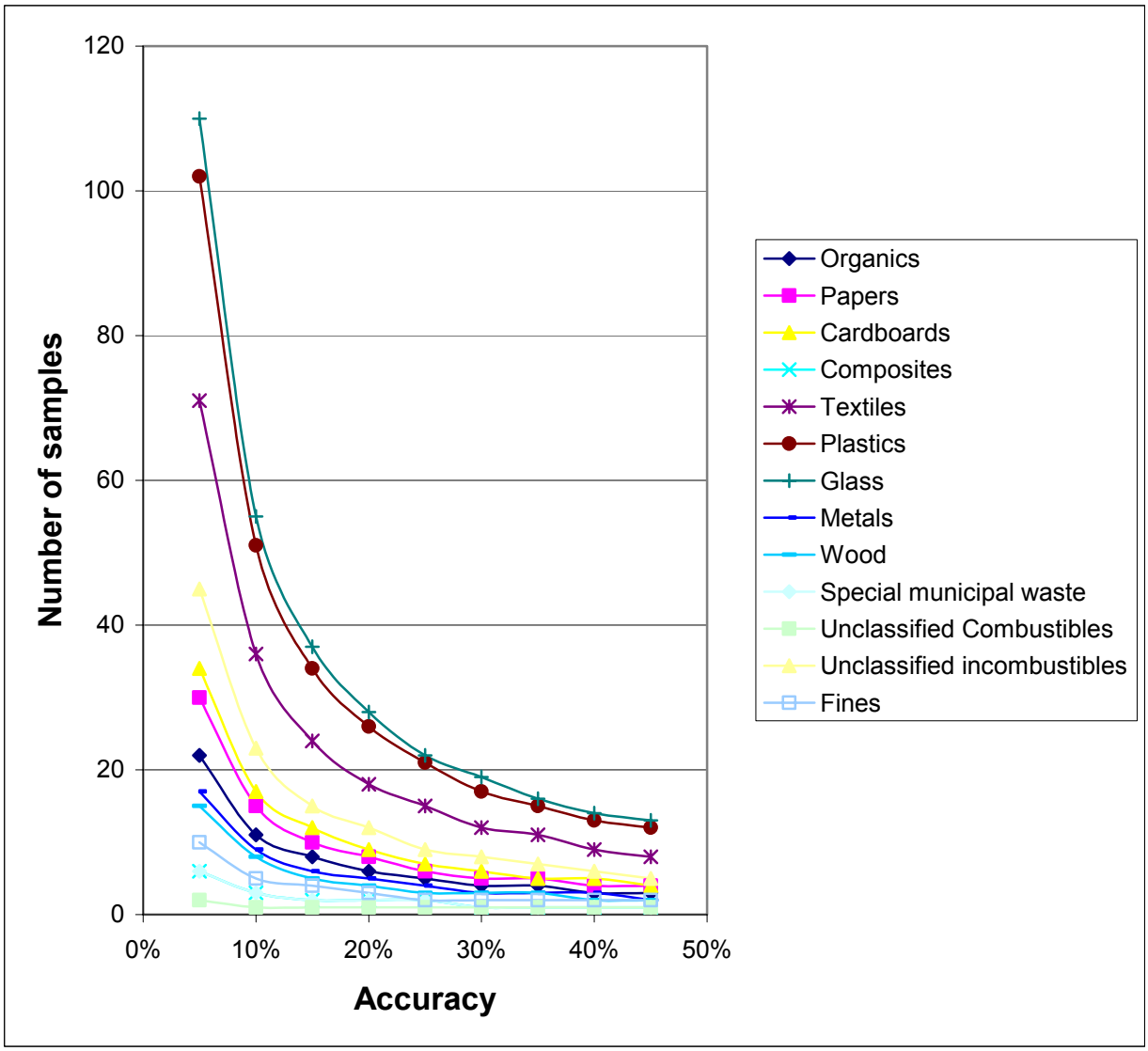
The minimum number of samples required is set by the waste category with the highest requirement:

Figure 3.17: Number of Mixed Residual Waste Samples Required for a Given Accuracy at 95% Confidence Levels



In the mixed residual waste stream, the fines and organics are the categories requiring the highest number of sample to reach the desired accuracy (10%), respectively 70 and 40 samples. Data from the Dublin Summer surveys were not included in the calculation as they increased the number of samples required for fines and organics.

Figure 3.18: Number of Mixed Dry Recyclables Samples Required for a Given Accuracy at 95% Confidence Levels



In the mixed dry recyclables stream, the glass and plastics are the categories requiring the highest number of sample to reach the desired accuracy (10%) with 55 samples. This is due to Mr Binman collection of glass with the optibag and the difference between the Dublin oxygen collection not accepting plastics and the other schemes surveyed.

It was note possible to generate the same figure for the organic separate collection, as the number of samples analysed was limited.

Conclusions:

A target of **70** mixed residual waste samples is required to reach statistical validity.

A target of **55** mixed dry recyclables samples is required to reach statistical validity.

4 NON-HOUSEHOLD WASTE SURVEYS

4.1 PROGRAMME

In total, twelve non-household surveys were conducted. This consisted of eight commercial surveys and four industrial surveys. Each survey lasted 5 days and a summary of the relevant details are given in Table 4.1 below.

Table 4.1: Summary of Non-Household Surveys

Date of Survey	*Survey Type*	*Business Sector*	*Business Name*	*Business Address*	*No. of Employees*	*On-Site Canteen*
COMMERCIAL SURVEYS						
Oct '04	Commercial	Financial	AIB	66 South Mall, Cork	204	√
Nov '04	Commercial	Communications	RTE	Donnybrook, Dublin 4	1,200	√
Mar '05	Commercial	Communication	Eircom	Mervue, Galway	170	√
Nov '04	Commercial	Hotel	Carrigaline Court Hotel	Carrigaline, Co. Cork	170	√
Dec '04	Commercial	Restaurant	Jacobs on the Mall	South Mall, Cork	40	X
Mar '04	Commercial	Wholesale	Musgraves	Tramore Road. Cork	650	√
Apr '05	Commercial	Supermarket	Dunnes Stores	Bishopstown Court, Cork	310	√
Apr '05	Commercial	Retail	Dunnes Stores	Bishopstown Court, Cork	90	√
INDUSTRIAL SURVEYS						
Oct '04	Industrial	Pharmaceutical	Pfizer	Loughbeg, Ringaskiddy, Co. Cork	242	√
Nov '04	Industrial	Electronics	EMC	Ovens, Co. Cork	1,500	√
Feb '04	Industrial	Food & Beverage	Heineken	Blackpool, Cork	204	√
Feb '04	Industrial	Electronics	Ship Company	Macroom, Co. Cork	21	X

The non-household surveys included commercial and industrial locations, as set out in the Methodology.

4.2 RESULTS

4.2.1 Financial Sector

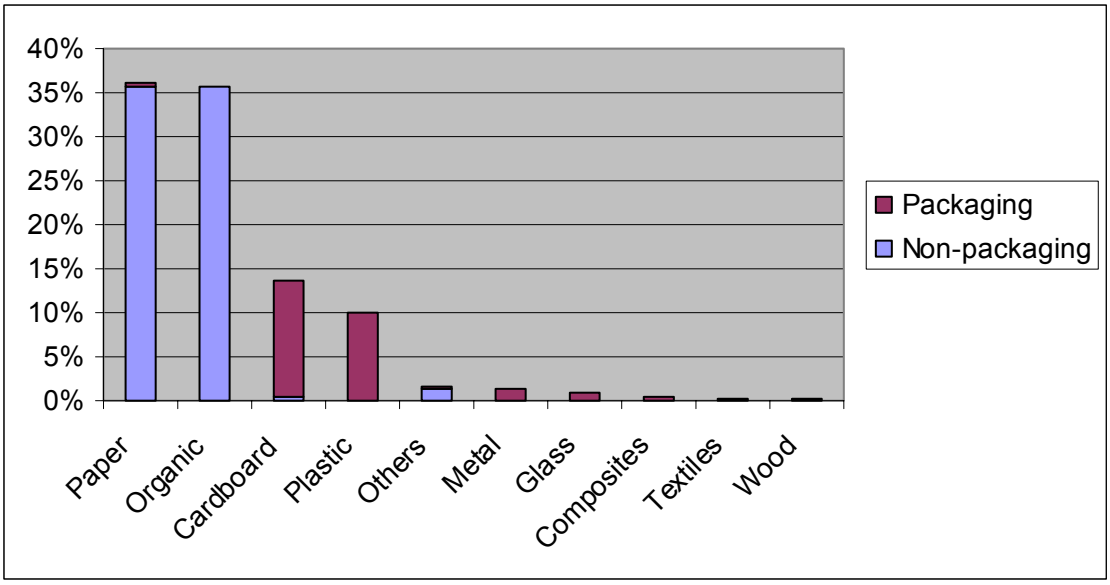
Background Information

The Allied Irish Bank (AIB) on the South Mall in Cork City is the largest bank in Cork. It employs 204 people and provides a variety of services in addition to its day-to-day banking (including stock broking, merchant banking, asset management, corporate banking, etc.). Waste arises in five main areas on site: tellers, offices, confidential bins, general and canteen.

Survey Results

The character of waste arising from the bank is summarised in Figure 4.1. Wastes are characterised according to the EWC codes specified in the methodology. However for presentation purposes wastes are classified according to the 10 main categories shown below. In addition, the packaging/non-packaging nature of the specific categories is also displayed. More detailed information on the character of each waste category is available in Appendix H.

Figure 4.1: Financial Services Waste Composition



As this bank has an on-site restaurant there is a high percentage of organics noted. Many financial institutions do not have such on site facilities and comparisons of the profile with and without restaurant wastes are discussed in more detail in Section 4.3.

4.2.2 Communication Sector (Broadcasting)

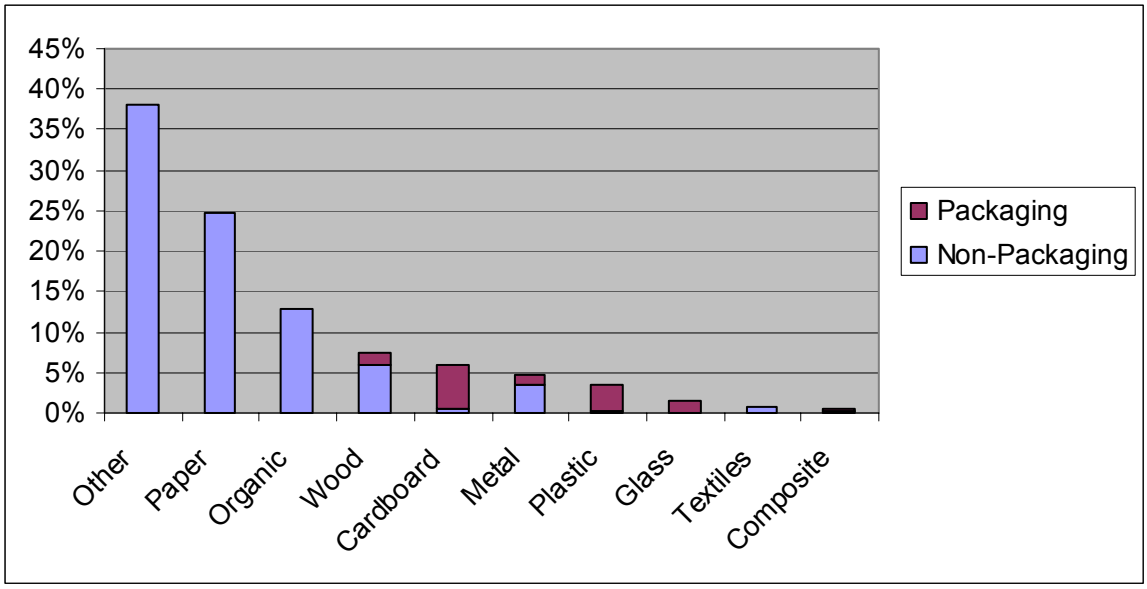
Background Information

Radio Telefís Eireann (RTE) in Dublin 4 is the main centre of public broadcasting in Ireland. It employs approximately 1,200 people (on-site) and waste arises from a number of different areas. These are: TV, Radio, Grounds, Offices, Sports and Social, Canteen and Other Areas. In addition they have a number of recycling skips for wood, metals, WEEE and cables (this constitutes a large portion of the total waste).

Survey Results

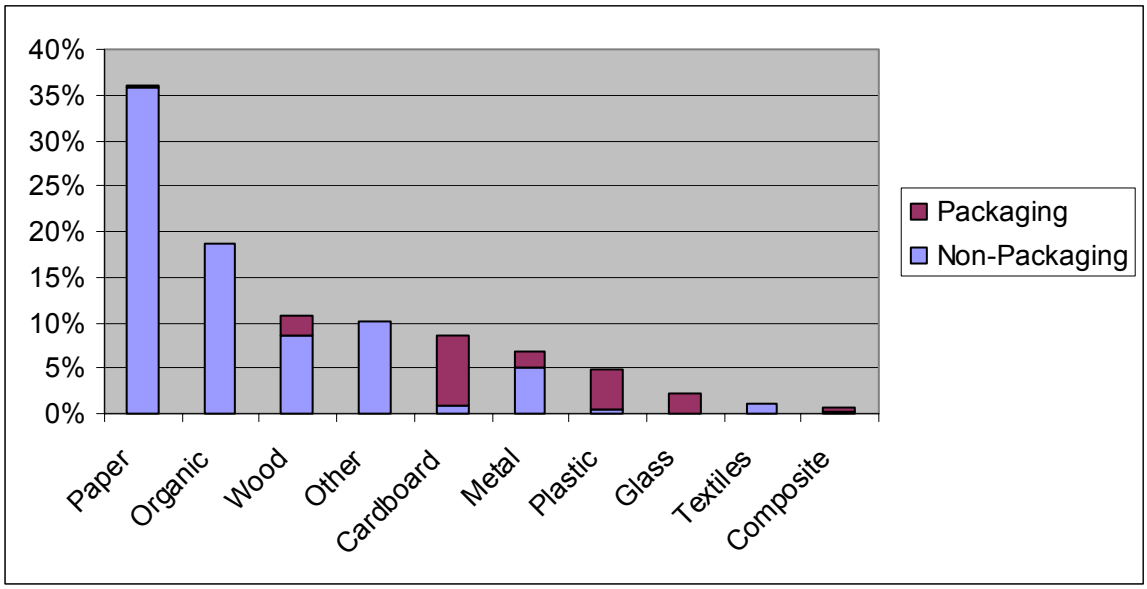
The character of waste arising from RTE is summarised in Figure 4.2. The individual waste categories are broken into their packaging and non-packaging fractions. More detailed information on the character of each waste category is available in Appendix H.

Figure 4.2: Communication Sector Waste Composition



The most significant waste category is the “Other” group (refers to special and irregular wastes). This includes electrical cables (2.6 tonnes arose during the survey) which constitutes a large percentage of the total weight. These are very specific wastes to this particular site and may not be truly reflective of this sector. Shown in Figure 4.3 are the same results with the electrical cables *omitted*. These results are discussed in more detail in Section 4.3.

Figure 4.3: Communication Sector Waste Composition (without Electrical Cables)



4.2.3 Communication Sector (Telecommunications)

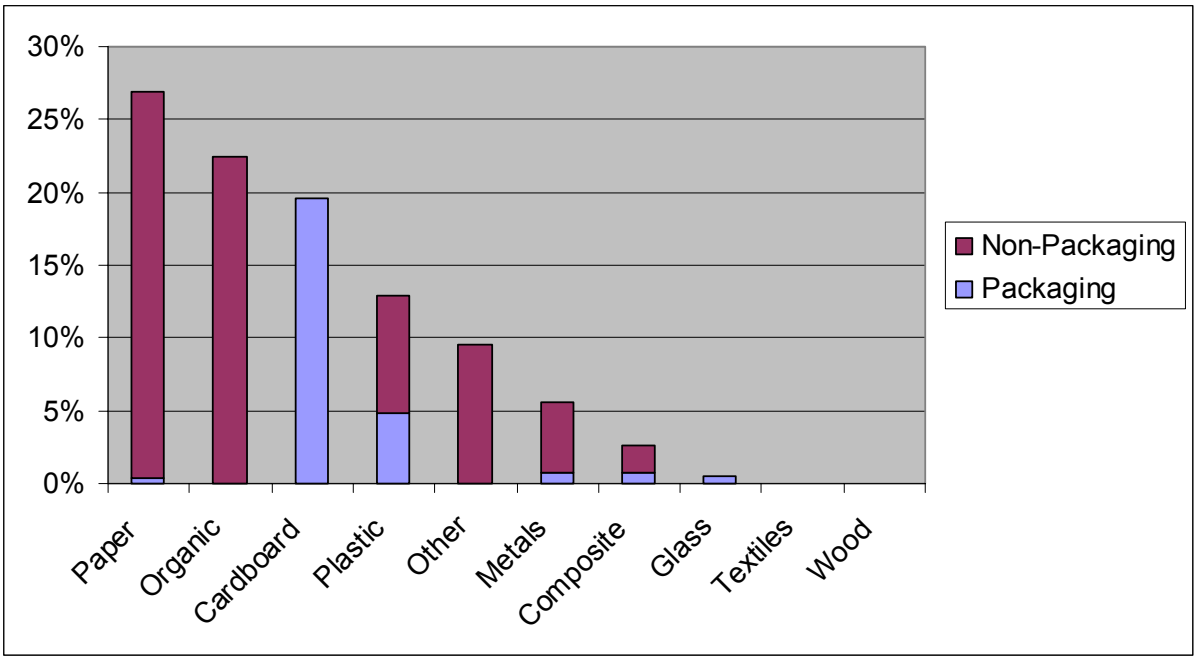
Background Information

Eircom (Galway) are the Eircom headquarters for the North West Region. It employs approximately 170 people and waste arises from a number of different areas. These are: kitchen, canteen, offices and yard. In addition they have recycling bins for cardboard, office paper, fluorescent tubes and batteries.

Survey Results

The character of waste arising from eircom (Galway) is summarised in Figure 4.4. In total, 0.23 tonnes of waste was produced during the study. As can be seen below the main waste arisings on site are: paper, organics and cardboard. It is interesting to note that 5% of the total weight of the waste comprised of newspapers. The individual waste categories are broken into their packaging and non-packaging fractions. More detailed information on the character of each waste category is available in Appendix H.

Figure 4.4: Communication Sector Waste Composition



4.2.4 Hotel Sector

Background Information

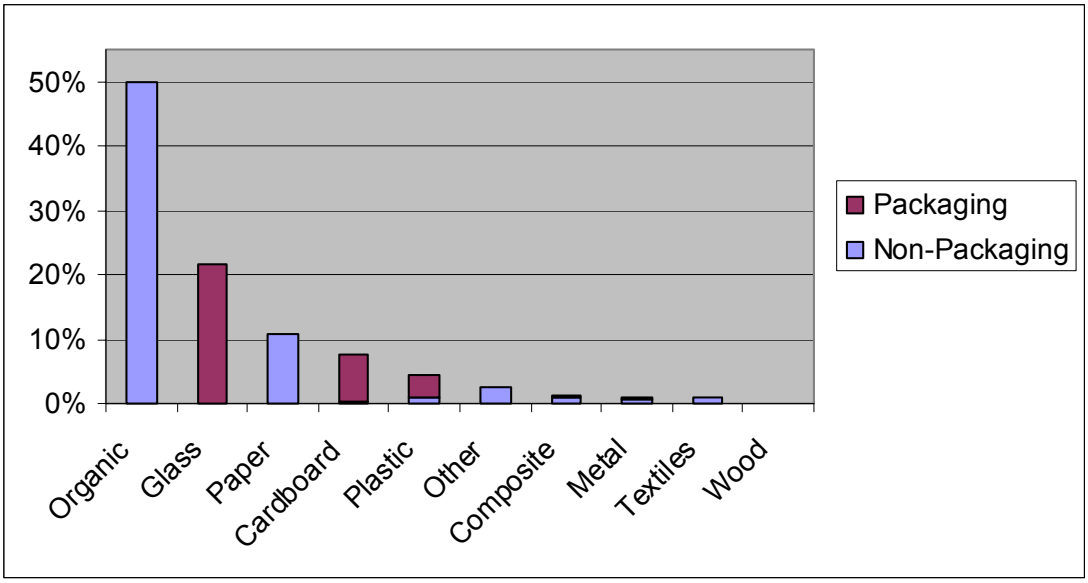
The Carrigaline Court Hotel is a 4-star hotel consisting of 91 bedrooms, bar, restaurant, five conference and meeting rooms and leisure centre. The hotel currently employs 170 people.

Survey Results

The character of waste arising from Carrigaline Court Hotel is summarised in Figure 4.5. The waste streams are broken into packaging and non-packaging factions. The most significant waste stream is 'Organic waste' which represents ~50% of the total weight of waste arisings. This is typical of the hotel sector.

The percentage of glass arising at 21.5% is high compared to previous surveys[13]. This may be due to the fact that this hotel has a busy public bar and that large bottles of mineral water are complimentary to residents. A comparison of the results from this hotel survey and those of previous studies from MS-7 is made in Section 4.3. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.5: Hotel Sector Waste Composition



[13] MS-7-2000

4.2.5 Restaurant Sector

Background Information

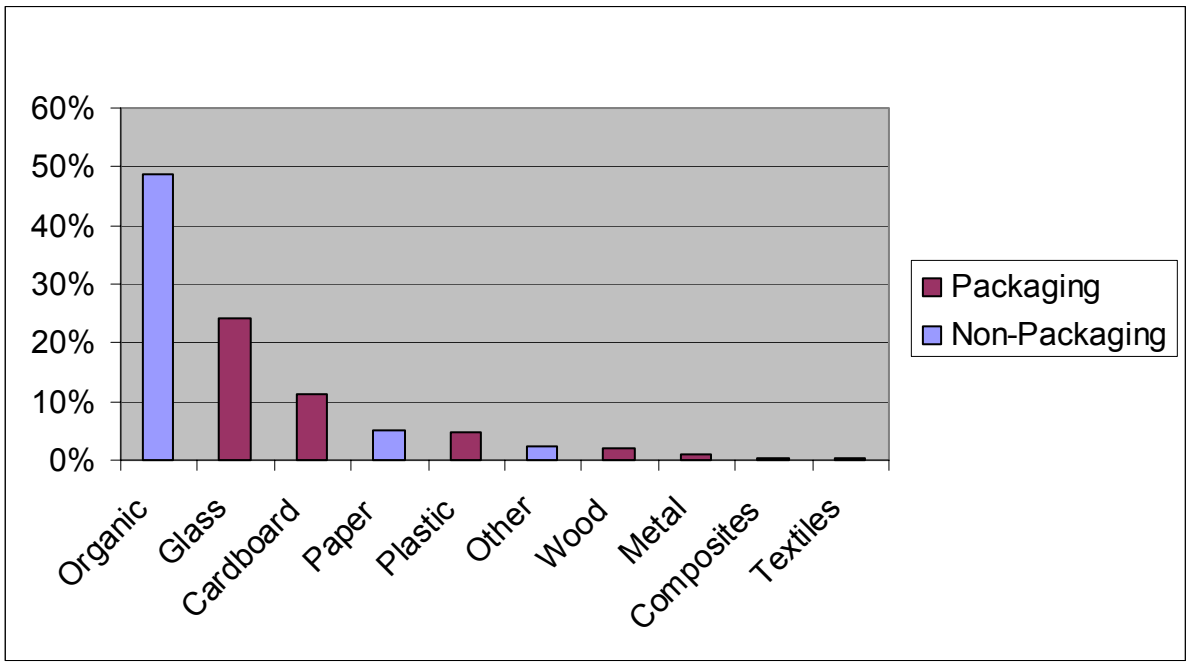
Jacobs on the Mall is situated in the main business area of Cork City. It is an upmarket restaurant which prepares virtually all its meals and ingredients directly from raw materials (no pre-packaged vegetables, sauces or meats are used). Consequently, a portion of their raw materials comes in returnable packaging. It also has an extensive wine cellar and this is reflected in the relatively high proportion of glass in the survey.

Survey Results

The character of waste arising from Jacobs Restaurant is shown in Figure 4.6. As expected the most noteworthy fraction is organic, followed by glass, cardboard and plastic. In total, it is estimated that 1.33 tonnes of waste are produced weekly.

Due to the nature of this restaurant, 'Organics' is the main waste category, followed by various packaging materials. They do not use disposable napkins, have a fully licensed bar (hence few cans are sold as all minerals come in bottles), use few tinned products and generally the only paper produced consists of receipts and daily menus. As mentioned the high glass composition is related to the large quantity of wine sold and this may therefore be uncharacteristic of less 'upmarket' restaurants.

Figure 4.6: Restaurant Sector Waste Composition



A comparison of the results from this survey and those of previous studies from MS-7 is made in Section 4.3. More detailed information on the character of each waste category is also available in Appendix H.

4.2.6 Wholesale Sector

Background Information

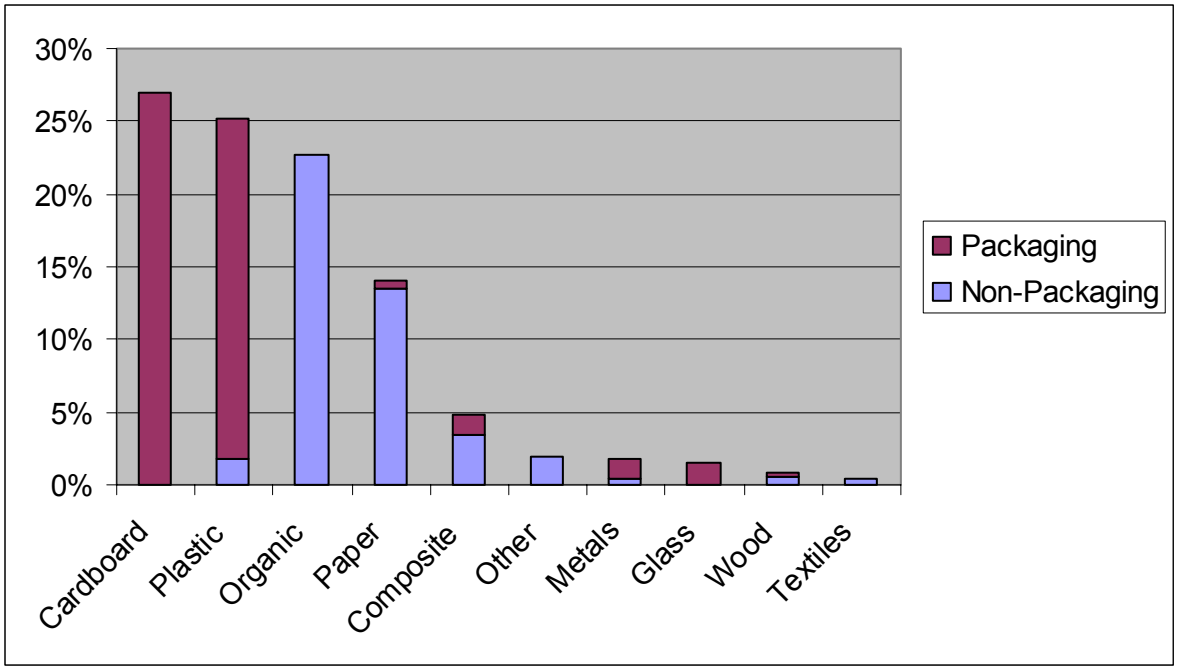
Musgraves, the main wholesale supplier of Centra and Supervalu, is situated on the outskirts of Cork City. This site is one of three nationally and has 650 employees. They have an on-site canteen, offices, various stores and an extensive recycling system. They employ 300 people in their offices which deal with the logistics for the south and west. The site operates 24 hours a day, 365 days a year. There is a dedicated waste management team on site to deal with out of date stock and the large quantities of on-site packaging waste.

Survey Results

The character of waste arising from Musgraves is summarised in Figure 4.7. The waste streams are broken into packaging and non-packaging factions. The most significant waste streams are cardboard and plastic packaging which represents almost 50% of the total weight of waste arisings. Apart from this packaging material there is a large proportion of organics waste which is related to large quantities of fruit and vegetables which have short shelf lives. The waste management staff removes compostable stock that is found to be out of date and then dispose of the extra packaging waste in the general skip.

Other points of note are the high quantity of waste paper. This is almost exclusively office paper from their offices (which includes their logistics department). Wood pallets are used extensively but are either reused or sent back to the suppliers for repair.

Figure 4.7: Wholesale Sector waste composition



4.2.7 Supermarket Sector

Background Information

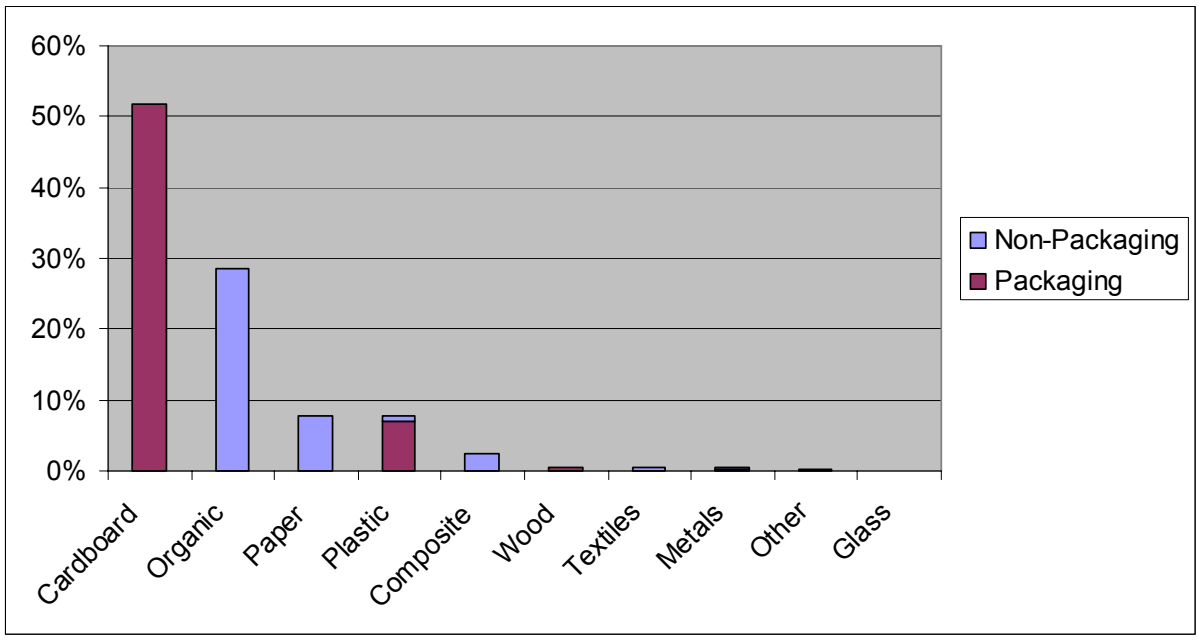
Dunnes Stores (Bishopstown Court) is a popular supermarket located on the outskirts of Cork city. The supermarket currently employs 310 people. During the survey the supermarket was open 24-hours per day. Waste arises on site from a number of different areas: Supermarket, Deli/Bakery/Hot Food Counter, Restaurant, Yard, Staff Canteen, Toilets and Offices. There are on site waste recycling collection facilities for cardboard, plastic and waste cooking oil.

Survey Results

The character of waste arising from Dunnes Stores (Bishopstown Court) is summarised in Figure 4.8. The waste streams are broken into packaging and non-packaging factions. The most significant waste stream is 'cardboard' which represents almost 50% of the total weight of waste arisings. In total 7.38 tonnes of waste was produced during the study.

A comparison of the results from this hotel survey and those of previous studies from MS-7 is made in Section 4.3. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.8: Supermarket Sector waste composition



4.2.8 'Other Retailers' Sector

Background Information

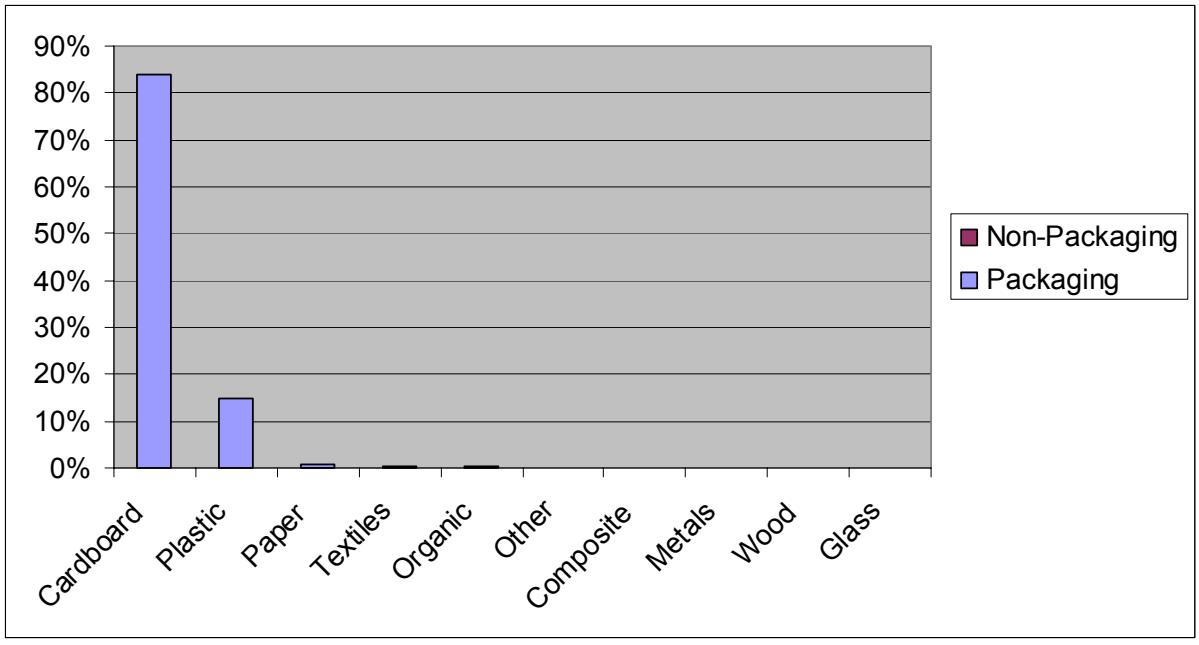
Dunnes Stores (Bishopstown Court) is located on the same site as the supermarket. The retail section currently employs 90 people. During the survey the retail section was open from 9am to midnight each day. The site recycles waste cardboard and plastic.

Survey Results

The character of waste arising from the retail section of Dunnes Stores (Bishopstown Court) is summarised in Figure 4.9. The waste streams are broken into packaging and non-packaging factions. The most significant waste stream is 'cardboard' which represents over 80% of the total weight of waste arisings. In total over 98% of waste arising from this area consisted on cardboard and plastic which were both sent for recycling. In total 2.1 tonnes of waste was produced during the study

A comparison of the results from this survey and those of previous studies from MS-7 is made in Section 4.3. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.9: Retail Sector Waste Composition



4.2.9 Pharmaceutical

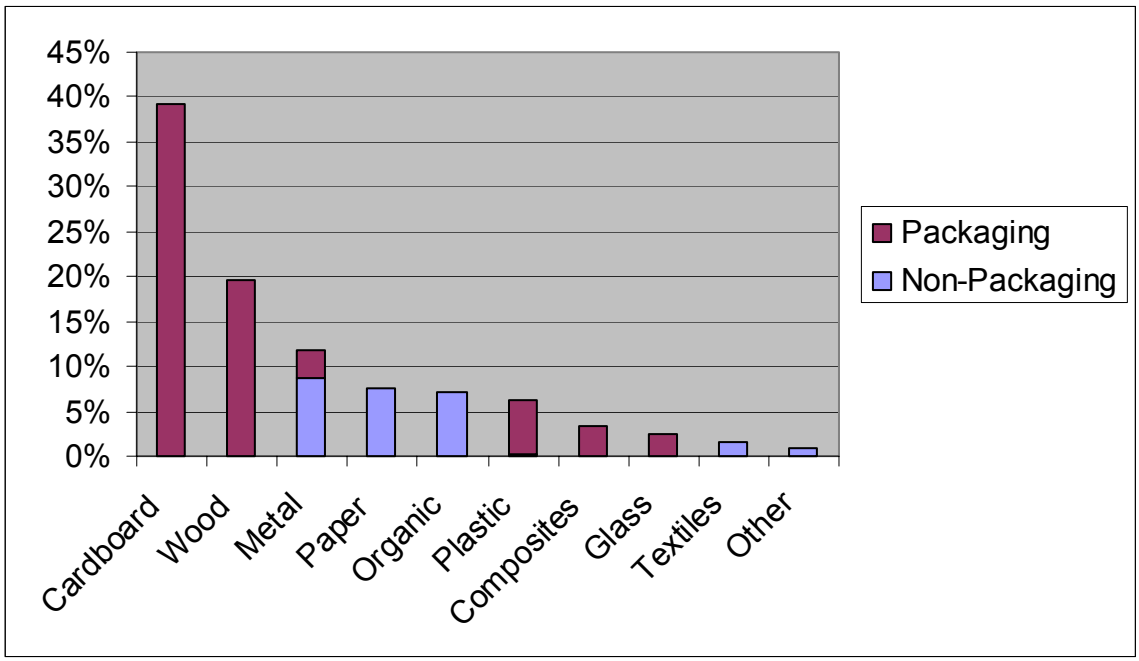
Background Information

Pfizer Loughbeg is a pharmaceutical manufacturing plant. They employ 242 permanent staff. Municipal type wastes arise in a number of different areas including: canteen, chemical weighing, labs, gowning and stores. There is also a significant quantity of hazardous process waste generated on-site which is sent abroad for treatment and was not considered in the survey.

Survey Results

The character of waste arising from Pfizer is summarised in Figure 4.10. The main individual waste streams are separated into packaging and non-packaging fractions. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.10: Pharmaceutical Sector Waste Composition



The most significant waste generated on site is cardboard. This arises predominantly from the Warehouse/Stores area where large quantities of fibre drums are used to bring in raw materials. These drums also contain significant quantities of metal and this is reflected in the metal percentages. These results are discussed in more detail in Section 4.3.

4.2.10 Electronics Sector

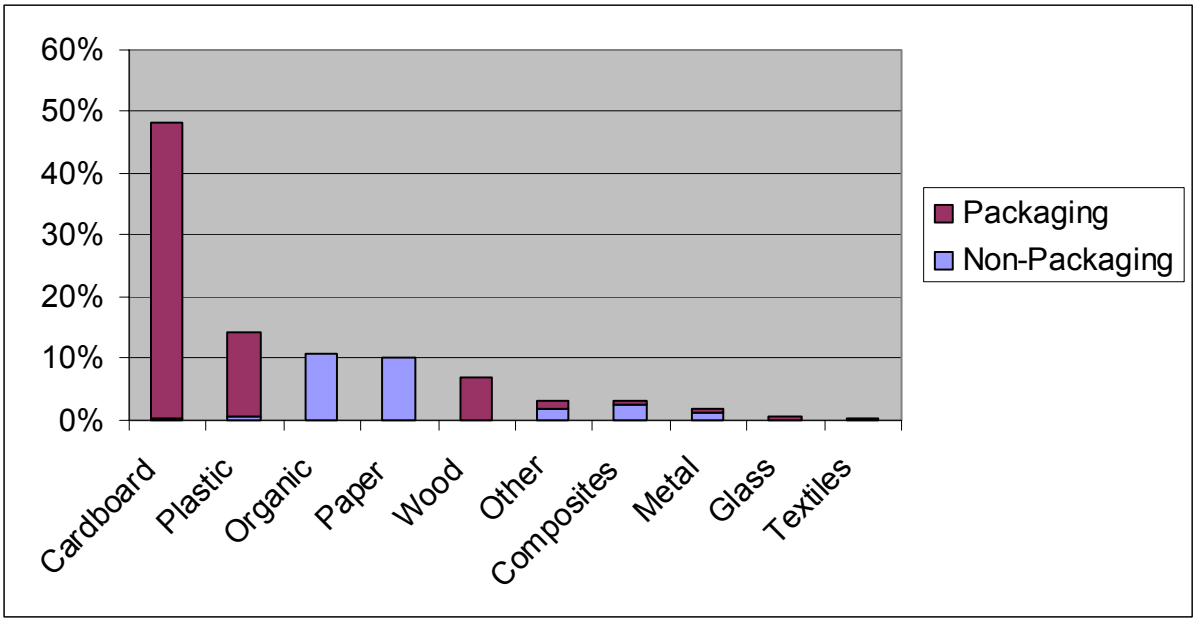
Background Information

EMC^2 is an electronics hardware producing company situated on the outskirts of Cork city. There is no electronics manufacture on site. Rather the individual parts are brought in, assembled and programmed before shipping worldwide. The site has expanded significantly in recent years and now employs 1,500 people. The wastes emanating from the site arise from the following main areas: offices, canteen, assembly floor, shipping, coffee docks, grounds and recycling centre.

Survey Results

The character of waste arising from EMC^2 is summarised in Figure 4.11. The data is presented in its packaging and non-packaging fractions. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.11: Electronics Sector waste composition



The most significant waste generated on site is cardboard. This arises from both the shipping department (outbound) and from goods in area. The other significant waste stream is plastic, consisting predominantly of packaging materials which include plastic film, bubble wrap, polyurethane foam and large quantities of PET. These results are discussed in more detail in Section 4.3.

4.2.11 Electronics Sector (SME)

Background Information

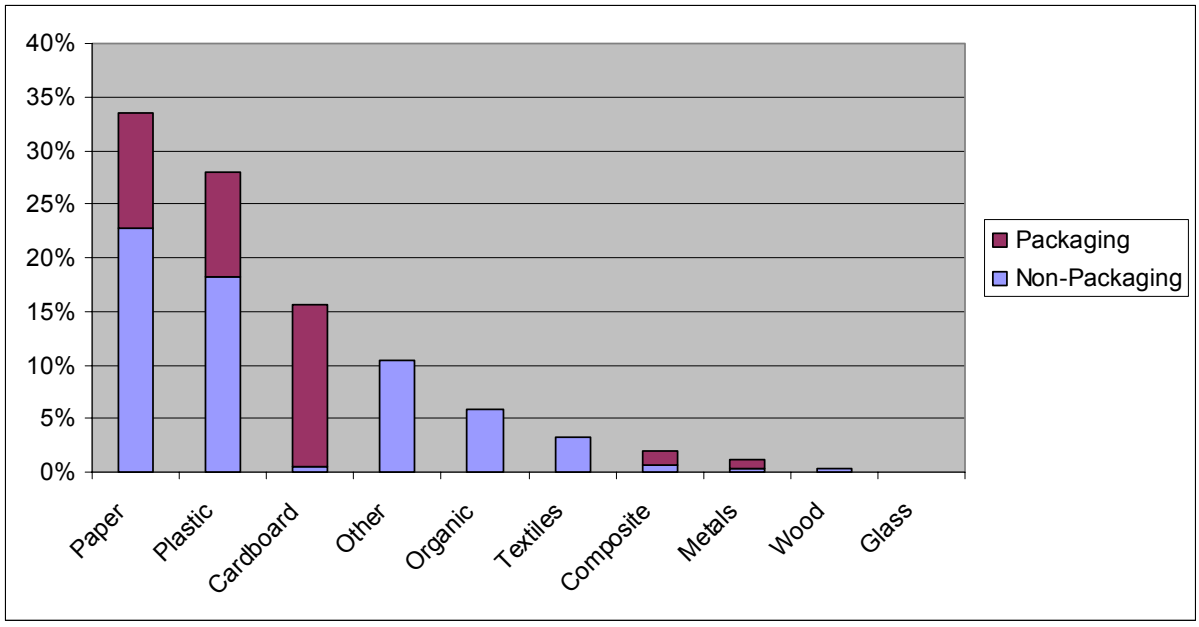
Ship Company is IPC licensed and currently employs 21 people. They are situated in Macroom and manufacture printed circuit boards. Apart from process waste their MSW is managed locally at the civic amenity site. They have a small on-site canteen though no food is served there (most employees bring their own lunch).

Survey Results

Due to the relatively small quantities on MSW generated each week this survey was conducted each Thursday for a month. On site waste is stored and gathered each Thursday morning and then brought to the local civic amenity site where recyclables are separated and general waste is disposed of for a fee.

The character of waste arising from Ship Company is summarised in Figure 4.12. The data is presented in its packaging and non-packaging fractions. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.12: SME (Electronics) Sector waste composition



Much of the paper used (tissue) is for cleaning purposes and the non-packaging plastic is generated within the process.

4.2.12 Food & Beverage

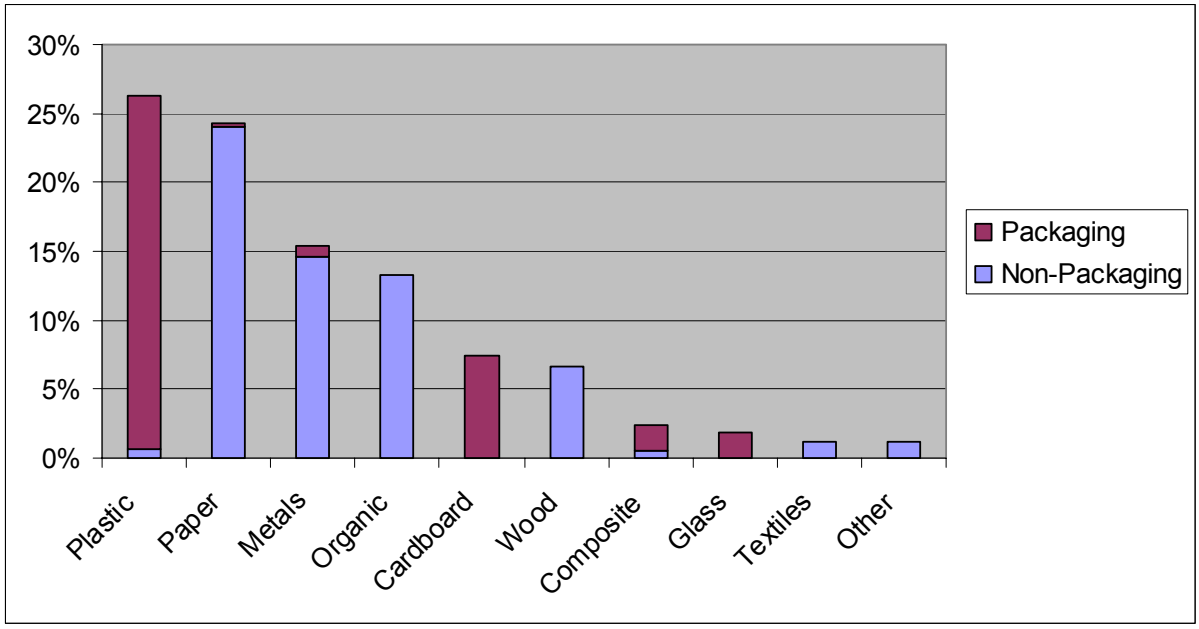
Background Information

Heineken Ireland, situated in Cork City, is the producer of kegged Heineken for Ireland. There are 204 employees on site. In recent years they have introduced an extensive waste management system which has seen a dramatic decrease in municipal waste going to landfill and an associated increase in packaging recycling. The main areas of waste on-site are offices, canteen, laboratory, brewing and recycling.

Survey Results

The character of waste arising from Heineken is summarised in Figure 4.13. The data is presented in its packaging and non-packaging fractions. More detailed information on the character of each waste category is also available in Appendix H.

Figure 4.13: Food & Beverage Sector Waste Composition



The most significant waste stream on site is plastic film packaging which is currently baled and sent for recycling. Office paper contributes a significant proportion to the overall waste generated. The on-site offices deal with the extensive logistics of the company. Metal waste from on-site work and damaged kegs are recycled. The organics fraction, mainly from the canteen is disposed of to landfill. In addition, waste grains and composite bags (which are unrecyclable) are also sent for landfill disposal. These have no EWC code and are classed as 20 03 01.

4.2.13 Survey Summary

The results from the various surveys completed during this project are summarised in Tables 4.2 and 4.3.

Table 4.2: Summary of primary waste categories identified during Commercial surveys

	Commercial Surveys						
	Financial	Hotel	Supermarket	Retail	Transport & Communication	Restaurant	Wholesale
Organics	35.7%	49.8%	31.1%	0.2%	20.5%	48.7%	22.8%
Cardboard	13.6%	7.5%	48.4%	83.8%	14.1%	11.2%	26.9%
Paper	36.2%	10.8%	7.9%	0.9%	31.5%	5.2%	14.1%
Plastic	10.0%	4.6%	7.7%	14.6%	8.9%	4.8%	25.2%
Glass	1.0%	21.5%	0.3%	0.0%	1.4%	24.4%	1.5%
Others	1.6%	2.5%	0.7%	0.2%	9.8%	2.2%	1.9%
Metal	1.4%	1.1%	0.5%	0.0%	6.2%	0.9%	1.7%
Composites	0.4%	1.1%	2.4%	0.0%	1.6%	0.4%	4.8%
Wood	0.1%	0.0%	0.5%	0.0%	5.4%	2.0%	0.8%
Textiles	0.3%	1.0%	0.5%	0.2%	0.6%	0.3%	0.4%

Table 4.3: Summary of primary waste categories identified during Industrial surveys

	Industrial Surveys			
	Electronics	Electronic - SME	Food & Beverage	Pharmaceutical
Cardboard	48.2%	15.6%	7.4%	39.9%
Plastic	14.2%	28.0%	26.3%	6.3%
Paper	10.3%	33.6%	24.2%	7.6%
Organics	10.9%	5.9%	13.3%	7.1%
Wood	7.1%	0.4%	6.7%	19.5%
Metal	1.9%	1.1%	15.5%	11.9%
Others	3.4%	10.3%	1.2%	0.9%
Composites	3.2%	1.9%	2.4%	3.3%
Glass	0.6%	0.0%	1.9%	2.4%
Textiles	0.2%	3.3%	1.2%	1.6%

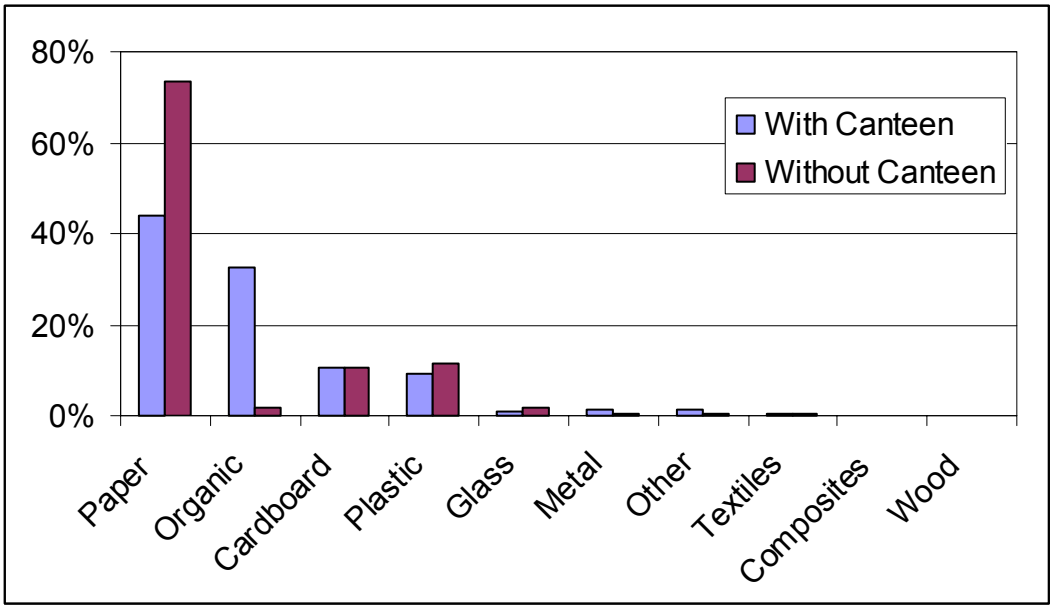
4.3 ANALYSIS OF RESULTS

4.3.1 Comparison of Commercial findings

4.3.1.1 The Financial Sector

In the development of a methodology for the characterisation of non household municipal waste it has been demonstrated that the character of waste arising from any commercial activity can be significantly altered by the presence of an on site restaurant/canteen. A comparison of the waste character from the AIB survey with and without data from the restaurant is illustrated in Figure 4.14.

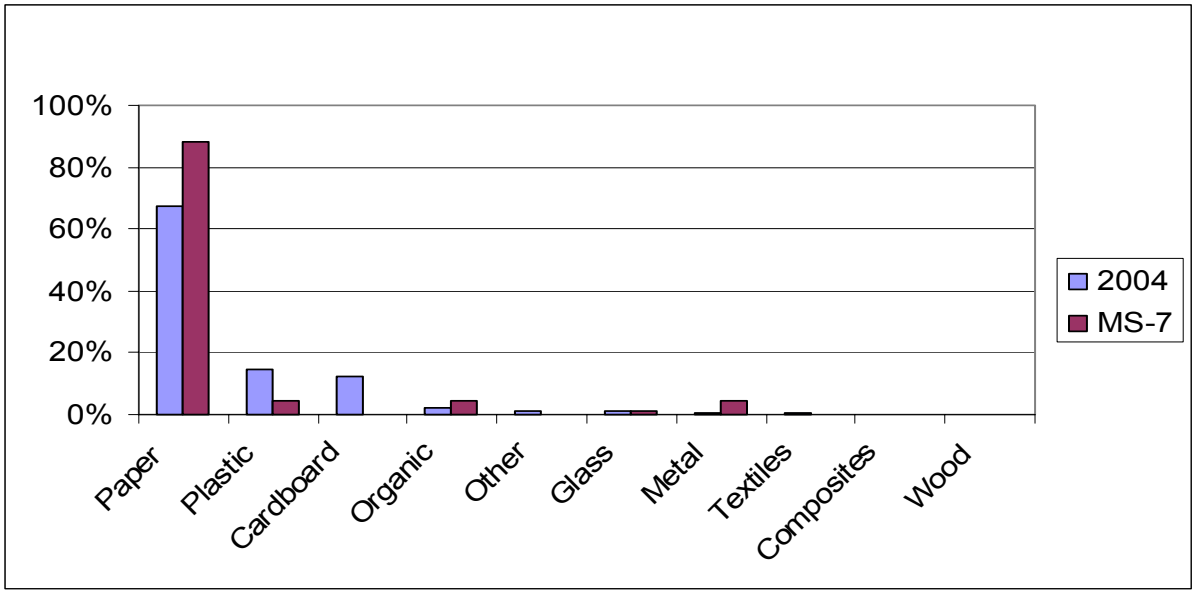
Figure 4.14: Comparison of survey results with and without canteen wastes



This comparison clearly indicates that the effects of a canteen on the overall waste character from a financial institution can be significant. These effects will need consideration when scaling up to generate a national figure for this sector. One possible approach is to scale up restaurant waste in financial institutions independently to non restaurant waste, if it were possible to extract such data.

During MS-7 a smaller bank was surveyed which had no on site restaurant/canteen and a comparison of those findings with the current results (without canteen wastes included) is shown in Figure 4.15.

Figure 4.15: Comparison of MS-7 and 2004 results for the financial sector (without canteen)

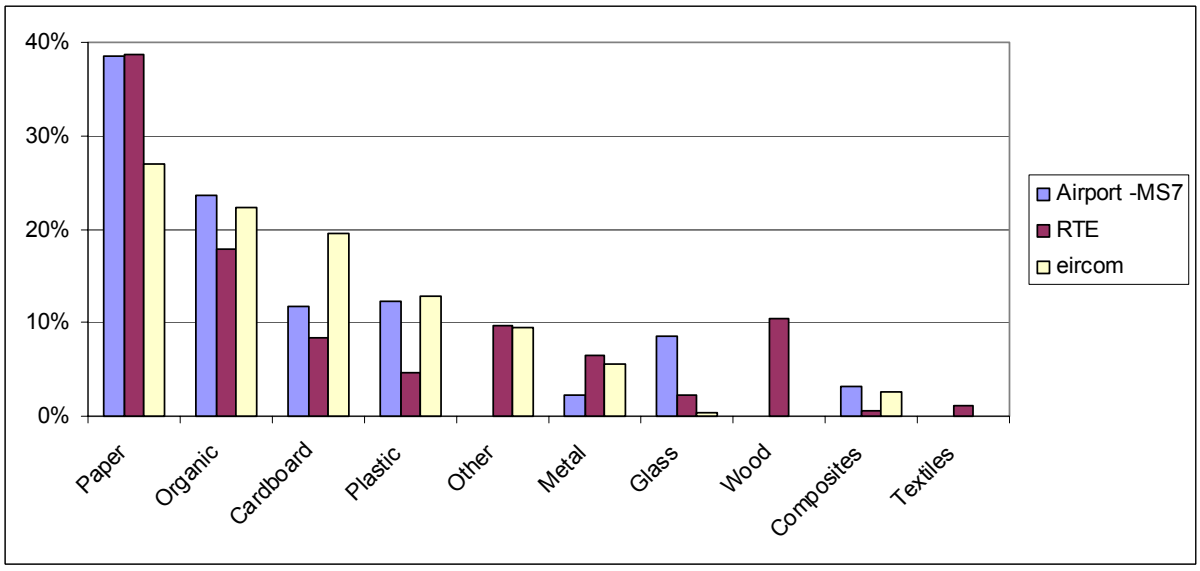


There are similarities between the findings of both studies, though some differences also exist. The high quantity of plastic waste in this current study is due to PE plastic bags (used for transferring money), which was not present in the smaller bank. The combined paper and cardboard figures are quite similar though the specific breakdowns are somewhat different.

4.3.1.2 Transport and Communications

The transport and communication sector is wide and very diverse. Applying the findings of one business across the whole sector cannot result in an accurate characterisation. Therefore, surveys need to be conducted at a variety of businesses within this sector. In the current work, the communication sector was examined at both RTE Headquarters and the Eircom North-West Regional Headquarters in Galway. A comparison of the results from this study with the corresponding findings of MS-7 (which examined Transport, in the form of Cork Airport), are shown in Figure 4.16.

Figure 4.16: Comparison of Communication & Transport Sectors (Electrical Cables Excluded)

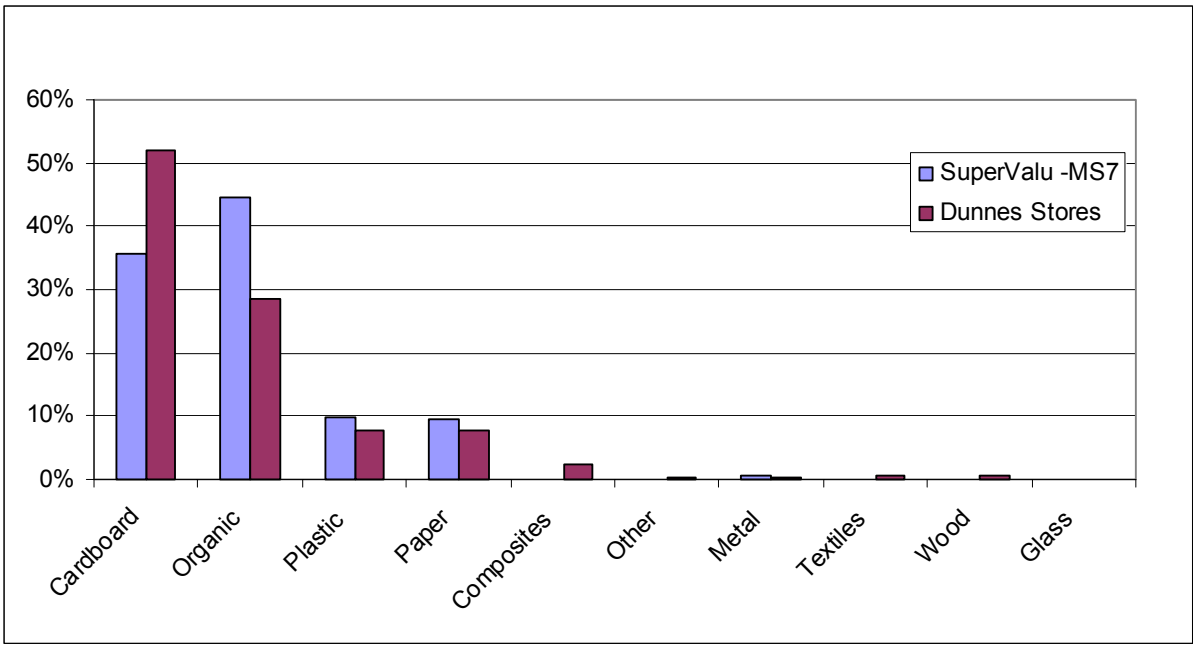


Though this is a very diverse sector the similarities between the profiles are striking. It should be noted that this profile excludes the 2.6 tonnes of electrical cables from RTE.

4.3.1.3 Supermarkets

Supermarkets represent a large section of the retail trade and produce a large fraction of the retail trade waste. During this study Dunnes Stores (Bishopstown Court) was studied. The results from this study were compared with the results from the corresponding findings of MS-7, which examined Supermarket waste in SuperValu in a Cork City suburb, as seen in Figure 4.17.

Figure 4.17: Comparison within the Supermarkets Sector



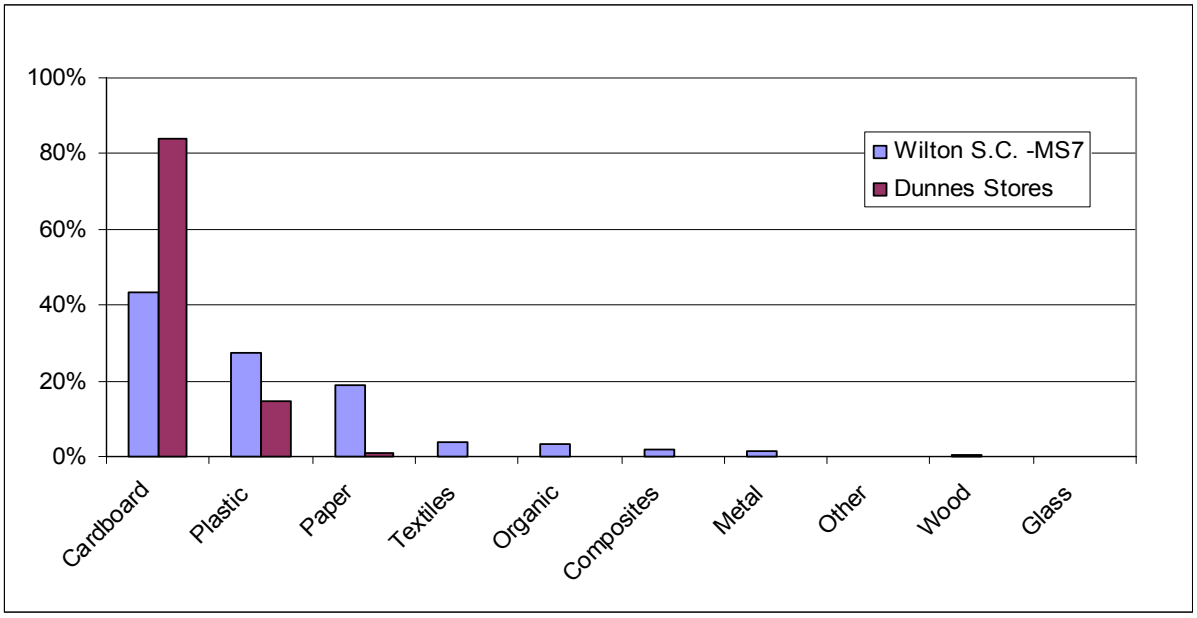
There is no clear indication why the discrepancies that exist in cardboard and organics arise. It may be attributed to a better turnover at the Dunnes Stores site but this cannot be confirmed.

4.3.1.4 'Other Retailers' Sector

'Other Retailers' are those retailers which do not fall into the supermarket sector. This is a very broad and ill-defined sector and should be considered in more detail in further studies. During this study Dunnes Stores (Bishopstown Court) was studied. The results from this study were compared with the results from the corresponding findings of MS-7, which examined 'Other Retailers' waste from Wilton Shopping Centre, Cork (shopping complex hosting numerous restaurants and fifty other retailers which fall into the 'other retailers' category including hairdressers, clothes shops, a DIY shop, music stores, telephone shops, chemists, vegetable shop and a butcher). The comparison between both surveys can be seen in Figure 4.18.

The current survey considers the large retail section of a 'store'. This provides a profile that is quite different from the small retailers that were considered during MS-7. This broad category should be considered in more detail in further studies.

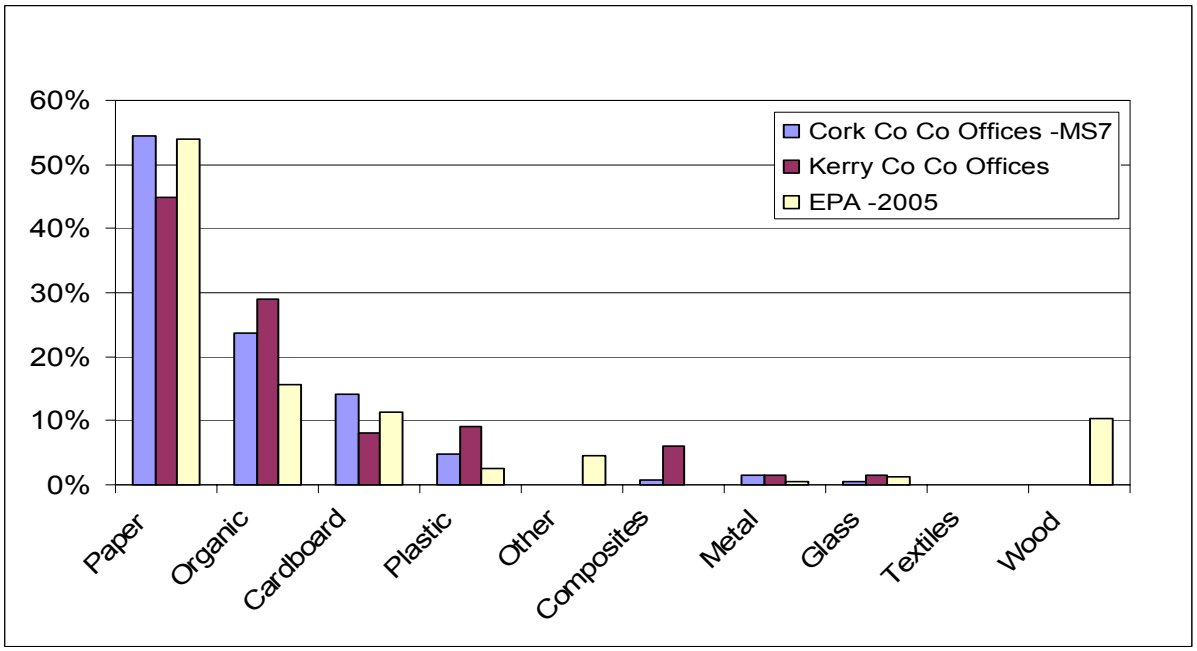
Figure 4.18: Comparison of 'Other Retailers'



4.3.1.5 Public Offices Sector

As part of this report the recent waste survey results conducted at the EPA offices in Wexford are included. This survey was conducted during April and the results are compared with the corresponding findings of MS-7, which examined waste from the Cork County Council complex (incorporating various departments). In March 2002 Kerry County Council conducted a survey of waste arising from their administration buildings (not conducted by CTC). The comparison between the three surveys can be seen in Figure 4.19.

Figure 4.19: Comparison of Public Offices

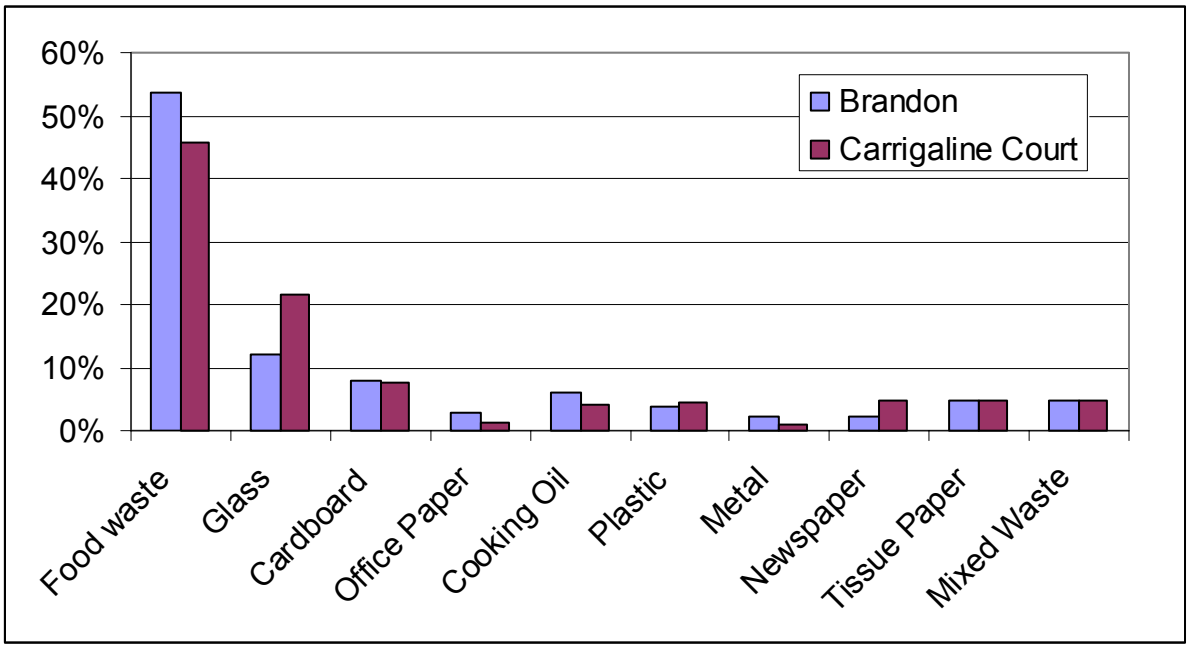


The close similarities between the three results indicate a consistent profile for office type wastes. There are a number of minor differences though. The lower proportion of organics in the EPA offices may be related to the fact that the canteen there does not serve hot dinners whereas these are served in the other two offices considered. The high proportion of wood at the EPA offices is attributed to the large quantities of wood packaging used for deliveries there.

4.3.1.6 Hotel Sector

The hotel industry is estimated to produce 11-15% of the commercial waste arisings in Ireland. During MS-7, three hotels were examined, though only one during the survey according to the developed methodology (the Brandon Hotel, Tralee, Co. Kerry). A comparison of the MS-7 findings with results from this program is shown in Figure 4.20.

Figure 4.20: Comparison of Hotel Survey Results from MS-7 and the Current Study



The results show that arisings from the Carrigaline Court are very similar to those obtained from the Brandon Hotel Survey. These are both large four-star hotels with leisure, restaurant and banqueting facilities.

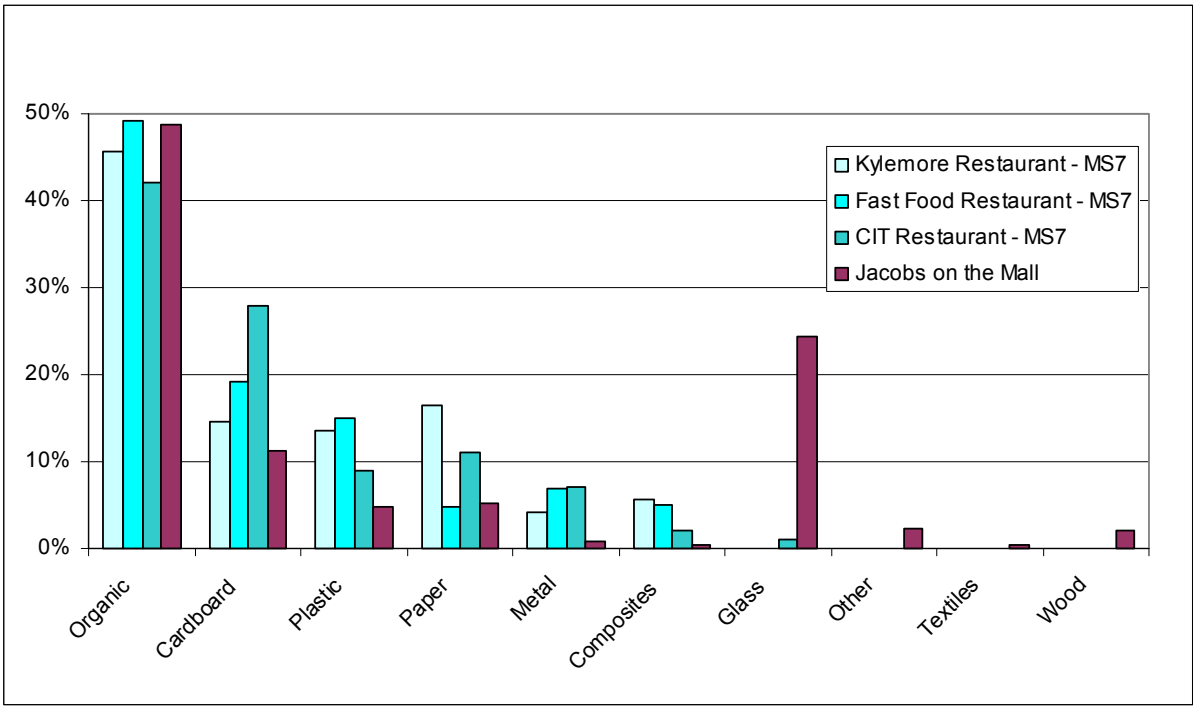
The one waste stream that is significantly different is the glass stream, which is 21.5% in the Carrigaline Court Hotel. This is much higher than results obtained from pervious surveys. The figure measured during the survey period has been cross-referenced with long-term recycling figures that confirm the high percentage of glass arising. It is possible that certain activities in the Carrigaline Court Hotel could be considered different to a “standard hotel” which would explain the relatively high percentage of glass. Some possible explanations for the disparity of results may be related to the fact that the hotel has a busy public bar where non-returnable bottles are sold and also that large glass bottles of mineral water are complimentary in each room.

From the results obtained to date there is good correlation of waste characters arising from the large four star hotels and this information will allow for a scale up for the national picture for large hotels. Future studies should concentrate on the smaller hotels and Inns to verify results obtained for this section of the hotel sector.

4.3.1.7 Restaurant Sector

During the MS-7 investigation it was estimated that the restaurant sector, which is a subset of NACE code sector H, contributed ~ 7.5% of commercial waste arisings. During that study three different restaurants were used for the characterisations. These were a university canteen, a fast food outlet and a busy city centre café/restaurant. A comparison of these findings with the current survey is depicted in Figure 4.21.

Figure 4.21: Comparison of Restaurant Survey Results from MS-7 and the Current Study



Though the results do not show a direct correlation between the two studies it does identify the diversity that exists within the sector. Vegetable oil in the current study is minimal (~2%) as the restaurant surveys used very little as fried food was not a large part of their menu. In the MS-7 report one of the restaurants examined was a fast food outlet which used a large quantity of oil each week.

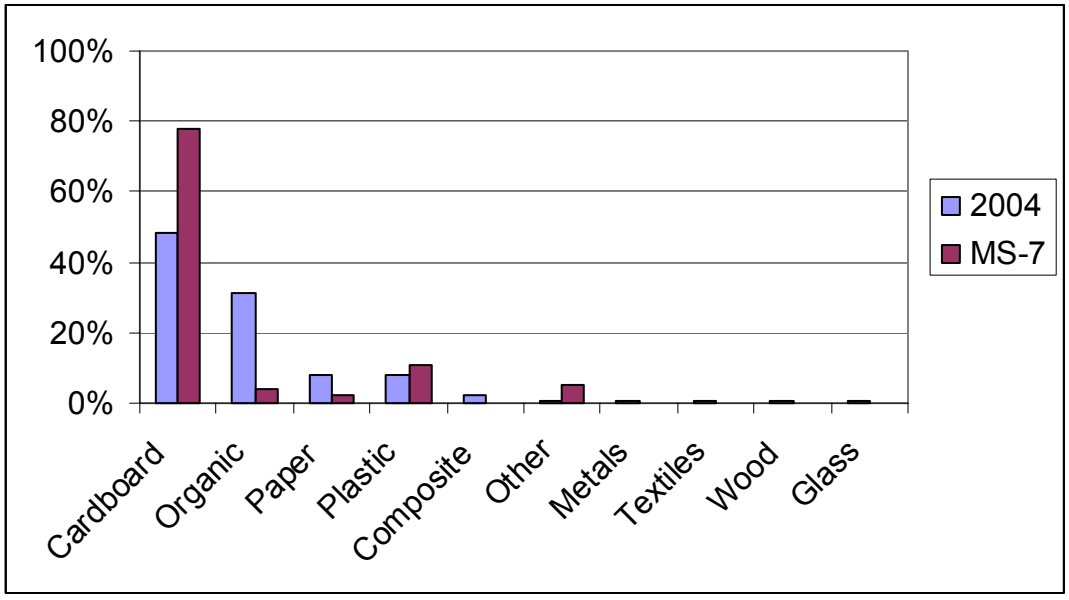
In addition, the high percentage of glass in the current study is directly related to quality of the restaurant. The other notable difference is the greater quantity of packaging materials in the MS-7 study as these establishments purchased a lot of packaged ingredients where as Jacobs prepared most of their meals from fresh produce, delivered in returnable packaging. Both paper and cardboard are very similar for both studies.

4.3.1.8 Wholesale Sector

During MS-7 preliminary information was gathered for this sector but a detailed audit was ***not*** carried out. The information used was very general and may not be appropriate to use based on its limited scope. However, due to the diversity of the wholesale sector applying the findings from the current study (a supermarket supplier) to the whole sector should be done with some caution and the results may be expected to have considerable uncertainty. Although theses type of wholesalers are significant contributors to the sector, other wholesalers (e.g. motor parts, clothing, furniture, etc.) would be expected to have a character with less organics. It is reasonable to assume that the high quantity of

cardboard and plastic packaging would be consistent within the sector. A comparison of both surveys is shown in Figure 4.22.

Figure 4.22: Comparison of Wholesale Survey Results from MS-7 and the Current Study



The survey of Musgraves (who are a major business in this sector) provided information on the extent of recycling that is currently performed. Virtually all their cardboard and plastic packaging wastes are recycled. This amounts to over 50% of their total waste stream. In addition, a large proportion of their organic wastes are composted.

4.3.2 Discussion of Industrial Survey Results

4.3.2.1 Industrial Waste Surveys

As outlined in the MS-7 report a significant percentage of non household municipal waste arises from the industrial sector (~43%). As little detailed investigation into the waste character within this sector had been previously carried out a number of industrial surveys were conducted. It was hoped to glean a number of points of information from these surveys. These were:

a) To investigate whether there was any similarities in NHMW generated across industrial sectors;

b) To compare different sized businesses within the same sector – does the character vary?

c) To compare the reported data on waste character with the survey results. A certain amount of information on the specific character of industrial waste can be determined from EPA questionnaires and IPC annual environmental reports. This program proposes to examine the information that is presented to the EPA in the industrial questionnaires and to determine the usefulness of this information in producing a national municipal waste character from the industrial sector.

Four industrial surveys have been carried out during the course of this study. All of the companies surveyed have supplied the EPA with detailed information on the nature of their waste, either through their Annual Environmental Report or through the EPA industrial questionnaire. This allowed comparison of audit findings with reported wastes.

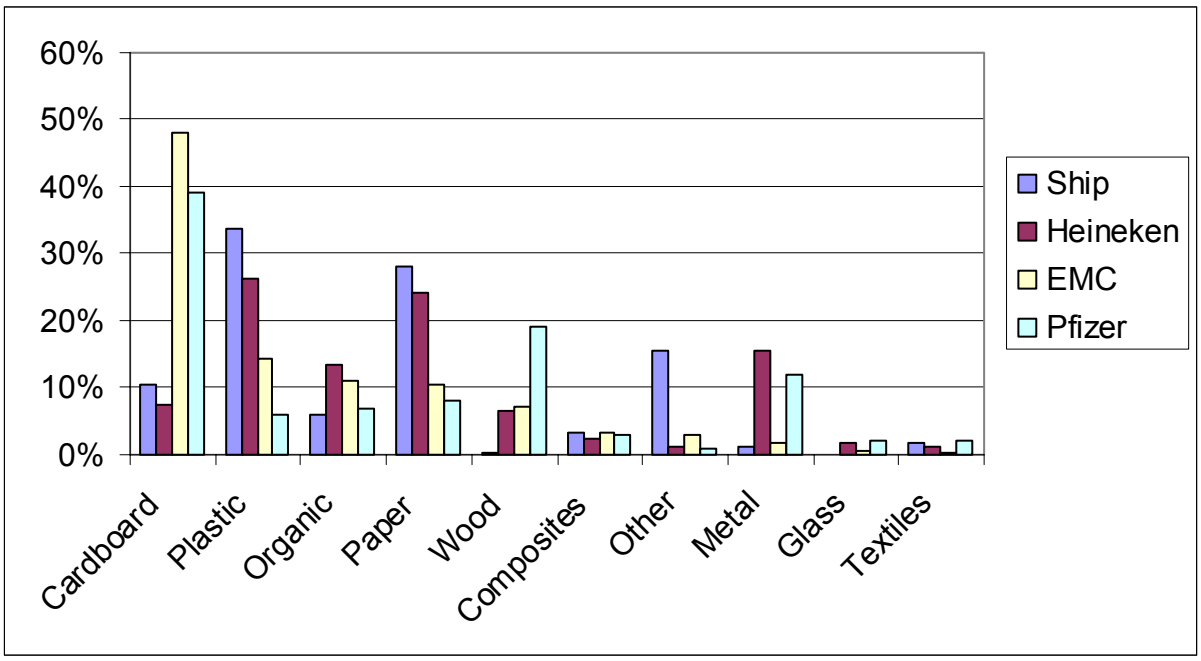
The companies examined were from three of Ireland's major industrial sectors. These are the pharmaceutical, electronics (both SME and large) and food and beverage sectors. Using this data to scale up for a national profile is not possible due to:

a) the diversity of the various industrial sectors in the country and

b) the possible diversity within specific sectors.

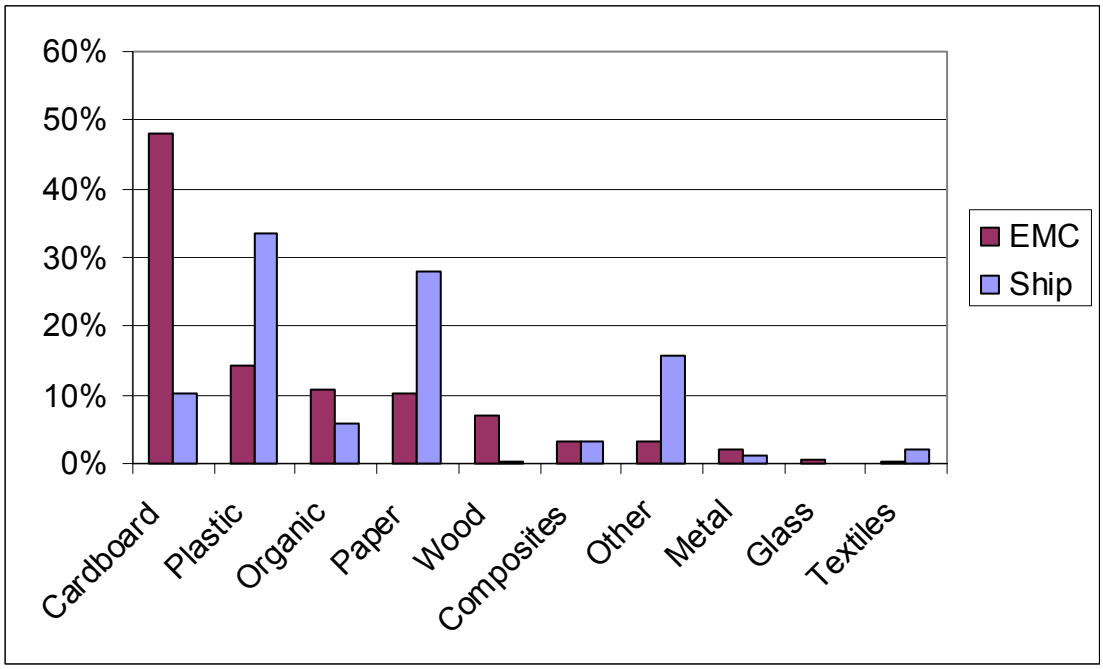
Figure 4.23 shows the variations in waste character from within the industrial surveys.

Figure 4.23: Comparison of Industrial Survey Results



Comparing the two companies within the electronics sector surveyed also shows that there is little correlation (see Figure 4.24). Ship is a small electronics manufacturing company employing 21 people while EMC[2] is a large multinational that employs 1,500 people. So while the companies are from within the same sector and are geographically proximate, application of a single character profile to their wastes is not possible.

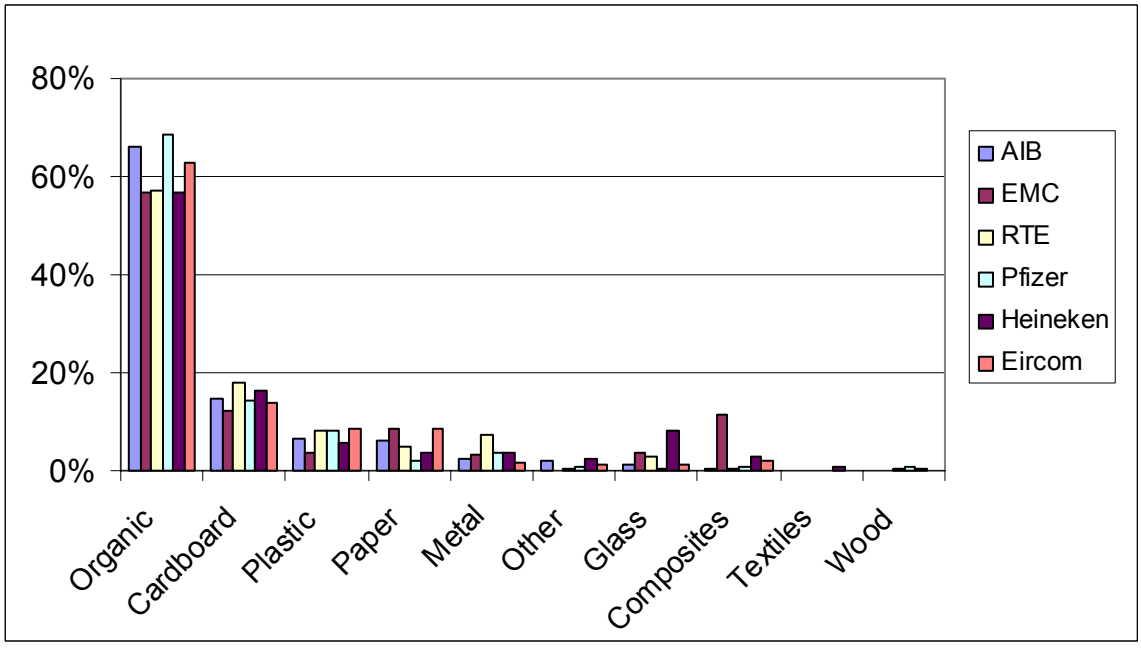
Figure 4.24: Comparison of Industrial Survey Results in the Electronics Sector



4.3.2.2 Comparison of Areas within Industrial Waste Surveys

During the course of the Industrial surveys it was decided to examine the findings from on-site canteens in an effort to determine if there is a generic waste profile for them. After noting their similarities they were subsequently compared with canteens from the commercial sector. Six on-site canteens were examined and a comparison of the findings from each of these is shown in Figure 4.25.

Figure 4.25: Comparison of Canteen Waste Arisings from AIB, EMC, RTE, Pfizer Heineken and Eircom



The similarities evident indicate that there may be a general waste character that is applicable to on-site canteens. Though there is quite a variation in the number of employees at each site (AIB: 204, Pfizer: 250, EMC: 1,500, RTE: 1900, Heineken: 204 and Eircom: 170) the profile does not alter significantly. The high percentage of composites present in EMC is due to composite coffee cups (they use 22,000 per month).The similarity in waste character arising from the surveyed restaurants/canteens suggests that it is reasonable to characterise canteens as a sub sector within the commercial and industrial sectors.

As noted previously, the canteens in the different establishments varied in size. On taking the total values generated during the surveys, scaling it up to produce an annual figure for canteen waste arisings and comparing this with the total number of staff served, a figure of quantity of canteen waste produced per employee per year was generated. These findings are detailed in Table 4.4.

Table 4.4: Comparison of Canteen Waste Produced per Employee Annually at Various Locations

	No. of employees	Quantity of Canteen waste generated annually / kg	Quantity of Canteen waste per employee per annum / kg
AIB	204	17,670	115
RTE	800	78,672	98
Eircom	170	6,392	106
EMC	1500	102,933	69
Pfizer	250	29,478	117
Heineken	204	14,220	70
Average			***95.83***

In an effort to determine the effects of canteen waste on the overall waste profile of each industrial site, the profiles – both with and without canteen wastes included – were compared. The findings for the two of the industrial sites with on-site canteens are shown in the following Figures.

Figure 4.26: Comparison of Total Waste Arisings, with and without Canteen Wastes at Pfizer Pharmaceutical

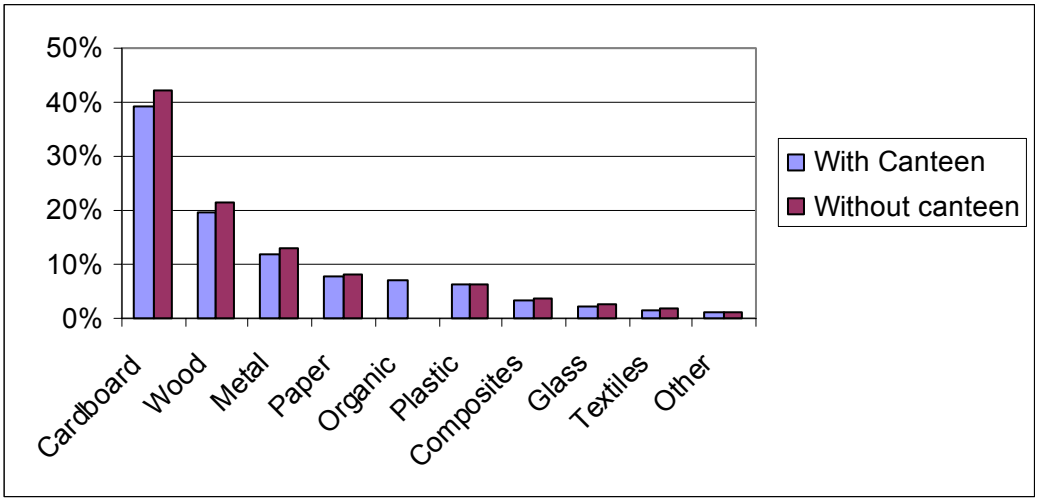
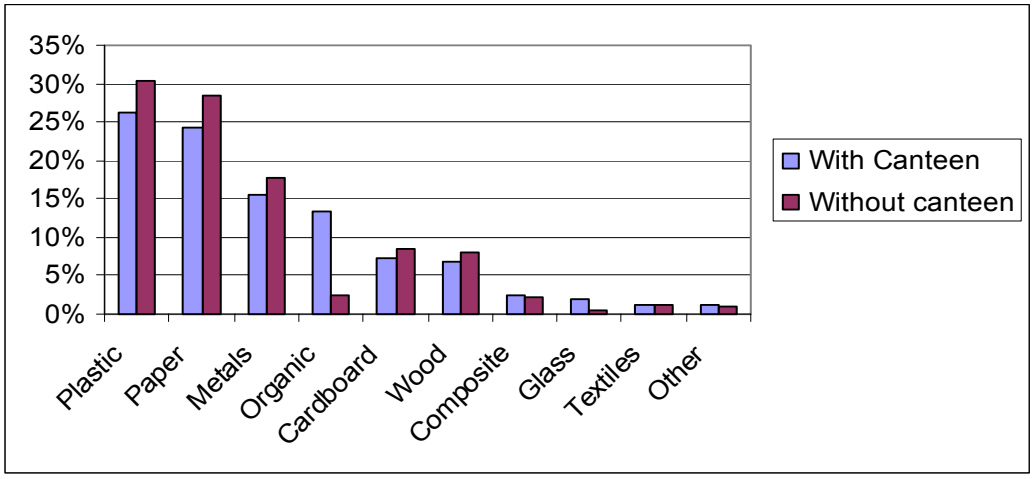
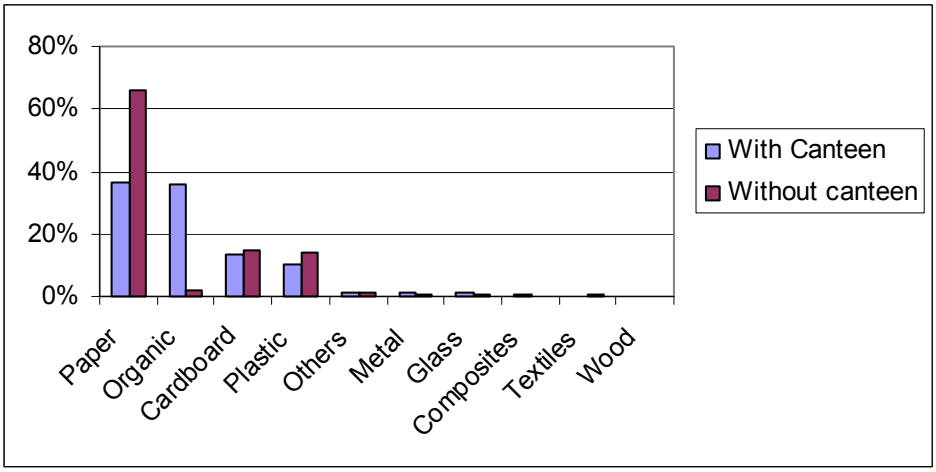


Figure 4.27: Comparison of Total Waste Arisings, with and without Canteen Wastes at Heineken Ireland



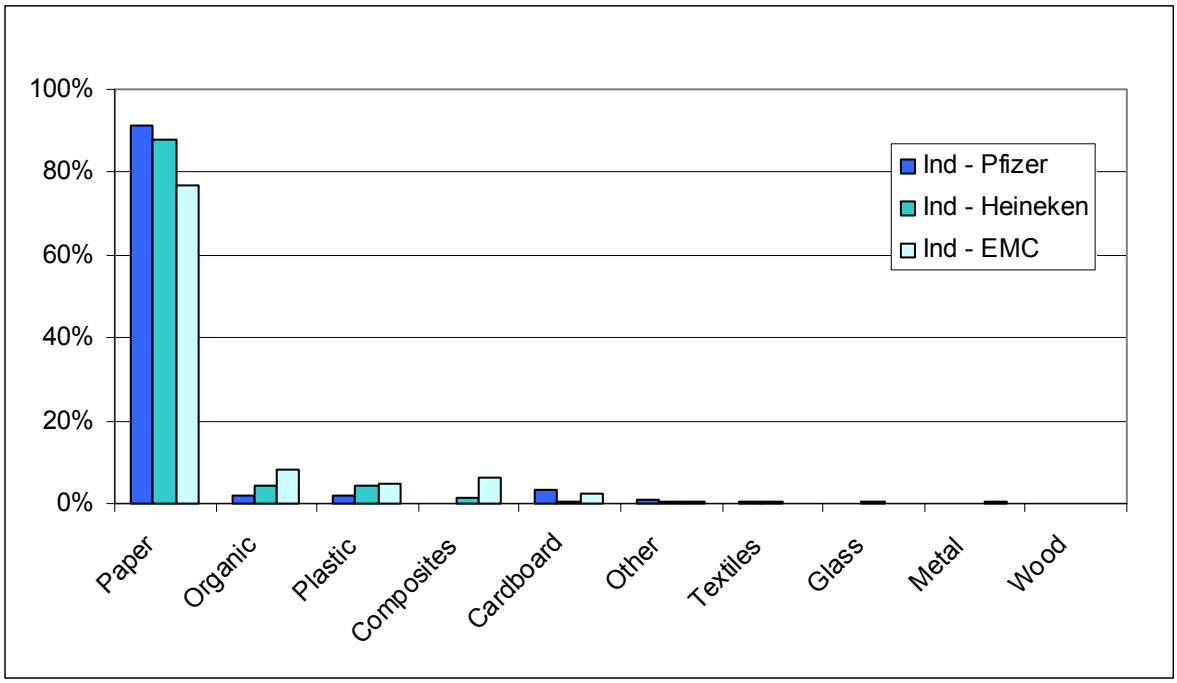
As can be seen though there are some differences, due to the large quantity of waste generated at these sites the overall canteen impact is small. However, considering a number of the commercial facilities with on-site canteens the impact that canteens can have, especially where the overall quantities of wastes generated are relatively small, can be significant (the differences in the other commercial sectors where the total waste generated is large is similar to the industrial sites profiles).

Figure 4.28: Comparison of Total Waste Arisings, with and without Canteen Wastes at AIB



In addition to examining canteens, office wastes – another common and significant sub-sector within the industrial sites – were compared. These findings are shown in Figure 4.29.

Figure 4.29: Comparison of Office Wastes Arisings from EMC, Pfizer and Heineken



The close similarities of the three offices again indicate a degree of consistency within this sub-sector of industry. The slight difference of the EMC[2] results (higher quantity of organics and composites) was due to the composite cups (including tea bags and residual liquids). Comparing the actual annual quantities generated per employee doesn't provide a conclusive and consistent value. These are listed in Table 4.5.

Table 4.5: Comparison of Office waste produced per employee annually at various industrial locations

	No. of employees	Quantity of Office waste generated annually / kg	Quantity of Office waste per employee per annum / kg
EMC[2]	1500	74,169	49.5
Pfizer	250	18,432	73.73
Heineken	204	22,212	108.9
Average			***77.4***

It should be noted that the relative number of people working in the office sections of each industry has not been determined. On a percentage basis of the total number of employees there were more office workers in Heineken than either EMC[2] or Pfizer and more in Pfizer than in EMC[2]. This may explain the relative variations in the calculated values.

As mentioned earlier, scaling up industrial waste nationally is not feasible. However, by splitting each industry into individual constituent parts may provide an option for characterisation. For example, if a particular industry contains offices, canteen, stores, and the shop floor, then characterisation of the wastes emanating from each area could be used to used to determine the overall waste character of that business.

4.3.2.3 Use of Information on Municipal Waste Reported to the EPA

There are a number of limitations in the use of data on municipal waste reported to the EPA by industrial sectors for non-household waste characterisation;

1. Data is reported according to EWC codes. Data reported under material specific EWC codes is useful (though limited in detail, e.g. plastics are reported as a group). However, a large percentage of waste is reported under EWC codes which are not material specific, e.g. EWC code 20 03 01 (Mixed municipal waste).
2. Industry often uses incorrect EWC codes when reporting to the EPA. Table 4.6 illustrates some actual misclassifications discovered in this study.

Table 4.6: Comparison of Waste Reported to Actual Waste Arising

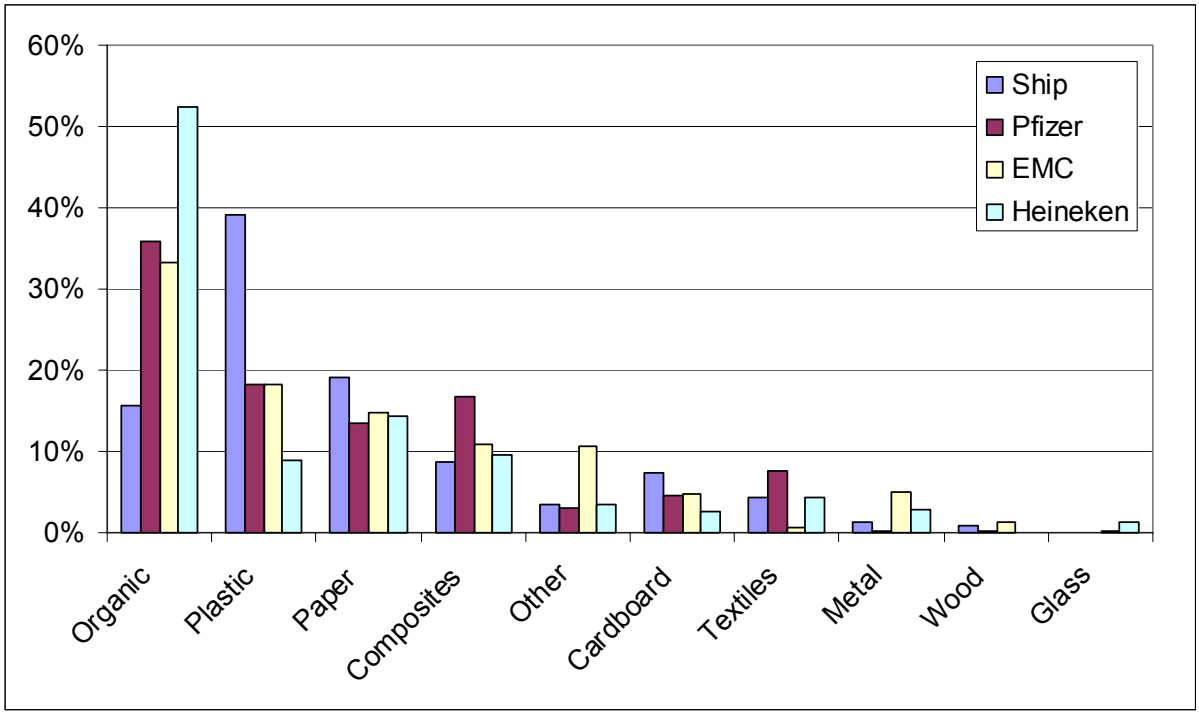
EWC Code used in EPA reporting	Related EWC description to waste reported	Reported waste description	Actual EWC code applicable
20 01 08	Biodegradable kitchen waste	Mixed Kitchen waste	20 03 01
20 01 08	Biodegradable kitchen waste	Canteen Oil	20 01 09
07 05 14	Solid waste from the MFSU of pharmaceuticals	Mixed municipal waste from site	20 03 01
15 01 01 / 15 01 02	Cardboard and Plastic packaging	Weights for cardboard and plastic should have been reported separately	15 01 01 15 01 02
20 01 04	Non existing	Scrap metal	20 01 40
20 01 03	Non existing	Canteen waste	20 03 01
None	Mixed recyclables	Mixed municipal waste from site	20 03 01
20 01 08	Canteen Waste	Mixed municipal waste from site	20 03 01

Data on municipal waste reported to the EPA by industrial sectors can be improved by;

1. Requesting industry to report waste in more detail. This can be achieved by requesting IPC companies and respondents to the EPA industrial questionnaire to provide more specific information on their waste in addition to the EWC code information. For example:

    - Waste falling within the EWC code 20 03 01 (mixed municipal waste) could be scaled up to generate a national figure for Industry (mixed wastes only). It was found that the mixed wastes from the four industrial sites were relatively similar (though Ship – the SME without a canteen was somewhat different to the others). Thus if accurate reporting of this fraction is performed a tentative scale-up could be made. The mixed waste only profiles are displayed in Figure 4.30.

Figure 4.30: Comparison of the mixed wastes generated at the four industrial sites surveyed



- In addition to this, wastes within this code (EWC 20 03 01) should be further classified as canteen waste, office waste, garden waste etc. Thus the profiles generated here can be used to scale up and/or generate a profile for that proportion of the mixed waste stream;
- Plastic waste reported as EWC code 20 01 39 should be further classified according to the type of plastic arising.

2. Industry should be provided with training and advice on classification of waste according to EWC codes.

More detailed reporting on the actual type of waste arising and the source of the waste arising will allow for accurate characterisation of industrial waste.

5 CONTAMINATION

The issue of contamination in municipal waste characterisation was identified in the brief as an area for specific attention. Contamination of material, e.g. paper bag being contaminated by food waste, can impact the results and usefulness of waste composition surveys. Characterisation studies often allude to the problems of contamination but, in general, do not tackle the issue. In the course of this study contamination of a number of material streams from the mixed waste stream was examined.

Contamination, though not formally defined, can be broken into four main categories.

- ***Cross-Contamination***: this contamination is a result of co-mingling of waste fractions in residual bins and containers. It is a significant problem for mixed municipal waste as large quantities of it are traditionally food waste. This affects all other fractions, especially paper and card which absorb the inherent moisture.
- ***Residual Contamination:*** typically this occurs in packaging waste where product (generally food) is left in the packaging material. This can have dramatic effects on results. For example, a typical 0.5 litre PET bottle weighs 25 grams with its cap on, an additional 25 mls of liquid will double its weight. Residual contamination affects the true weight of material contained in mixed residual waste and segregated waste for recycling.
- ***Storage Contamination:*** this is associated with stored waste getting wet, generally by rain, which yields inaccurate weights for collected wastes. This will mainly be confined to cardboard and paper products.
- ***Mixed Dry Recyclable Contamination:*** Within any dry recyclable collection there will be a certain percentage of it that will be un-recyclable. This material can also be referred to as 'non-conforming' material or 'non-targeted' material.

5.1 METHODOLOGY

Contamination measurements were carried out on packaging materials, both in-situ and off-site in a laboratory.

5.1.1 Methodology common to Household and Non-Household Surveys

The accuracy of the measurement of contamination levels will depend on:

- Number of waste categories for which contamination levels needs to be calculated
- Number of samples to be subject to contamination analysis

Waste Categories for Contamination Assessment

In order to measure the level of contamination on packaging for the primary waste categories (e.g. paper, plastic) it is necessary to investigate each secondary subgroup presented. This is because of the multi-material nature of packaging (e.g. plastic packaging waste is composed of PET and PE containers, plastic films, mixed rigid and flexible packaging). Since each of type of packaging may have different contamination levels based on their content (e.g. butter will adhere more to a container than will water).

Number of samples

No information was available in the existing literature on the coefficient of variation of contamination levels for the different waste categories, which could have helped to determine the number of samples required. It was decided to collect as many samples as practicable and use the results to determine the number of samples required for future surveys.

Contamination Analysis

The purpose of the contamination study was to determine the correction factors for the quantities of packaging waste collected and measured by weight.

Contamination levels were measured according to the following procedure:

a) Samples were collected during the waste characterisation process;

b) The item was weighted while contaminated;

c) Items of contamination were physically removed from the material being analysed – usually liquids or food residues. Where necessary containers or packaging are subsequently washed;

d) Drying of the material (where appropriate) to remove any moisture contamination;

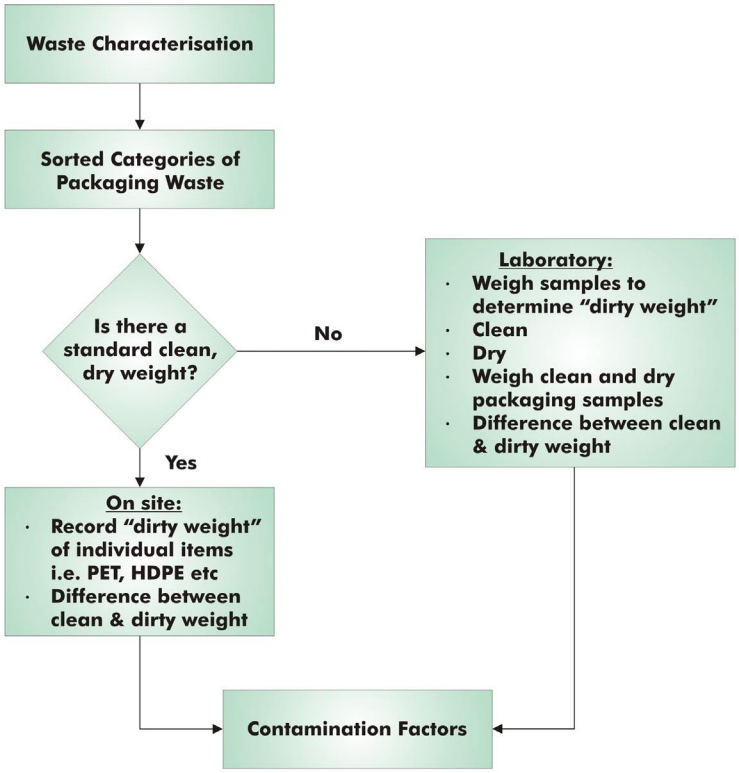
e) Weighing of the clean dry test material and comparing this with the contaminated weight to generate the contamination correction factor.

A summary of the methodology is presented in Figure 5.1.

Where a particular item is very common in the waste stream, it might be possible to determine in advance what its clean, dry weight is. In this case the cleaning and drying step is not necessary.

Standard weights were not available for all materials. Those waste categories were glass, paper and cardboard, supermarkets bags & films, mixed flexible and mixed rigid plastics.

Figure 5.1: Process Flow-chart for Calculation of Contamination



% Contamination = (dirty weight – clean weight) / Dirty weight

Three differences arise in the methodologies employed in the contamination analyses for household and non-household packaging waste.

- Firstly, household waste composition was carried out on collected waste, therefore we expect to have an increased contamination due to mixing and compaction in the Refuse Collection Vehicle. The non-household waste was characterised at the point of generation.
- The household waste contamination studies were carried out after the majority of the samples have been through the waste characterisation process. As part of this, drinks bottles, i.e. PET and HDPE had been emptied of their contents in cases where the weight of liquid was estimated to be greater than the weight of the container. The non-household waste contamination did not empty the contents but assessed the containers in the conditions they were received.
- Finally, in the contamination analysis of the non-household waste, an oven was used to dry the samples after the initial weighing and cleaning of the samples (typical operating temperature was 70°C for 24 hours). The household waste was drip dried for a period of 7 days.

5.1.2 Household Samples

Waste contamination measurements were carried out on Mixed Residual Waste and Mixed Dry Recyclables. Generally, the contamination of material takes place after the material has been discarded. Typically contamination occurs in packaging waste where product (generally food) is left in the packaging material. It was intended that the correction factors developed be applied to packaging waste composition calculated during the waste composition surveys.

5.1.2.1 Number of Waste Categories

The relative importance of each secondary packaging waste category was measured following the first waste characterisation campaign in October 2004. A total of 13 secondary categories were selected for assessment as they represented 94% of the packaging waste landfilled.

5.1.2.2 Number of Samples

Preliminary investigations of the most relevant waste streams (with regard to contamination) were conducted.

Samples were taken from the sorted categories of packaging waste, once the characterisation was complete[14]. In some cases it is necessary to go to the bulk sample from the RCV in order to get enough samples to test contamination. Where this is required, the samples should be selected, characterised and then the contamination measured. Any bottles containing liquid (typically this only applied to PET and HDPE), which had been sorted as part of the waste characterisation, were emptied into the “Liquid fit for human consumption” collection container.

The samples were weighted and the weight noted. Items that had a standard weight, which was known when clean and dry, could be weighted individually during the waste characterisation. This, in particular, is applicable to PET, HDPE, Composite liquid packaging (Tetra Pak), Ferrous packaging and aluminium packaging. The other samples were analysed in a laboratory, as no standard weight was known, following Figure 5.1. Standard weights for these items, when clean and dry, were obtained from preliminary surveys.

The difference in weight is calculated as a percentage of the ‘dirty weight’ to determine the percentage of the household waste, that is collected, which is contamination.

5.1.2.3 Sampling Locations

Samples were taken from the Mixed Residual Waste at each Waste Characterisation location (as per Section 3.1). Mixed Dry Recyclable samples were only taken at the Oxigen depot, at Clonshaugh, Co. Dublin, because very little variability was expected in the contamination of this waste stream due to the limited proportion of organic waste.

[14] In some cases it is necessary to go to the bulk sample from the RCV in order to get enough samples to test contamination. Where this is required, the samples shuld be selected, characterised then contamination is removed.

5.1.3 Non-Household Samples

5.1.3.1 Number of Waste Categories

Due to the source segregation that currently exists in most businesses, there are a number of waste materials where contamination is prevalent and other materials where it is not as evident. For example, the majority of businesses now segregate both paper and cardboard. These segregated streams are generally stored in dry areas and as such contamination is not a significant contributing factor to their overall percentages. Ferrous metals generally arise from canteens and while some sites are poor at cleaning these, most clean and store separately for recycling. Aluminum cans and glass are usually empty so contamination is not a major factor with these streams.

One area where contamination is an issue is plastic packaging – especially PET and HDPE. In non-household samples of PET and HDPE bottles, the bottles were not emptied prior to contamination analysis. Paper packaging can also be highly contaminated but this is usually limited to tissue paper and paper packaging in the canteens rather than originating in other areas of the commercial business.

The level of contamination in waste arising from commercial and industrial premises will vary considerably depending on the sector from which the waste is arising. More importantly the level of contamination (generally by organic waste) will depend on the level of waste segregation at the specific premises. The survey methodology employed in this project attempts to segregate the organic 'contaminant' at source such that the true packaging levels and true organic fraction are measured. Minimised contamination levels result in accurate waste characterisation.

5.1.3.2 Sampling locations

Table 5.1 shows the companies from which samples of non-household waste were taken.

Table 5.1: Sources of the Different Categories, of Non-Household Waste, for Analysis

Secondary Packaging Waste Category	AIB	Pfizer	Carrigaline Court	RTE	EMC	Heineken	Jacobs	Musgraves	Dunnes Stores
Paper Packaging						X	X	X	X
Flat and corrugated						X	X	X	X
PET packaging	X	X	X	X	X	X	X	X	
PE packaging	X	X	X	X	X	X	X	X	
Plastic films						X	X	X	X
Ferrous Metals	X	X	X	X	X	X	X	X	

5.2 RESULTS

5.2.1 Household Samples

5.2.1.1 Mixed Residual Waste (MRW)

Contamination levels and their confidence intervals at are presented in Table 5.2 for Primary waste Categories and Table 5.3 for Secondary waste Categories. This combines the results from all locations surveyed.

Table 5.2: Contamination Correction Factors on Primary Categories of Household MRW Packaging

Primary Category	No. of items	Total weight (kg)	Contamination	Confidence Interval (95% confidence levels, 10% accuracy)
Paper	1,440	11.98	25.9%	0.20%
Cardboard	863	20.61	21.5%	0.73%
Plastic	4,113	42.07	22.4%	1.31%
Glass	138	51.05	3.2%	0.17%
Metals	375	14.68	23.0%	2.74%
Composites	157	5.39	16.3%	2.83%

i.e. for every 1kg of paper packaging waste being landfilled, 259g (plus or minus 2.0g) is contamination

Table 5.3: Contamination Correction Factors on Secondary Categories of Household MRW Packaging

Secondary Category	No. of items	Total weight (kg)	Contamination	Confidence Interval (95% confidence levels, 10% accuracy)
Paper Packaging	1,440	11.98	25.9%	0.20%
Cardboard: Flat packaging	805	16.73	22.2%	0.49%
Cardboard: corrugated packaging board	58	3.88	20.8%	0.98%
PET packaging	148	5.79	14.2%	2.14%
PE packaging	196	5.04	23.1%	2.47%
Supermarkets bags & films	309	4.61	23.2%	1.11%
Mixed flexible plastic packaging	2,556	11.62	19.2%	0.21%
Mixed rigid plastic packaging	904	15.02	32.2%	0.61%
Green Glass packaging	56	26.91	2.5%	0.00%
Clear Glass packaging	82	24.13	4.0%	0.34%
Ferrous Metals	130	8.86	27.6%	3.12%
Aluminium	245	5.82	18.3%	2.35%
Liquid packaging	157	5.39	16.3%	2.83%

* i.e. for every 1kg of PET packaging waste being landfilled, 142g (plus or minus 2.14g) is contamination

5.2.1.2 Mixed Dry Recyclables (MDR)

Contamination levels in the mixed dry recyclables (Dublin) are presented in Table 5.4 for Primary waste Categories and Table 5.5 for Secondary waste Categories.

Table 5.4: Contamination Correction Factors on Primary Categories of Household MDR Packaging

Primary Category	No. of items	Total weight (kg)	Contamination	Confidence Interval (95% confidence levels, 10% accuracy)
Paper	245	17.15	7.2%	0.41%
Cardboard	228	34.46	4.4%	0.23%
Metals	515	17.99	8.2%	0.22%
Plastic	342	15.69	7.2%	0.29%
Composites	288	8.99	4.9%	0.27%

*i.e. for every 1kg of paper packaging waste being recovered, 72g (plus or minus 4.1g) is contamination

Table 5.5: Contamination Correction Factors on Secondary Categories of Household MDR Packaging

Secondary Category	No. of items	Total weight (kg)	Contamination	Confidence Interval (95% confidence levels, 10% accuracy)
Paper Packaging	245	17.15	7.2%	0.41%
Flat Packaging	154	17.10	3.7%	0.21%
Corrugated Packaging Board	74	17.36	5.0%	0.25%
Aluminium	287	5.89	8.5%	0.22%
Ferrous Metals	228	12.10	7.9%	0.21%
PET	177	8.15	7.9%	0.23%
HDPE	165	7.54	6.5%	0.35%
Liquid packaging	288	8.99	4.9%	0.27%

*i.e. for every 1kg of PET packaging waste being recovered, 79g (plus or minus 2.3g) is contamination

5.2.1.3 Effect of Locations

The results of the contamination assessments in mixed residual waste samples for each location are presented in Table 5.6.

Table 5.6: Household Contamination levels per location in Mixed Residual Waste

Secondary Waste Category	Waterford (County)	Fingal (City)	Galway (City)	Longford (Rural)	Limerick (County)	Cork (City)
Paper Packaging			26.8%		23.7%	30.6%
Cardboard: Flat packaging			16.3%		23.8%	31.1%
Cardboard: Corrugated Packaging Board			22.9%		17.4%	25.4%
PET Packaging	13.3%	14.2%	15.6%	20.4%	11.4%	11.7%
PE Packaging	21.0%	21.3%	13.9%	31.1%	25.0%	28.0%
Supermarkets Bags & Films			9.2%		31.6%	28.6%
Mixed Flexible Plastic Packaging			20.5%		28.7%	17.8%
Mixed Rigid Plastic Packaging			30.1%		28.7%	48.9%
Green Glass Packaging					2.5%	
Clear Glass Packaging					5.5%	2.5%
Ferrous Metals	33.6%	30.0%	25.1%	18.2%	36.6%	29.4%
Aluminium	25.2%	29.1%	13.5%	21.2%	15.2%	12.5%
Liquid Packaging	25.6%	28.8%	17.3%	8.4%	11.8%	12.3%

Contamination levels differ between some of the locations.

It seems that there is a correlation between the presence of organic waste in the black bin and the levels of contamination in the Mixed Residual Waste stream. The best comparisons that can be made are between Galway, Limerick and Cork, since there is a full compliment of data for each of these locations. The average contamination level in Galway was 19%, 23% in Limerick and 25% in Cork.

The biggest source of contamination present in the Mixed Residual Waste stream is Organic waste. Since there is a Brown Bin collection in Galway for Organic matter (food and garden waste), there is much less waste of this type being disposed of in the black bin. This would explain why Galway has the lowest contamination levels. A further analysis of the characterisation data shows that Cork has the highest Organic content and also the highest level of contamination, across the board. Limerick is placed between Galway and Cork in terms of the levels of contamination and organic matter in the waste.

In the secondary categories of plastic, for which there are data across the 6 locations, Galway and Waterford have the two lowest average contamination percentages and these are the two locations where Organic matter is collected in the Brown bins.

Another potential contributor to contamination levels is ash. To get a true assessment of the levels of ash in the waste, it is necessary to include 'Fines <20mm' as well as the 'Unclassified incombustibles' since some of the ash is contained in bags and so can be collected in the appropriate container for 'Unclassified incombustibles' whilst the loose ash will have gravitated through the 20mm (diameter) holes in the characterisation table. The results show that the three locations with the highest contamination levels are also the locations that have the three highest aggregate levels of 'Unclassified incombustibles' and 'Fines < 20mm', which are primarily ash. Similarly, the three locations with the lowest contamination levels had the three lowest levels of ash.

However, in terms of metals, the presence of organic matter in the bin is not a primary factor in the contamination levels. The contamination of ferrous metal packaging comes primarily from the residue of the contents remaining inside the tin and also the practices of some people in placing waste in the

ferrous packaging before disposing of in the bin. In aluminium packaging, it primarily consists of residual liquid and widgets in drinks cans and food in aluminium food packaging.

5.2.1.4 Comparison with other surveys

The contamination measurements were compared with the findings of the Oregon (State of Oregon DEQ,2002)and Austrian surveys (2001). These are shown in Table 5.7.

Table 5.7: Comparison between this Study (RPS MCOS) and other Characterisation Studies

Primary Category	RPS-MCOS ('04-'05)	Oregon (2002)	Austria (2001)
Paper	25.9%	22.8%	25.7%
Cardboard	21.5%		
Plastic	22.4%	25.8%	37.2%
Glass	3.2%	2.10%	3.5%
Metals (overall)	23.0%		17.9%
Ferrous	27.6%	8.5%	
Aluminium	18.3%	10.8%	
Composites	16.3%		

5.2.2 Non-Household Samples

Initial contamination studies were performed in-situ on a number of packaging materials during the course of the first series of surveys (October 2004). The studies were limited to PET, PE and ferrous metal food cans and the samples examined were all from the mixed municipal waste stream. Subsequent contamination studies (March 2005) continued these investigations and extended them to include cardboard, paper and plastic film packaging.

The results of the contamination studies are shown below for the three materials analysed.

Table 5.8: PET Contamination Analysis

	Total Weight (kg)	Actual PET Weight (kg)	Contamination Weight (kg)	% Contamination
AIB	6.78	3.04	3.74	55%
Pfizer	7.87	4.27	3.6	46%
Carrigaline Court	12.38	4.54	7.84	63%
RTE	21.78	10.15	11.63	53%
EMC	5.6	3.53	2.07	37%
Heineken	4.3	2.47	1.83	43%
Jacobs	0.63	0.52	0.11	17%
Musgraves	9.67	5.31	4.36	45%
Total	*69.01*	*33.83*	*35.18*	*51%*

The overall level of contamination associated with PET was generally very high. Apart from Jacobs restaurant, which used very little and cleaned what they had (this value has a minor effect on the

overall contamination level due to the small quantities involved). The contamination in this stream was exclusively attributable to excess liquid in the containers.

Table 5.9: PE Contamination Analysis in Non-Household Waste

	Total Weight (kg)	Actual PE Weight (kg)	Contamination Weight (kg)	% Contamination
AIB	2.83	1.74	1.09	39%
Pfizer	4.32	2.68	1.64	38%
Carrigaline Court	4.83	3.82	1.01	21%
RTE	7.12	4.46	2.66	37%
EMC	0.94	0.78	0.16	17%
Musgraves	2.57	1.89	0.68	26%
Heineken	1.97	1.69	0.28	14%
Jacobs	1.98	1.83	0.15	8%
Total	*26.56*	*18.89*	*7.67*	*29%*

PE contamination was associated with excess liquid (in milk bottles) and residual food (usually in the form of sauces) in food containers. The percentage of contamination was quite varied in this material. The value for Jacobs is lower than in other facilities. Excluding this from the calculations yields a contamination figure of 31%.

Table 5.10: Ferrous Metals Food Cans Contamination Analysis[15] in Non-Household Waste

	Total Weight (kg)	Actual Ferrous Can Weight (kg)	Contamination Weight (kg)	% Contamination
AIB	2.55	2.19	0.36	14%
Pfizer	2.09	1.91	0.18	9%
Carrigaline Court	-	-	-	N/A
RTE	13.28	11.68	1.6	12%
EMC	-	-	-	N/A
Musgraves	1.64	0.75	0.89	54%
Heineken	7.06	4.38	2.68	38%
Jacobs	1.16	0.97	0.19	16%
Total	*27.78*	*21.88*	*5.9*	*21%*

As most canteens had facilities for recycling metals (where the majority of ferrous tin cans arose), the overall contamination levels were low. The data from Musgraves could be considered somewhat anomalous due to the relatively small quantity of materials available (1.63 kg). Contamination was mainly due to residual food in food containers. Omitting this value changes the level of contamination to 19%.

During the second phase of surveys additional investigation was done on:

[15] Most canteen areas are currently cleaning and recycling their tin food cans so there was limited scope for analysis of this waste stream.

(a) paper packaging,

(b) cardboard packaging and

(c) plastic film packaging.

During these contamination tests, samples of the above materials were extracted after the characterisation investigation. They were stored until an adequate weight was obtained and then dried in a ventilated oven overnight.

The results are presented in the following tables.

Table 5.11: Plastic Film Contamination Analysis in Non-Household Waste

	Plastic Film Weight/kg	Dried Plastic Film Weight/kg	Contamination Weight/kg	% Contamination
Heineken	5.12	4.08	1.04	20%
Musgraves	2.62	2.12	0.5	19%
Dunnes	4.56	3.55	1.01	22%
Jacobs	2.09	1.49	0.6	29%
Total	*14.39*	*11.24*	*3.15*	*22%*

Plastic films from the mixed waste were taken for analysis. The samples varied in composition from film packaging on food products to cling wrap from homemade sandwiches. The relatively high value in Jacobs is attributed to residual meat juices in the packaging but nevertheless the values are fairly consistent.

Table 5.12: Cardboard Contamination Analysis

	Cardboard Weight/kg	Dried Cardboard Weight/kg	Contamination Weight/kg	% Contamination
Heineken	4.48	3.84	0.64	14%
Musgraves	4.2	3.54	0.66	16%
Dunnes	6.73	3.54	3.19	47%
Jacobs	1.79	1.61	0.18	10%
Total	*17.2*	*12.53*	*4.67*	*27%*

In general, due to the source separation of organics, cardboard contamination was relatively low. The anomalous figure from Dunnes was due to the exposure of this particular sample to rain overnight. Omitting this from the calculations yields a relative contamination figure of 14%. Contamination in this stream was usually attributed to excess food attached to the samples or some degree of wetness – usually due to food residues.

Table 5.13: Paper Packaging Contamination Analysis

	Paper Packaging Weight/kg	Dried Paper Packaging Weight/kg	Contamination Weight/kg	% Contamination
Heineken	2.72	2.4	0.32	12%
Musgraves	1.22	1.04	0.18	15%
Dunnes	3.01	2.76	0.25	8%
Jacobs	1.15	0.97	0.18	16%
Total	*8.1*	*7.17*	*0.93*	*11%*

Paper packaging was usually quite clean with any contamination due to food – either through direct contact or through adsorption in the mixed waste stream.

5.2.3 Summary of Contamination Findings

The contamination findings from this study can be compared with the very detailed findings of the Oregon study mentioned during the literature review. These are compared in Table 5.14.

Table 5.14: Comparison between Non-Household Results and Other Characterisation Studies

Material	CTC % Contamination Level	Oregon Study % Contamination Level *
PET	51	27
PE	29	22
Ferrous Tin	19	10
Plastic film	22	33
Cardboard	14	17
Paper	11	15

* - these values are quoted in the literature as negative percentages

The estimated values from the current investigations compare relatively well for all materials with the exception of PET. PET, as a material was not examined during the Oregon study (the value used in Table 4.38 is for other plastics packaging which is not specific).

5.3 IMPLICATIONS OF CONTAMINATION ASSESSMENT

5.3.1 Use of Correction Factors

The assessment of municipal packaging contamination measured contamination levels from which correction factors can be calculated. The results presented in Section 5.2 must be used with caution. They can only be applied to 'correct' waste composition study results that are derived from the methodology used here. They should not be applied to the total tonnage of packaging waste as reported in the National Waste Database.

The condition of waste and degree of contamination changes during the different stages of management. For example, in Dublin the content of the household residual waste bin is landfilled in its entirety, therefore it is safe to correct the packaging landfilled content based on table 5.2. However in other locations waste must be trommelled or otherwise treated prior to landfiling, so the correct factor would not apply.

5.3.2 Effects of Contamination and Compliance with EU Directives

Future contamination correction factors if applied to the quantity of municipal waste reported by the EPA will have an effect on the compliance with the Packaging Waste Directive (94/62/EC) and the Landfill Directive (99/31/EC).

Applying the correction factors will reduce the weight of packaging waste by transferring the weight of contamination to the other waste categories.

In the residual waste stream, it will decrease the quantity of packaging waste landfilled and increase the quantity organic waste landfilled. In the mixed dry recyclables waste stream it will decrease the reported quantity of packaging waste sent for recovery. The net effect will be to reduce the proportion of packaging waste estimated to be landfilled. This will increase the estimated packaging recovery rates for Ireland as a while.

Under the EU Landfill Directive, the percentage of biodegradable waste landfilled is a key parameter. If a correction is applied to packaging waste, some of this must be attributed to the biodegradable (food) category. This will increase the amount of food waste landfilled, making it more difficult to reach the Directive targets.

5.3.3 Discussion

Sampling for Contamination

Prior to engaging in future assessments of contamination it should be clear where those corrections factors will be applied (whether on waste quantities sent for disposal or recovery or waste composition results) as the sampling methodology will differ. The two options are to measure contamination in tandem with the waste characterisation study (as in this project) or to measures contamination at the point of disposal or recovery. Differences are summarised in Table 5.15.

In order to apply contamination correction factors to waste quantities obtained from waste facility records (as in the national Waste Database), measurement of contamination at those facilities will be required. A choice can be made as to whether contamination surveys are carried out in tandem with composition studies or in dedicated surveys at the disposal or recovery points.

Table 5.15: Comparison of Contamination Measurement Methodologies

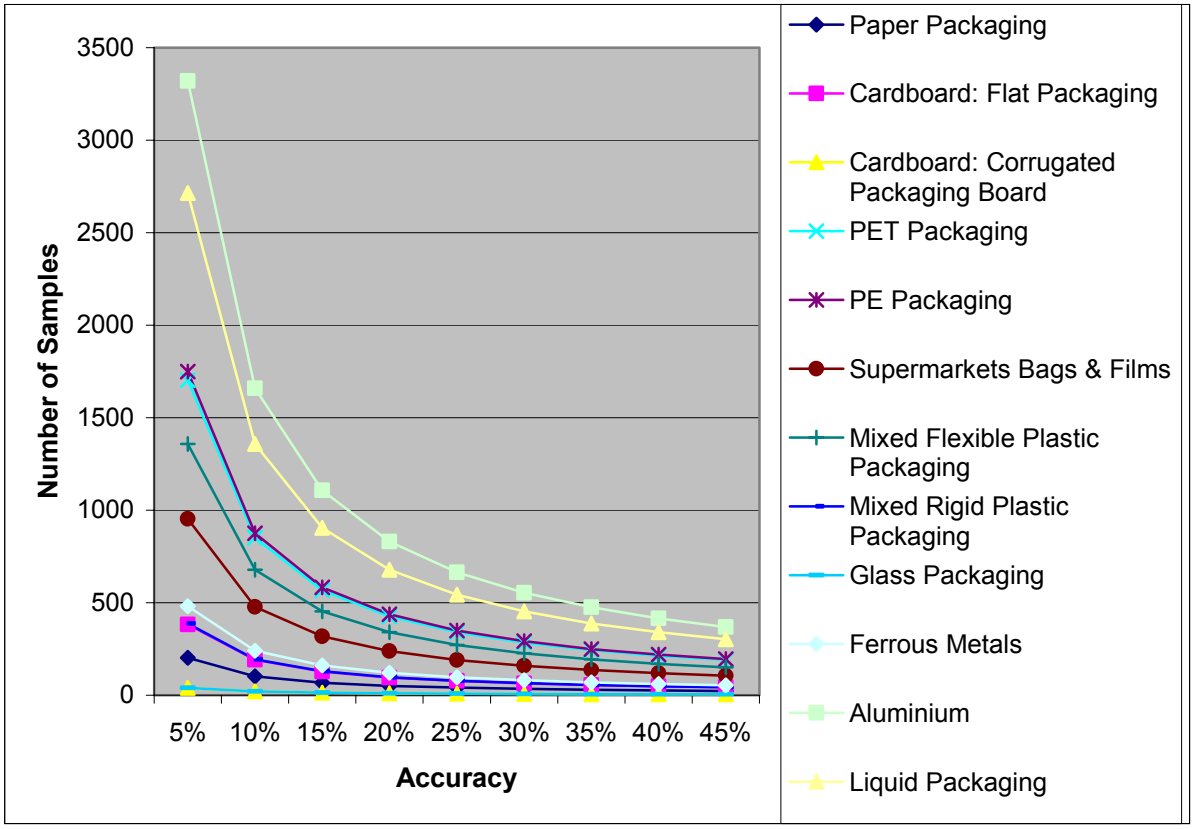
	Sampling for Contamination during Waste Composition Surveys	Sampling for Contamination at Waste Treatment Facilities
Advantages	o More details about area where samples were collected are required	o A dedicated survey examining contamination means less reliance on whether or not characterisation studies are completed by local authorities. o Higher number of samples can be processed o Economy of scale in contracting multiple surveys
Disadvantages	o Dependent on waste composition surveys carried out. o Complicates waste characterisation surveys o Difficult to find suitable facilities (samples may need to be transferred to a suitable facility)	o Difficult to distinguish between household and commercial waste

If the contamination correction factors are used in the calculation of national statistics, which will be reported to EU, we would recommend to carry out sampling at landfill sites, transfer station and MRFs.

5.3.4 Number of Samples Required

Using data obtained on household waste contamination, it was possible to determine the recommended number of samples (n) required to achieve the desired level of accuracy. This presented in Figure 5.2.

Figure 5.2: Recommended Number of Samples Required



5.3.5 Locations and Waste Types

It is recommended to concentrate the sampling effort on residual waste, as contamination in packaging waste sent to recovery is not expected to vary. However, another survey on the recovery waste stream should be carried out to confirm the findings presented in Section 5.2.1.

The future sampling will have to be carried out at different locations (e.g. landfill sites) to reflect the diversity in household and commercial residual waste collections and variations in pre-treatment methods employed by waste contractors in different locations.

5.3.6 Use Uniform Household and Non-household Methodologies

Sampling

Some difference in the household and non-household methodologies occurred in this survey. In order to ensure consistency and simplicity in future contamination assessments the following recommendations are made:

If sampling at the waste treatment facility, we recommend measuring contamination on an unsorted sample of packaging, as the contamination correction factor will have to be applied to unsorted waste.

If sampling during the waste characterisation, we recommend measuring contamination on a sample of packaging sorted as normal during the waste characterisation process. If the packaging contains liquid the contamination measurement should be carried out after the liquid has been emptied in the Liquid Fit for Human Consumption category, in cases where the weight of the liquid was estimated to be greater than that of the container.

- One advantage of this technique is that when a limited number of samples is available (e.g. PET is scarce in residual waste when a good separate collection scheme is in place), full containers would not create outliers that would distort the results. Overall the approach reduces the number of samples you need to reach statistical validity by removing outliers.
- It has also the advantage of reducing contamination of packaging without requiring a full and time consuming contamination assessment which is unlikely to be carried out with each waste composition survey.

Note – Correction factors should only be applied to waste composition results when the factor is calculated on samples that have been characterized using the same technique as the composition study.

Measurement of Contamination

It is important to keep a record of individual weights for each individual item where contamination was measured. It is also necessary to keep account of the number of items per sample. This will allow further statistical analysis.

6 GENERATING A NATIONAL PROFILE

6.1 NATIONAL PROFILE FOR HOUSEHOLD WASTE

6.1.1 Scale up per Cluster

Table 6.1 summarises the waste composition and waste arising per cluster.

Table 6.1: Waste Composition by Primary Category for Each Cluster

Clusters	2-BIN RURAL	3-BIN RURAL	2-BIN TOWN	3-BIN TOWN	1-BIN CITY	2-BIN CITY	3-BIN CITY
kg / household / week*	24.87	27.11	24.27	24.08	18.55	22.57	17.37
Primary Waste category							
Organics	26%	25%	28%	22%	25%	37%	28%
Papers	19%	19%	29%	19%	15%	21%	20%
Cardboards	8%	5%	7%	5%	8%	5%	5%
Composites	3%	1%	1%	1%	2%	1%	2%
Textiles	11%	9%	7%	8%	10%	5%	7%
Plastics	13%	12%	13%	10%	13%	12%	10%
Glass	5%	5%	6%	6%	12%	7%	9%
Metals	3%	4%	2%	6%	4%	4%	3%
Wood	1%	1%	0%	1%	5%	1%	0%
Special municipal waste	2%	2%	0%	1%	0%	1%	1%
Unclassified Combustibles	0%	1%	0%	2%	1%	0%	1%
Unclassified incombustibles	1%	3%	2%	3%	1%	1%	2%
Fines	5%	10%	4%	12%	2%	3%	11%
Bulky waste+WEEE	3%	2%	0%	2%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

*This includes waste delivered to Recycling Centres and Bring Banks

Table 6.2: shows a comparison of the total percentage of packaging waste per cluster.

Table 6.2: Comparison of Packaging Proportion Between Cluster

Clusters	2-BIN RURAL	3-BIN RURAL	2-BIN TOWN	3-BIN TOWN	1-BIN CITY	2-BIN CITY	3-BIN CITY
Packaging Proportion	29%	27%	27%	25%	36%	29%	28%
Quantity (kg) / household / week	7.1	7.2	6.5	6.0	6.3	6.6	4.8

The proportion of packaging waste is relatively constant between clusters except in the cluster 1-bin City (apartments). This can be explained by the lower quantity of organic waste generated which increases the proportion of other materials. Cluster 3-bin City has a much lower quantity of packaging per household than other clusters, this is mainly due to the low waste generation of the area surveyed (Galway City).

6.1.2 National Scale up and Comparison with Previous Surveys

6.1.2.1 Scale up

The number of households in each cluster shown in Table 3.4 was used to generate a weighted mean of the household waste composition in Ireland.

Table 6.3 presents the weighted mean composition and household waste quantity for the primary categories. This includes material collected in Recycling Centres and Bring Banks.

Table 6.3: 2004 Irish Household Waste Composition

Primary Waste category	% Non-Packaging	% Packaging	% Total	kg / household / week	kg / household / year	Tonnes / year
Organics	29%	0%	29%	6.9	357	460,236
Papers	20%	2%	22%	5.1	264	339,432
Cardboards	0%	6%	7%	1.6	81	104,176
Composites	0%	1%	2%	0.4	21	27,503
Textiles	8%	0%	8%	2.0	102	131,896
Plastics	2%	10%	12%	2.9	153	196,723
Glass	0%	6%	6%	1.5	76	98,499
Metals	1%	2%	4%	0.8	43	55,925
Wood	1%	0%	1%	0.2	10	13,370
Special municipal waste	1%	0%	1%	0.2	12	16,090
Unclassified Combustibles	0%	0%	0%	0.1	5	5,835
Unclassified Incombustibles	1%	0%	2%	0.4	18	23,696
Fines	5%	0%	5%	1.2	61	78,986
Bulky Waste+WEEE	1%	0%	1%	0.3	17	21,429
Total	72%	28%	100%	23.5	1222	1,573,795

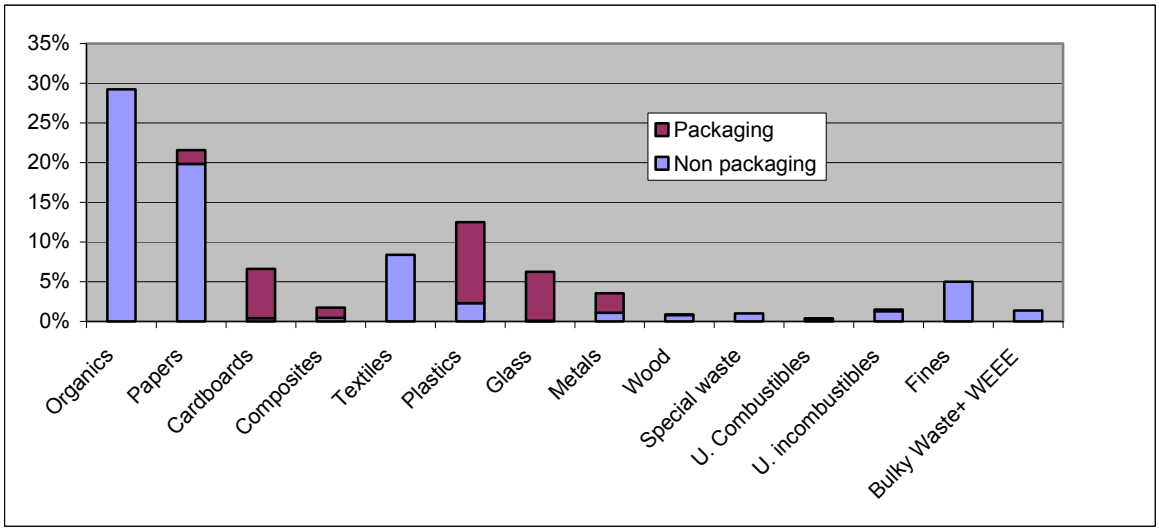
This demonstrates a reasonable correlation with the composition profile presented by the EPA in the 2001 National Waste Database Report. There is also a close correlation between the quantity collected during the surveys (average 23.5 kg/week) and the waste arisings reported in EPA National Waste Database Interim Report 2003 (23.8 kg/week).

The quantity of bulky waste and WEEE is lower than other European countries (i.e. Holland has a bulky waste generation of 129 kg / person / year). The quantity may be underestimated due to the use of private collectors instead of public collection channels, and non reporting or errors in reporting (e.g. classified as street cleaning instead of household) . Only Co. Longford (83 kg/household/year) and Co. Waterford (28 kg/household/year)) reported bulky waste collection in 2003 in the National Waste Database returns[16].

Figure 6.1 shows the breakdown between packaging and non-packaging waste in household waste.

[16] ESTO project: Scenarios of household waste generation in 2020

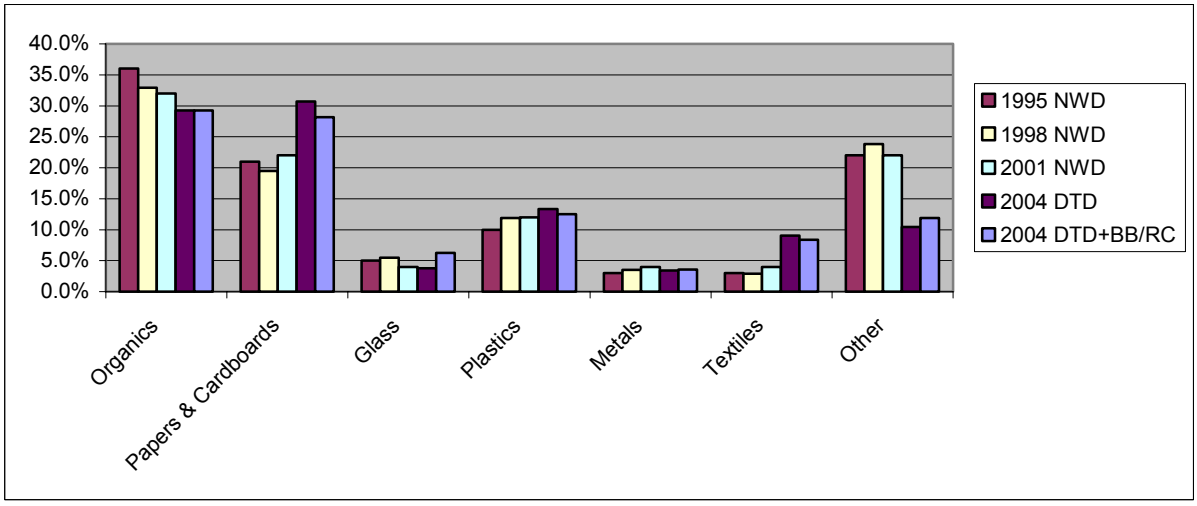
Figure 6.1: Irish Waste Composition per Waste Category and Packaging / Non packaging



6.1.2.2 Comparison with Previous Surveys

Figure 6.2 shows a comparison of the national results with the previous waste composition surveys published in the 1995, 1998 and 2001 EPA National Waste Database. The previous surveys were only carried out on residual waste or waste brought to landfill, and do not take into account the materials diverted towards recycling by separate collection.

Figure 6.2: 2004 Results Compared with Previous National Waste Database Waste Reports



* (DTD- door-to –door collection only, DTD +BB/RC: door-to –door collection and delivery to Bring Banks and recycling Centres).

The reduction in organic waste and increase in paper waste follow the forecast from 1995 to 2020 published by ESTO[17] and is consistent with the trend demonstrated in previous waste composition

[17] ESTO project: Scenarios of household waste generation in 2020. Reduction of 29.3% to 27.8% of the EU average waste composition between 1995 and 2020 predicted for the EU countries.

surveys. The decrease in organics may be explained by a decrease in food waste generated for a combination of reasons (e.g. increase in convenience food use, less leftovers, reduction in peelings, and increased home composting).

The increase in paper, cardboard, and glass follows EU predictions [18]. These wastes are associated with the increases in packaging, newspapers and magazines, plastic bottles, tin cans etc., reflecting our change to a consumer society.

The steady percentage of the plastic category can be explained by the effect of the Plastic Bag Levy 2002, which counteracts the increased replacement of traditional packaging by flexible and rigid plastic packaging.

The increase in textiles may be explained by the switch of the secondary category 'disposable nappies' from primary category 'composites' to 'textiles'. Disposable nappies account for 4% of the overall waste composition. Clothing has become relatively less expensive in recent years and this may be another factor behind the increase.

The reduction of the category 'others' is also significant. Likely reasons for this include a more diligent sorting during this programme, less ash due to a decrease in the use of solid heating fuel and an increase in textile due to 'disposable nappies' now being classified as 'textiles' rather than 'composites'.

6.1.2.3 Packaging Waste

The average percentage of packaging for waste collected by door-to-door and drop-off collection is 28%. The breakdown of each category is shown in Table 6.4.

Table 6.4: Irish Packaging Breakdown by Packaging Categories

Packaging Waste Category	%
Paper Packaging	2%
Cardboard packaging	6%
Composites packaging	1%
Textile packaging	0%
Plastic packaging	10%
Glass packaging	6%
Metals packaging	2%
Wood packaging	0%
Other packaging	0%
Total packaging	**28%**

This is higher than the percentage reported in the 1998 EPA National Waste Database where 25% of the residual waste bins content was packaging waste. The 1998 result was obtained from the waste

[18] European Topic Centre, Future Waste Amount in the EU, 2001, http://waste.eionet.eu.int

characterisation campaign carried out in Dublin as part of the REMECOM project and excludes waste collected by bring banks at the time. The 2004/2005 results seemed to agree with the increasing amount of packaging waste arisings for the years 2001,2002 and 2003 reported in Appendix A of the EPA National Waste Database Interim Report 2003.

6.1.2.4 Applying the Contamination Correction factors

As an exercise, the contamination correction factor (see Section 5.2) was applied to the national household waste profile. It was assumed that all contamination was due to biodegradable kitchen and canteen waste. The difference between the primary waste categories is presented in Table 6.5.

Table 6.5: Household Waste Composition Profile with and without Contamination Correction Factors

	No Correction	Contamination Correction
Packaging Weight (Kg/household/week)	6.68	5.89
Organics	29.20%	32.70%
Paper Packaging	1.7%	1.4%
Cardboard Packaging	6.2%	5.4%
Composites Packaging	1.3%	1.2%
Plastics Packaging	10.2%	8.4%
Glass Packaging	6.2%	6.1%
Metals Packaging	2.5%	2.2%
Textile Packaging*	0.0%	0.0%
Wood Packaging*	0.0%	0.0%
Other Packaging*	0.3%	0.3%
Total Packaging	28.4%	25.0%

*No correction factors were applied to those categories

The impact of the correction factors is to reduce the packaging content overall by 3.4% of overall content. Given that household waste generation is approximately 1.5 million tonnes, this would be roughly equivalent to 50,000 tonnes of packaging. The amount of organic waste would increase by the same amount. As outlined in Section 5.3 caution must be employed in applying the correction factors.

6.1.2.5 Mixed Residual Waste Scale-up

In order for the EPA to report on the quantities of packaging and organic waste landfilled under the EU Directive on the Landfill of Waste (99/31/EC) and the EU Directive On Packaging and Packaging Waste (94/62/EC), an average household residual waste composition was calculated using the same scale-up methodology as described in section 2.2.1.3. The results are presented in Table 6.6

Table 6.6: Average Residual Waste Composition

Primary Waste category	Non packaging	Packaging	Total
Collected	12.93	4.08	17.01
Organics	36%	0%	36%
Papers	13%	2%	15%
Cardboards	1%	4%	5%
Composites	1%	1%	2%
Textiles	11%	0%	11%
Plastics	3%	11%	14%
Glass	0%	4%	4%
Metals	1%	2%	3%
Wood	1%	0%	1%
Others	10%	0%	10%
Total	**76%**	**24.0%**	**100%**

6.1.2.6 Future Methodology for Scale-Up of Household Results

The result from each local authority should be combined to calculate the national profile.

It is recommended to combine all the results from Cities to obtain a city waste composition profile and repeat the exercise for towns and rural areas.

All households located in Cork City, Galway City, Limerick City, Waterford City and the Dublin Region are classified in City. Fingal County Council was assumed to be in the City category, though it has 9% of its population in rural areas.

The national waste composition profile is generated by calculating the weighted mean for each category using proportion of households shown in Table 6.7 as weighing factors.

Table 6.7: Number of Households in the Group Cities, Towns and Rural.

	Number of households	Proportion 2002
Cities-Apartments	76,904	6%
Cities-Houses	400,507	31%
Towns	306,431	24%
Rural	504,116	39%

The number of households in urban and rural areas for each local authority can be found at http://www.cso.ie/census/documents/vol3_t1_9.pdf.

Table 6.7 needs to be updated after each Census of Population.

Using the above approach, even if not all local authorities report waste composition surveys, a waste composition can still be calculated for each level of urbanisation.

It is advised that the suitability of this stratification be reviewed, if new developments in Irish waste management occur.

6.2 NATIONAL PROFILE FOR NON-HOUSEHOLD WASTE

6.2.1 Introduction

As detailed in Section 2.2, two methods are used to scale up the results of the current surveys (including the findings of MS-7 where appropriate) to generate a national profile for the commercial waste arisings. In summary these scale-up methods are:

1. ***Sectoral Size*** – the most significant commercial waste producing sectors are quantified. This is done with the assistance of waste contactors (IPODEC Ireland) who provided data on sectoral waste tonnage arisings in a number of national locations. Taking these findings and combining them with similar data gathered during MS-7, the size of the most significant commercial sectors (as a percentage) is determined. The national tonnages for each sector are thus deduced by applying these percentages to the EPA National Commercial waste arising figures (National Waste Database 2003[19]). The waste character for each specific sector (often referred to as a "fingerprint") as determined during the current characterisation study is then applied to the relevant sectors to determine a national waste profile.

2. Sector specific socio-economic factors (***Sectoral Factors***) – after conducting the audits on the relevant businesses the quantity of waste produced per employee per year is calculated. Using these figures and the total number of employees in each relevant sector, the quantity of waste produced per sector is determined (employee figures were obtained from the Central Statistics Office). Where necessary, further breakdowns within the individual NACE codes are used (see Appendix A). In certain cases the number of employees may not be an appropriate scale up factor and in these cases sector specific scale up factors are used. Some possible examples of different sectoral factors are:

- Floor area or turnover for retail & wholesale
- Number of meals for restaurants
- Number of bednights sold for hotels
- Number of bed days in hospitals

A comparison of the findings from both methodologies should indicate either (a) anomalies in calculations (from either the surveys or scale-up); or (b) findings that correlate well.

It should be noted that although a number of industrial surveys were conducted there is insufficient data available to generate a profile characteristic of that portion of the NHMW. As noted in Section 4.5 there was wide disparity between the industrial survey results as a whole, though specific internal areas within the businesses (e.g. canteens and offices) had similar profiles. Generation of a profile for this part of the non household municipal waste requires further (and more elaborate) data gathering.

[19] National Waste Database 2003, Interim Report, EPA, 2004

This would be most effective if AERs and industrial questionnaires were amended to provide accurate quantitative and qualitative data.

6.2.2 Scale up based on National Waste Arising Data – 'Sectoral Size'

6.2.2.1 National Waste Arisings

During MS-7 it was determined that of the total commercial waste *arisings*[20]in 2001, 495,552 tonnes of it was actually attributable to industrial non-process municipal waste (INPMW). This figure was determined through an EPA survey of industrial waste generators. This waste was reported under EWC Chapter 20 (275,012 tonnes) and Chapter 15 (220,540 tonnes). As more recent data is not available the ratio of these values is used to generate a comparative estimate of the quantity of commercial and industrial wastes from the 2003 national commercial waste figure 1,332,735 tonnes. The breakdown is shown in Table 6.8.

Table 6.8: Breakdown of Non-Household Municipal Waste into Commercial and Industrial Waste

Year	Total Commercial Waste Arisings / tonnes	Calculated Industrial Waste Arisings / tonnes	Calculated Commercial Waste Arisings / tonnes[20]
2001	1,156,732	495,552	661,180
2003	1,332,735	570,944	761,791

In 2001 data it was estimated that non-process industrial municipal waste contributed 42.84% to the total commercial waste arisings. Applying this percentage to the 2003 commercial waste arisings indicates that of the total commercial waste arisings reported in the 2003 database 570,944 tonnes is attributed to industrial waste and **761,791 tonnes** to commercial waste.

6.2.2.2 Sectoral Contributions to the Commercial Waste Profile

The main national waste producing commercial sectors were deduced during the MS-7 study from the relative market share of IPODEC Waste Contractors. The country was treated as two separate regions: the Dublin region (due to its size and individual make-up) and 'Outside Dublin' region. In the latter, an average of Limerick and Waterford market size was taken. During this current project similar values for the Cork region were obtained. These have been added to the 'Outside Dublin' profile to provide a broader data set from which to determine sectoral sizes. Scale up is done in a similar fashion to the previous work. The sectoral sizes for the various regions are shown in Table 6.9.

It is important to note the potential limitations of this method. Some waste contractors that were approached were unwilling to divulge this type of information due to its 'sensitive' nature. Therefore the sectoral breakdowns are based on the information of one waste contractor (albeit a major contractor). The data submitted by IPODEC Ireland contained tonnages produced per sector and their estimated market share of those sectors. A key recommendation of this report is to extend the reporting requirements of all waste contractors to include weight of waste collected per sector that they collect from. This would lead to a far higher degree of certainty of the sectoral sizes used in this scale up method.

[20] National Waste Database 2001, EPA, 2002.

Table 6.9: Estimated % of Main Commercial Waste Producing Sectors in Dublin, Cork, Limerick and Waterford

Sector	*Dublin*	*Cork*	*Limerick*	*Waterford*	*Cork/Lim./Wat. average*
Financial	19.9	4.4	0.6	1.2	2.1
Hotel	10.64	6.8	13.3	17.6	12.6
Transport/Communications	5.78	19.1	26	1.1	15.4
Wholesale	7.72	5.8	1	3.6	3.5
Supermarket	11.4	15.4	14.2	25.3	18.3
Other Retail	7.05	11.3	14.2	17.38	14.3
Public Offices	5.71	17.3	1.5	2.1	7.0
Colleges	9.47	4.1	2.8	4.5	3.8
Restaurant	10.54	6.4	4.4	4.6	5.1
Hospital	3.16	3.5	6.2	7.7	5.8
Other Sectors	8.63	5.9	15.8	14.92	12.2

6.2.2.3 National 'Commercial Waste' Arisings

The Dublin region, according to the National Waste Database Interim Report 2003, generates 460,064 tonnes of municipal waste arising from commerce and industry. This corresponds to 34.5% of the national total (as compared with 35.8% in 2001[2]). Thus, based on the estimated national **commercial** waste arisings of 761,791 tonnes (see Table 6.9), the Dublin region produces 262,818 tonnes of ***commercial*** waste. The remaining 498,973 tonnes is produced in the rest of the country. Applying these values to the sectoral weightings detailed in Table 6.9 allows calculation of the waste tonnages produced per sector nationally. These tonnages are shown in Table 6.10.

Table 6.10: National Tonnages of Waste Arisings from the Commercial Sectors

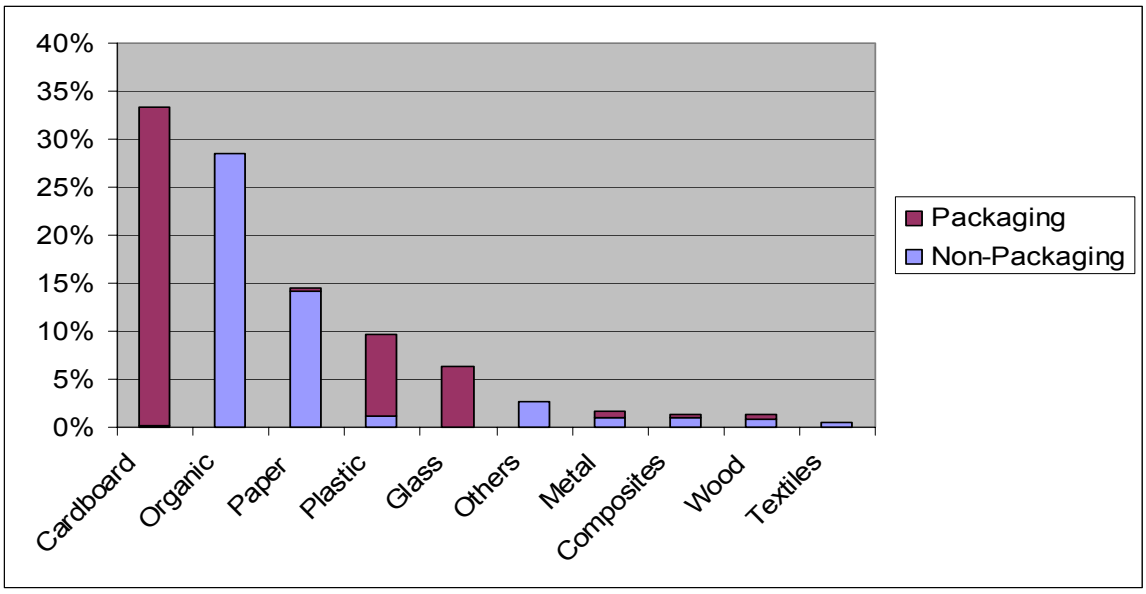
Total Waste Arising Per Sector					
Sector	% Per Sector		Tonnes Per Sector		National Total
	Dublin	Limk/Watd/Cork Average	Dublin	Outside Dublin	(Tonnes)
Financial	19.9	2.1	52,301	10,312	62,613
Hotel	10.6	12.6	27,964	62,704	90,668
Transport/Communications	5.8	15.4	15,191	76,842	92,033
Wholesale	7.7	3.5	20,290	17,298	37,587
Supermarket	11.4	18.3	29,961	91,312	121,273
Other Retail	7.1	14.3	18,529	71,320	89,849
Public Offices	5.7	7.0	15,007	34,762	49,769
Colleges	9.5	3.8	24,889	18,961	43,850
Restaurant	10.5	5.1	27,701	25,614	53,315
Hospital	3.2	5.8	8,305	28,940	37,245
Other Sectors	8.6	12.2	22,681	60,908	83,589
Total	**100%**	**100%**	**262,818**	**498,973**	**761,791**

The national waste character profile for the sectors examined during *this study only* are shown in Figure 6.3 and detailed in Table 6.11. A more detailed breakdown of the individual sectors is given in Appendix I. Each main material streams is broken into packaging and non-packaging wastes. Based on the sectors examined during this survey, only 547,501 tonnes of the total 761,791 tonnes of commercial waste are accounted for (i.e. approximately 72% of the total national waste arisings).

Table 6.11: National Commercial Waste Breakdown Data 2005 ('Sectoral Size' method)

Waste Categories	Total/tonnes		Total/%	
	Non-Packaging	*Packaging*	*Non-Packaging*	*Packaging*
Cardboard	940	177,475	0.2%	32.4%
Composites	5,798	1,898	1.1%	0.3%
Glass	28	35,247	0.0%	6.4%
Metal	5,530	3,745	1.0%	0.7%
Organic	158,697	0	29.0%	0.0%
Others	15,169	74	2.8%	0.0%
Paper	78,088	1,863	14.3%	0.3%
Plastic	6,510	46,668	1.2%	8.5%
Textiles	2,689	58	0.5%	0.0%
Wood	4,206	2,819	0.8%	0.5%
Total	**277,654**	**269,848**	**50.7%**	**49.3%**

Figure 6.3: National Commercial Waste Profile 2005 (Surveys Completed During this Survey only)



6.2.2.4 Combining MS-7 and the Current Study

In order to generate a more thorough waste character profile the findings from the MS-7 study have been combined with the current results. During this study some sectors common with MS-7 were examined and others were examined for the first time. Also, some sectors that were investigated during MS-7 were not considered during this project.

Extending the estimation described in the previous section (and summarised in Figure 6.3) to include the data from MS-7 produces a more complete national waste profile. The additional sectors included are public offices, hospitals and colleges. Also, where common sectors were analysed (e.g. hotels, finance) the results were combined. This extends the total quantity of waste accounted for from 547,501 tonnes to 678,205 tonnes. The results from this study, MS-7 and the combined values for the primary waste streams are summarised in Table 6.12.

Table 6.12: National Commercial Waste Breakdown Data – 2005, MS-7 and Combined Results

Waste Categories	***Composition of Commercial Arisings***		
	CTC 2005	**MS-7, 2001**	**Combined results**
Cardboard	32.6%	21.9%	26.0%
Paper	14.6%	25.7%	22.6%
Glass	6.4%	3.9%	4.5%
Plastic	9.7%	11.1%	10.6%
Metals	1.7%	3.5%	3.3%
Organics	29.0%	28.7%	27.1%
Textiles	0.5%	0.9%	0.7%
Others	5.5%	4.4%	5.2%
*Total Commercial waste arisings accounted for**	**72%**	**83%**	**89%**

* Surveys in 2005 included certain commercial sectors that were not surveyed in 2001 (see also Table 6.27)

There are some differences in the results obtained from MS-7 and this study. These can be attributed to the different commercial enterprises examined. During MS-7 colleges and public offices were included. These generated large quantities of paper waste. During the present survey a large supermarket, a large wholesaler and a large drapery store were analysed. Each of these generates significant quantities of cardboard. So while the overall quantity of paper/cardboard was virtually unchanged the specific make up did change.

The percentage of glass is a little higher than in the current work (probably due to the nature of the hotel and restaurant investigated) while metals and others were lower.

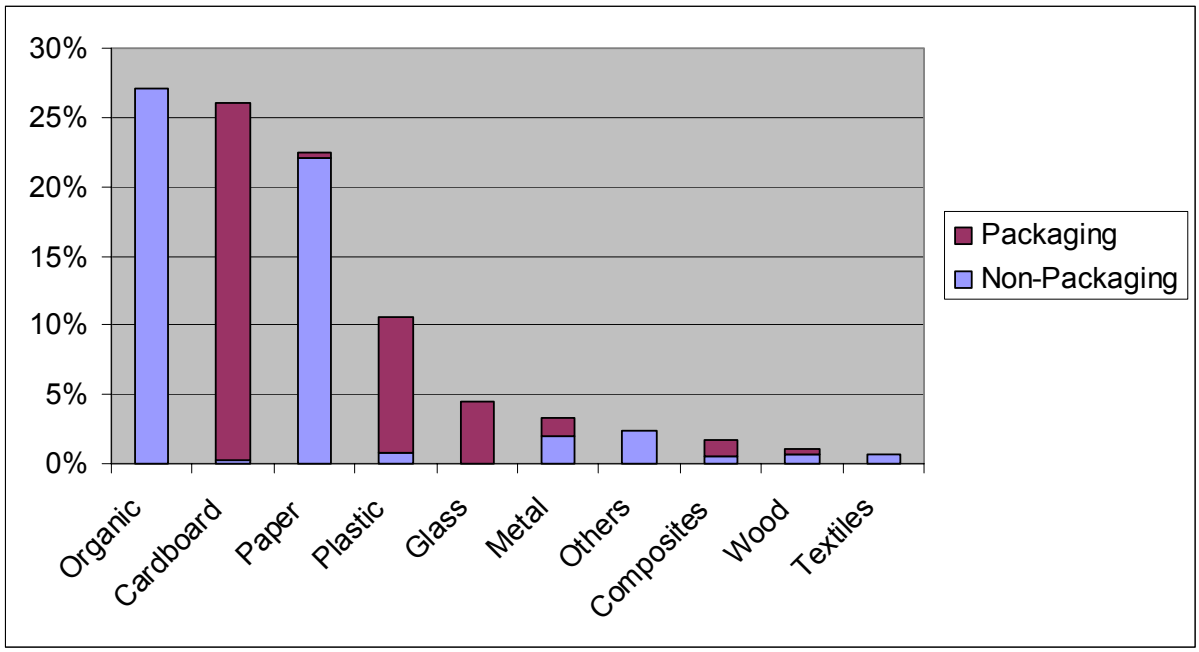
However, by combining the results of both studies a more accurate representation of the total commercial waste arisings is made. Also, through combining the results of both studies the overall quantity of commercial wastes accounted for is approximately 90%.

Applying the combined results to the sectoral breakdown, as shown in Table 6.10, produces a more accurate national waste profile. These results are shown in Figure 6.4 and Table 6.13.

Table 6.13: National Commercial Waste Breakdown Data – 2005 and MS-7 Results Combined – 'Sectoral Size Method'

Waste Categories	Total / tonnes		Total / %	
	Non-Packaging	*Packaging*	*Non-Packaging*	*Packaging*
Cardboard	1,624	175,388	0.2%	25.8%
Composites	3,878	8,201	0.6%	1.2%
Glass	14	30,371	0.0%	4.5%
Metal	13,648	9,091	2.0%	1.3%
Organic	183,632	0	27.1%	0.0%
Others	15,747	37	2.3%	0.0%
Paper	149,671	3,055	22.1%	0.5%
Plastic	5,526	66,611	0.8%	9.8%
Textiles	4,248	492	0.6%	0.1%
Wood	4,576	2,396	0.7%	0.4%
Total	**382,564**	**295,641**	**56.4%**	**43.6%**

Figure 6.4: National Commercial Waste Profile 2005 (Results of Current Surveys Combined with those of MS-7)



6.2.2.5 Comparison of Results

The composition of commercial waste as determined through this study (combined with MS-7) is compared with the findings of previous compositional analyses. These studies are the National Waste Databases 1998 and 2001. The results are detailed in Table 6.14

Table 6.14: Comparison of Commercial Waste Character Determined by this Study, 'Sectoral Size' Method and the 2001 and 1998 National Waste Databases

Waste Categories	*Composition of Commercial Arisings*		
	This Study 2005	**NWD 2001**	**NWD 1998**
Paper & Cardboard	48.6%	48.6 %	58.6%
Glass	4.5%	7.2 %	3.4%
Plastic	10.6%	10.3 %	10.6%
Metals	3.4%	2.6 %	1.7%
Organics	27.1%	20.6 %	15.1%
Textiles	0.7%	1.3 %	0.6%
Others	5.1%	9.4 %	9.9%

Though there are some minor changes within the various categories the most obvious one is the increased quantity of organic waste that is now arising.

6.2.3 Scale up Based on Economic and Demographic Factors – 'Sectoral Factors'

6.2.3.1 National Employment Figures

From the survey results on the participating commercial businesses the quantity of waste produced per employee per year is calculated. Using these values, and the total number of employees in each relevant sector, the quantity of waste produced per sector will be determined. The employee figures from the Central Statistics Office are listed in Table 6.15. Where appropriate, further breakdowns within these NACE codes are shown (see Appendix I for detailed national information)

Table 6.15: Employee Figures for Various NACE codes

NACE Code	Relevant NACE Sector	*Total Employees (August 2004)*
G	**Wholesale & retail trade**	**270,200**
51	*Wholesale*	*48,300*
52	*Retail*	*221,900*
H	**Hotels and restaurants**	**116,100**
55	*Hotels*	*55,000*
55	*Restaurants*	*61,100*
I	**Transport, storage & communication**	**114,800**
60	*Land transport*	*55,400*
61	*Water Transport*	*4,400*
62	*Air Transport*	*6,900*
64	*Post/Telecommunications*	*29,900*
63	*Supporting activities*	*18,100*
J	**Financial & other business services**	**243,100**
65	*Finance*	*42,200*
66	*Insurance*	*20,300*
67	*Auxiliary to finance*	*19,600*
70	*Real estate*	*7,200*
71	*Leasing*	*9,700*
72	*Computers*	*32,500*
73	*R&D*	*2,700*
74	*Other business activities*	*108,900*
L 75	**Public administration & defence**	**93,500**
M & L	**Education & health**	**294,400**
M – 80	*Education*	*112,300*
L – 85	*Health*	*182,100*
O	**Other services**	**114,400**

Calculating the quantity of waste generated per employee per annum is done by taking the survey results, scaling them up to produce an annual figure and then dividing it by the corresponding number of employees at the corresponding site. These values, as calculated during this study, MS-7 and a recent Finnish study[21] are shown in Table 6.16.

[21] Helsinki Metropolitan Area Waste Characterisation Study, 2004

Table 6.16: Calculation of Scale-up Factors Based on Employee Numbers

Sector	Total Annual Weight (2005)/ kg	No. of Employees (2005)	2005 Factor – kg / employee /annum	MS-7 kg /employee /annum	Combined Factors kg /employee /annum	Finnish Study kg /employee /annum
Finance	48,112	204	236	249	242.5	214
Public Offices Sector	12,916	120	108 *	205	156.5	184
Hotel	126,109	170	742	995	868.5	1, 326
Supermarkets	620,104	310	2,001	2,104	2,052.5	4,935
Transport & Communication	597,214	1,370	436	-	436	380
Retail	176,127	90	1,957	980	1,468.5	1,130
Wholesale	1,126,406	650	1,733	-	1,733	1,679
Restaurant	67,517	40	1,687	-	1,687	2,167

* - independent study conducted by the EPA at their offices in Wexford

As noted previously, scaling up for certain national sectors using the values estimated in Table 6.15 may be reasonable, while for other sectors different factors should be considered. Application of this method has its limitations due to the shortage of accurate sectoral data. Sectoral waste quantities are calculated based on factors estimated by combining the results from this study and MS-7. Where no additional surveys were carried out (e.g. hospitals, public offices, etc) the factors generated during MS-7 are used and applied to the most up to date statistics available.

The consistency of the results with those determined in the Finnish study provides a good degree of certainty about the per employee factors calculated (though some differences exist – most notably in the service industry and wholesale/retail). As more information becomes available through further studies so too will the accuracy of these factors.

6.2.3.2 Financial

The value of waste estimated per employee in the current study correlates well with the value previously generated in MS-7. Taking the combined value (242.5 kg/employee/annum) and applying it to the total number of employees in the financial sector (which includes activities that have similar practices like building societies, etc.) generates a total estimated waste from this sector of 57,372 tonnes. These calculations are expanded in Table 6.17.

Table 6.17: Quantity of Waste Generated by the Financial Sector

Waste Indicators	
Waste per AIB employee per year (tonnes) (2005)	0.236
Waste per AIB employee per year (tonnes) (combined)	0.2425
Employee Numbers	
Total Financial sector employees (see Table 6.15)	243,100
National Waste Calculations	
Total Waste Generated (tonnes) (2005)	57,372
Total Waste Generated (tonnes) (combined 2005 & MS-7 indicators)	58,952

6.2.3.3 Restaurants

Scaling up for the restaurant sector is limited by the availability of data. Ideally, the number of sittings in the country annually would be used in conjunction with a factor based on the quantity of waste per sitting. As these figures were unavailable, scale up will be based on employee numbers. As shown in Table 6.10, the estimated quantity of waste generated per employee is 1,687kg/employee/year. The results of the scaling up calculations are detailed in Table 6.18.

Table 6.18: Quantity of Waste Generated by the Restaurant Sector

Waste Indicators	
Jacobs on the Mall Employees	40
Annual waste generated (tonnes)	67.52
Waste per Jacobs employee per year (tonnes)	1.687
Employee Numbers	
Total restaurant sector employees (see Table 6.15)	61,100
National Waste Calculations	
Total Waste Generated (tonnes) (2005)	103,076

6.2.3.4 Hotels

In MS-7 scaling up was done on the basis of bednights sold (CSO data). The most recent figure available for bednights sold to overseas customers is 10.278 million (2005, CSO[22]). Domestic tourism contribute an additional 5.8 million with Northern Ireland contributing 0.834 million (2003, Failte Ireland)[23]. This yields a total of 16.921 million bednights sold in Ireland in 2003 according to the most recent figures available.

Two indicators are used to scale up for a national figure. The amount of waste generated per bednight during the current survey was estimated to be 6.01 kg/bednight. National waste arisings based on employee numbers will also be calculated - though purely for comparison.

Table 6.18: Quantity of Waste Generated by the Hotel Sector

Hotel Occupancy	
Bednights sold to overseas visitors (including Northern Ireland) (2003)	11,112,000
Bednights sold to Irish residents (2003)	5,800,000
Total national bednights (2003)	16,912,000
Waste Indicators	
Waste generated per bednight (kg) (2005)	6.01
Total Hotel sector employees (see Table 6.15)	55,500
Waste generated per employee per annum (kg) (2005) (see Table 6.16)	742
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – based on bednights sold	101,677
Total Waste Generated (tonnes) (2005) – based on employee numbers	41,181

[22] CSO Statistical Handbook 2004

[23] http://www.failteireland.ie/research

The figure calculated for this sector during MS-7 was 63,765 tonnes. This was based on a waste per bednight figure of 4.74 kg. Taking an average of this value and the value calculated in 2005, and applying it to the total number of bednights gives a projected waste arising figure for the hotel sector of 90,919 tonnes.

6.2.3.5 Wholesale

There are a number of difficulties in scaling up for this sector. Floor area is the ideal factor upon which to base calculations. However, determining national floor areas for the entire sector is not possible at this time. Another option is to use turnover, however due to variety within this sector (electrical wholesaler and food wholesaler) this also appears to be inappropriate.

For the current calculations, employee figures are used. These are used in conjunction with the estimated waste generated per employee (see Table 6.16). The relative proximity of the value determined during this study (1,733 kg/employee/year) and the Finnish study (1,679 kg/employee/year) provides a certain degree of verification of this value.

Table 6.20: Quantity of Waste Generated by the Wholesale Sector

Wholesale	
Waste generated per employee per annum (tonnes) (2005)	1.733
Total wholesale sector employees (see Table 6.15)	48,300
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – based on employee numbers	83,704

If information on turnover became available then this method should be further investigated for scale up.

6.2.3.6 Supermarket

The supermarket sector is included in NACE sector 52 which includes all retailing services. A full list is shown below. This shows the wide scope of this sector (which accounts for 221,900 employees – see Table 6.15). Supermarkets are included in sector 52.1, though this sector also includes department stores.

52.1 Retail sale in non-specialised stores

- *52.11 Retail sale in non-specialised stores with food, beverages or tobacco predominating*
- *52.12 Other retail sale in non-specialised stores*

52.2 Retail sale of food, beverages or tobacco in specialised stores

52.3 Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles

52.4 Other retail sale of new goods in specialised stores

- *52.41 Retail sale of textiles*
- *52.42 Retail sale of clothing*
- *52.43 Retail sale of footwear and leather goods*
- *52.44 Retail sale of furniture, lighting equipment and household articles n.e.c.*
- *52.45 Retail sale of electrical household appliances and radio and television goods*

52.46 Retail sale of hardware, paints and glass

52.47 Retail sale of books, newspapers and stationery

52.48 Other retail sale in specialised stores

In 2001, this area (NACE 52.1) had 62,311 employees[24]. In 2002, this had risen to 67,604 employees. Taking the percentage increase between these two years and applying it to subsequent years, it is estimated that the total number of employees in 2005 is approximately 81,270. This figure is quite possibly higher due to the number of large department stores that have opened in the past number of years. This figure, along with the waste generated per employee per annum (see Table 6.16) is used to scale up for a national figure. The waste per employee estimated during the current study (2001 kg) correlates well with MS-7 (2104 kg) and the combined value is used (2,052.5 kg)

Table 6.21: Quantity of Waste Generated by the Supermarket Sector

Supermarkets	
Waste generated per employee per annum (tonnes) (2005)	2.0525
Total Supermarket sector employees (see Table 6.15)	81,270
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – based on employee numbers	166,807

6.2.3.7 Retail

In addition to the businesses listed in Section 5.2.3.7, the retail sector is also classed as including the following:

50.1 Sale of motor vehicle

50.2 Maintenance and repair of motor vehicles

50.3 Sale of motor vehicle parts and accessories

50.4 Sale, maintenance and repair of motorcycles and related parts and accessories

50.5 Retail sale of automotive fuel

For the purpose of the current scale up these, in addition to the supermarket employees, are omitted. Thus the total number of employees in the retail sector in Ireland is estimated as 100,430 (= 221,900 – 81,270 – 40,200). This figure is used for the scale up.

The factor generated from the current study – kg/employee/year – should be treated with a degree of caution. It differs significantly from MS-7 (i.e. 980 kg/employee/year compared with 1,957 kg). The current value was generated at a large retail store which may not be representative of the sector and while the figure generated during MS-7 was from a number of small retail shops, these too are not wholly representative of that sector. Therefore, the combined figure is used (1,468.5 kg) and should account for the variety within this sector.

[24] www.cso.ie

Table 6.22: Quantity of Waste Generated by the Retail Sector

Retail	
Waste generated per employee per annum (tonnes) (combined)	1.4685
Total Retail sector employees (see Table 6.15)	100,430
National Waste Calculations	
Total Waste Generated (tonnes) (2005)	147,481

6.2.3.8 Third Level Educational Establishments - Colleges

During MS-7 the factor used for this sector was waste generated per student. Values from the CIT (56.4kg) and NUI & St. Pats (90.8kg) were used. These are used again. The total number of full and part time students nationally has increased and these values, along with the scale up calculations are shown in Table 6.23.

Table 6.23: Quantity of Waste Generated by the 3rd level Sector

3rd level Education	
National Full time students	137,323
National Part time students*	37,276
Total National 3rd level students	174,599
Waste Factors	
CIT (2002) (tonnes)	0.0564
NUI & St. Pats (2002) (tonnes)	0.0908
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – CIT Factor	9,847
Total Waste Generated (tonnes) (2005) – NUI Factor	15,853

* - based on Department of Education estimates

6.2.3.9 Public Offices

The public office sector was not examined during the current work though the results from a recent waste survey of the EPA offices in Wexford have been included. The waste factor generated during MS-7 is used as on its own as well as in combination with the EPA generated value. The calculations are shown in Table 6.24.

Table 6.24: Quantity of Waste Generated by the Public Offices Sector

Public Offices	
Waste generated per employee per annum (tonnes) (MS-7)	0.205
Waste generated per employee per annum (tonnes) (2005)	0.1565
Total Public Office sector employees*	154,200
National Waste Calculations	
Total Waste Generated (tonnes) (MS-7)	31,611
Total Waste Generated (tonnes) (EPA, 2005)	24,132

* - from CSO. Includes civil service, defence, An Garda, regional bodies and semi-state companies.

The differences in the values generated using the EPA findings and those of MS-7 exclusively may be due to the multiple functions of the County Council offices. In addition, the EPA canteen does not serve full dinners and this may also affect the results.

6.2.3.10 Hospitals

Hospitals, another significant national sector, was examined during the 2002 study but not during the current one. The waste factor used during MS-7 was from Waterford Regional Hospital and indicated that on average 2.92 kg of waste is generated per bed day. The most up to date data available on National Bed days used is from 2005 (www.doh.ie), though this is a provisional figure. This value excludes long-stay patients. For long stay patients the only information available is based on the 31st of December 2003. This states that of the 23,825 long stay beds available in the country there was an 88.9% occupancy rate corresponding to 21,169 patients. As this is the only figure available it has been taken as representative of the whole year. The calculations are shown in Table 6.25.

Table 6.25: Quantity of Waste Generated by the Hospital Sector

Hospitals	
All publicly funded acute hospital bed days (2005 – provisional)	3,858,964
No. of long stay bed days (21,169 x 365)	7,726,685
Total number of hospital bed days	11,585,649
Waste Factors	
Waterford Regional (2002) (tonnes)	0.0564
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – Waterford Factor	33,830

6.2.3.11 Transport & Communication

Accurately scaling up for this sector will always be subject to concern due to its diverse nature. It includes all forms of transport, post, telecommunications and ancillary services for these. The various categories within this NACE code are:

60 - Land transport; transport via pipelines

61 - Water transport

62 - Air transport

63 - Supporting & auxiliary transport activities; activities of travel agencies

64 - Post and telecommunications

This NACE sector should be investigated according to its main categories. To date categories 62 and 64 have been examined. Also, many of the ancillary activities are similar to office services.

In this study, scale-up is based on employee numbers applied to the entire NACE sector - this should be regarded with caution. The scale up factor used is waste generated per employee per year. The value (436kg) is as a combination of both the RTE and Eircom sites. The total number of employees in this sector is detailed in Table 6.15 and the calculations are shown in Table 6.26.

Table 6.26: Quantity of Waste Generated by the Transport & Communication Sector

Transport & Communication	
Total number of employees (2005)	114,800
Waste Factors	
Waste generated per employee per year (tonnes) (2005)	0.436
National Waste Calculations	
Total Waste Generated (tonnes) (2005) – Employee numbers	50,053

6.2.3.12 Summary

The results generated using the 'Sectoral Factors' are summarised in Table 6.27.

Table 6.27: Summary of 'Sectoral Factors' Information Sources and Calculations

Sector	Factor Used	Source	Estimated National Sectoral Waste Arisings (tonnes)
Finance	Employee Numbers	2005 & MS-7 combined	58,952
Restaurants	Employee Numbers	2005	103,076
Hotels	Bednights	2005	101,677
Wholesale	Employee Numbers	2005	83,704
Supermarkets	Employee Numbers	2005 & MS-7 combined	166,807
Retail	Employee Numbers	2005 & MS-7 combined	147,481
3rd Level	Student Numbers	MS-7	15,853
Public Offices	Employee Numbers	2005 & MS-7 combined	24,132
Hospitals	Hospital Beds	2005 & MS-7 combined	33,830
Transport & Communication	Employee Numbers	2005	50,053
Total			**785,568**

Applying these values to the sectoral 'fingerprints' as determined during MS-7 and the current study is shown in Figure 6.5 and Table 6.28.

Figure 6.5: National Commercial Waste Profile 2005 (Sectoral Factor Method)

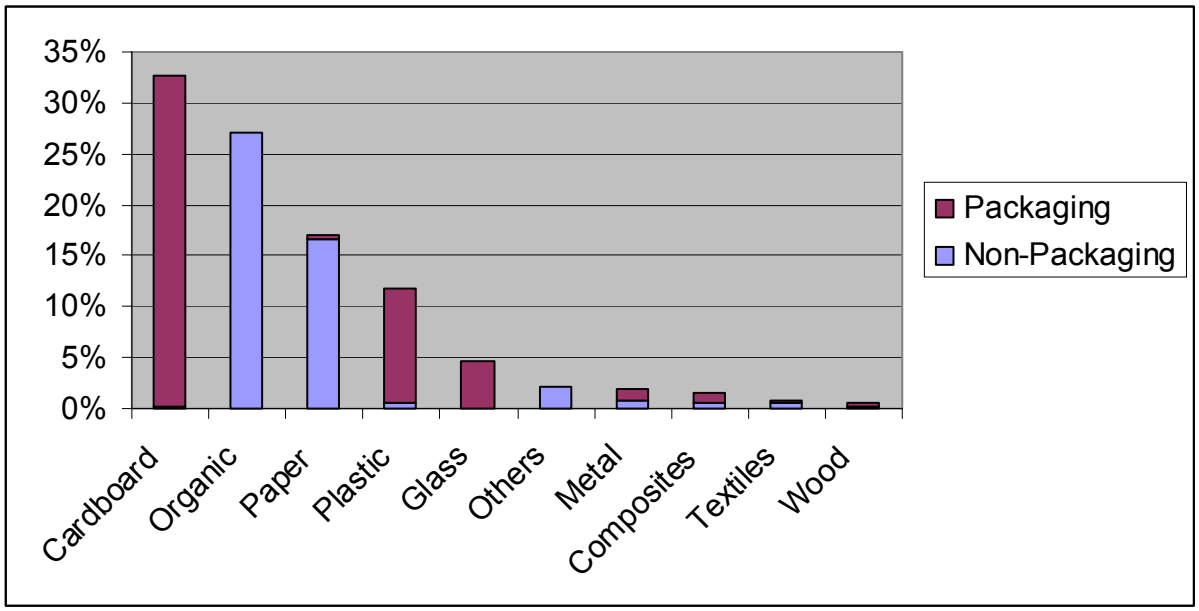


Table 6.28: National Commercial Waste Breakdown Data – Sectoral Factor Method

	Total / tonnes		Total / %	
	Non-Packaging	Packaging	Non-Packaging	Packaging
Cardboard	1,635	254,827	0.2%	32.4%
Composites	4,879	7,400	0.6%	0.9%
Glass	12	35,807	0.0%	4.6%
Metal	5,808	9,707	0.7%	1.2%
Organic	212,324	0	27.0%	0.0%
Others	16,783	35	2.1%	0.0%
Paper	130,268	3,485	16.6%	0.4%
Plastic	5,080	87,274	0.6%	11.1%
Textiles	4,615	798	0.6%	0.1%
Wood	2,220	2,612	0.3%	0.3%
Total	**383,624**	**401,944**	**48.8%**	**51.2%**

6.2.4 Comparison of Data Generated by 'Sectoral Size' Method with that Produced by Estimation of 'Sectoral Factors'

A comparison of the total waste arisings as determined by both scale up and sectoral size methods is summarised in Table 6.29. The total estimated through sectoral factor scale up is larger than by the sectoral size method. The main areas where discrepancies arise are in the restaurant, retail, wholesale and Transport & Communications sectors. Potential reasons for these differences are summarised in Table 6.29. Although the waste profile as determined through the National Waste Database (i.e. Sectoral Size method) is taken as being more reliable, there are potential discrepancies here also (though reporting has improved immensely in recent years the possibility that information is still incorrectly reported (or not reported at all) should be considered).

Table 6.29: Comparison of National Commercial Waste Quantities

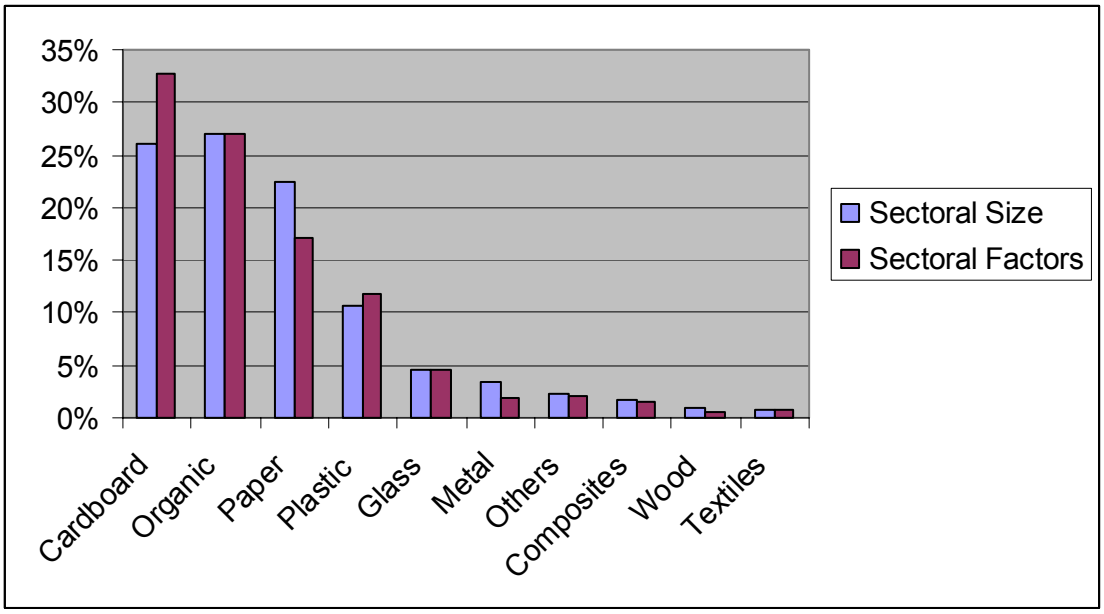
Sector	National Waste Generated (tonnes)	
	Based on Sectoral factors	Based on NWD and sectoral size
Finance	58,952	62,613
Restaurants	103,076	53,315
Hotels	101,677	90,668
Wholesale	83,704	37,587
Supermarkets	166,807	121,273
Retail	147,481	89,849
3rd Level	15,853	43,850
Public Offices	24,132	49,769
Hospitals	33,830	37,245
Transport & Communication	50,053	92,033
Total	**785,568**	**678,202**

Table 6.30: Summary of Scale up Information Issues

Sector	Reliability of Information	Potential areas of Scale-up disparity
Finance	Good quality of information available. The waste character profile obtained in the current study compares well with that of MS-7.	Similarity in values for both scale-up methods indicates a robust quality of information and characterisation of this sector.
Restaurants	Site examined in current study is an upmarket restaurant – may not be representative of the sector as a whole. Further studies in different areas within this sector required e.g. fast food.	Scale up factor used was employee numbers. Meals served would be more appropriate but information not available. Sectoral size determined by waste contractor may also be erroneous.
Hotels	Good quality of information available for this sector. Fingerprint may be somewhat skewed due to the extent of public bar business. Compares well with MS-7.	Correlation between the two scale-up provides confidence in the values generated.
Wholesale	The site surveyed was a supermarket/grocery wholesaler and may not be representative of the entire sector (electronics, hardware wholesalers would be distinctly different). Requires further investigation.	Both the accuracy of the estimated sectoral size and the sectoral factor used (employee numbers – turnover is preferable) could lead to differences between the generated values.
Supermarkets	Site surveyed was a large supermarket but this NACE code also includes shopping centres. Accurate employee numbers on this area needed.	The difference between the scale-up values is of the order of 15% which is relatively accurate. Turnover may be a more appropriate scale up factor.
Retail	Very diverse sector. Current study looked at busy drapery store – not reflective of sector as a whole. Combined with MS-7 value should provide accurate sectoral scale up data. Should be considered for further surveys.	Using turnover as opposed to employee numbers would be the preferred scale up factor. Again, possible inaccuracy in waste contractor sectoral size estimation.
3rd Level	No survey carried out this time. MS-7 results thought to be reliable. This sector needs more thorough investigation – particularly primary and secondary schools.	Disparity is thought to be linked to inaccurate reporting by waste contractors – possibly this includes primary and secondary school wastes.
Public Offices	No survey done this time but EPA waste survey results used (in combination with MS-7 values). Accuracy of profile generated is good though the potential diversity of this sector should be considered.	Many public offices have multiple activities (including large canteens). The EPA HQ does not have these facilities.
Hospitals	Though no survey was carried out this time the results from MS-7 are thought to be reliable.	Good correlation between both scale up methods.
Transport & Communication	Very diverse sector. Survey results thought to be accurate but this sector may need further delineation in subsequent investigations.	Heterogeneous nature of this sector ensures that confidence in either scale up method is limited.

A comparison of the national waste arisings for the commercial sector, as estimated for the primary waste categories by both scale-up methodologies, is shown in Figure 6.6. Other than the obvious differences in the paper and cardboard categories (which when aggregated are almost identical) the rest of the materials streams are very similar. This provides a good degree of confidence in the waste character for the national commercial waste arisings.

Figure 6.6: Comparison of Compositional Make-up as Determined by both Scale-up Methods



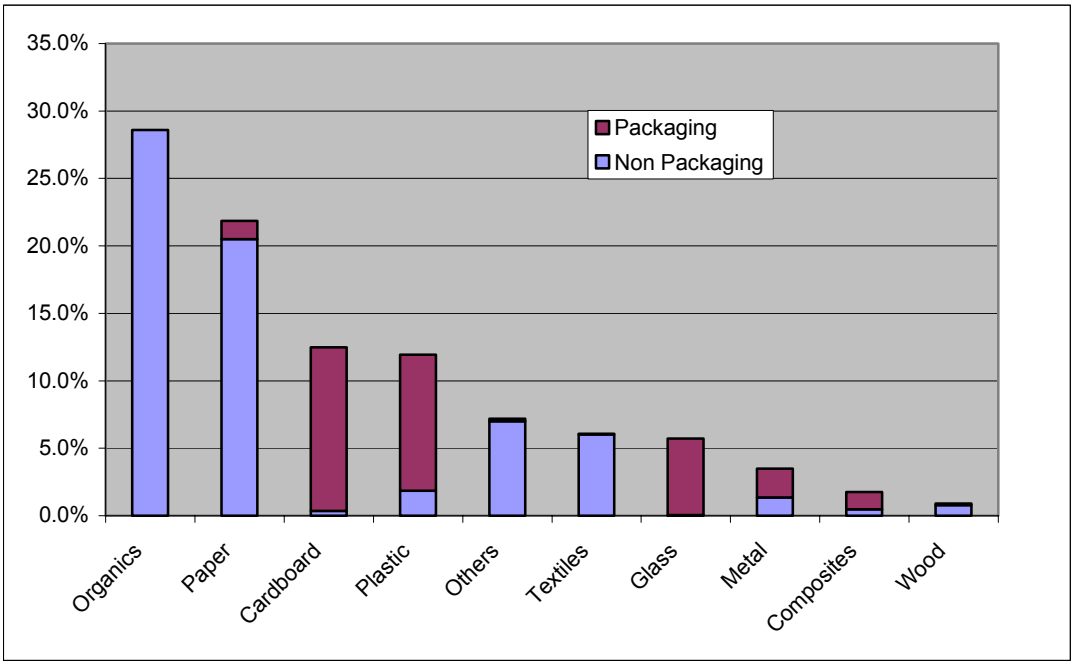
6.3 NATIONAL MUNICIPAL WASTE PROFILE

The Municipal Waste Composition profile is a combination of Table 6.3 and Table 6.13. The result is shown in Table 6.31 and Figure 6.7.

Table 6.31: Irish Municipal Waste Composition Profile

	Household		Commercial		Municipal	
Waste categories	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**	**%**
Organic	460,236	29.2%	183,632	27.1%	643,868	28.6%
Paper	339,432	21.6%	152,726	22.5%	492,158	21.9%
Cardboard	104,176	6.6%	177,012	26.1%	281,188	12.5%
Composites	27,503	1.7%	12,079	1.8%	39,582	1.8%
Plastic	196,723	12.5%	72,137	10.6%	268,860	11.9%
Textiles	131,896	8.4%	4,740	0.7%	136,636	6.1%
Glass	98,499	6.3%	30,385	4.5%	128,884	5.7%
Metal	55,925	3.6%	22,739	3.4%	78,664	3.5%
Wood	13,370	0.8%	6,972	1.0%	20,342	0.9%
Others	146,035	9.3%	15,784	2.3%	161,819	7.2%
Total	**1,573,795**	**100%**	**678,206**	**100%**	**2,252,001**	**100%**
Packaging	**447,534**	**28.4%**	**295,642**	**43.6%**	**743,176**	**33.0%**

Figure 6.7: Irish Municipal Waste Composition Profile



An estimated 2,252,001 tonnes of municipal waste (excluding street cleansing waste) were generated in Ireland in the twelve-month period covered by the Waste Characterisation Survey (2004/2005). This consisted of 1,573,795 tonnes of household waste and 678,206 tonnes of commercial waste.

The commercial waste quantity is much smaller than the quantity as per the National Waste Database Interim Report 2003. This is due to the fact that on analysis of an EPA survey of industrial waste generators what was considered to be commercial waste in previous reports, a significant quantity was considered to be Industrial Non-Process Municipal Waste (INPMW) and reported under Chapter 20 of the EWC.

When the INPMW is discounted, it is estimated that the 2003 Commercial waste arisings, as per the National Waste Database Interim Report 2003 were 761,791 tonnes.

Taking this into account, the total municipal waste generated in 2003 (excluding street cleansing waste) was 2,358,292 tonnes, which is comparable to the scaled-up RPS-MCOS figure.

It is important to note that INPMW, which was examined only in brief during this project, contributes a significant portion to the overall non-household municipal waste stream (estimated 43% - see Section 6.2.2.1). INPMW is reported by industry under the EWC Chapters 15 and 20. Within each of these chapters there are specific material streams characterised (e.g. 15 01 04 – metallic packaging; 20 01 01 – paper and cardboard) but also a segment which is classified as ‘mixed wastes’ i.e. waste of a municipal character coming from the daily activities occurring on industrial sites (e.g. 15 01 06 – mixed packaging (or often referred to as mixed wastes in AER returns); 20 03 01 – mixed municipal waste).

This mixed waste fraction of industrial wastes needs further examination. This would provide a more accurate overall picture of the mixed wastes currently being disposed of nationally in the non-household sector. Due to the limited number of surveys conducted during this study a statistically sound characterisation profile for the mixed waste cannot be provided. It is recommended that a number of additional surveys be conducted – possibly based on NACE sectors and their employee numbers – to generate a statistically acceptable profile that may be applied to the mixed wastes fractions of EWC Chapters 15 and 20.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY OF RESULTS

The composition of household and commercial waste based on the results of this project is summarised in Table 7.1 below.

Table 7.1: Household, Commercial and Municipal Average Waste Composition

	Household	Commercial	Municipal
Organic	29.2%	27.1%	28.6%
Paper	21.6%	22.5%	21.9%
Cardboard	6.6%	26.1%	12.5%
Composites	1.7%	1.8%	1.8%
Plastic	12.5%	10.6%	11.9%
Textiles	8.4%	0.7%	6.1%
Glass	6.3%	4.5%	5.7%
Metal	3.6%	3.4%	3.5%
Wood	0.8%	1.0%	0.9%
Others	9.3%	2.3%	7.2%
Total	**100.0%**	**100.0%**	**100.0%**
Packaging	**28.4%**	**43.6%**	**33.0%**

Table 7.1 does not include any correction of composition due to contamination of the waste categories by food, moisture etc.

7.2 UPDATE THE 1996 MUNICIPAL WASTE CHARACTERISATION METHODOLOGY

It is recommended to update the existing 'Manual' produced by the EPA in 1996 to respond to three overall issues:

- the changing nature of household waste collection
- the new methodology developed specifically for non-household waste characterisation
- the need to formalise methodology for scaling-up household and non-household results to form a national profile

For household waste, the Manual should be updated in accordance with the 3-stage approach outlined in Section 2.2 of this Report. New elements include a more detailed project planning stage, some amendments to the sorting methodology, and a new procedure to combine the data from 2-bin, 3-bin and bring banks/ recycling centres. The output of statistical analysis during this study – which provides the number of samples required to reach a given degree of accuracy – should be included.

For non-household waste, the new methodology should be based on the sectoral approach to waste characterisation, as developed in the EPA MS-7 project and further elaborated in this Report. Each survey requires a week-long site-specific audit of waste at the selected business.

For both types of survey, a single waste composition recording form will be used (included in Appendix D). This form will require more background information to be recorded for each survey, which will facilitate analysis and interpretation.

There is a need to include protocols to deal with Health & Safety in the planning and execution of surveys. A basic risk assessment approach has been followed in this study and can form the basis for the revision.

While not directly considered in this project, the inclusion of a protocol to ensure the ethical conduct of surveys – addressing the issue of confidentiality - is also advised.

7.3 PROGRAMME TO DELIVER ON-GOING WASTE CHARACTERISATION

This project provides an up-to-date and reasonably comprehensive picture of municipal waste composition as of 2004/2005. An on-going campaign of waste characterisation is required so that the data is continuously updated and improved. It is recommended that a rolling programme of surveys be carried out under the guidance of the EPA.

7.3.1 Future Household Waste Characterisation Programme

Having statistically analysed the results of the surveys completed for this project, it is estimated that 68 surveys of household waste are required to reach to reach a accuracy of 10% at 95% confidence level for Irish household waste. These 68 surveys will form one programme, which can be carried out over a two-year period. At the end of the programme the EPA would combine the data and scale-up to form a national profile.

Each of the 34 Irish local authorities will have to carry out 2 surveys every 2 years. This will include mandatory waste characterisation of mixed residual waste sample and waste characterisation of mixed dry recyclables and organic separate collections where the service is available.

Following the analysis of the results gathered during the project, we recommend the following organisation of the programme (Table 7.2).

Table 7.2: Proposed Sampling Requirements

Local Authorities	Samples Required	Local Authorities	Frequency
8 City Local Authorities	1 Sample Houses And 1 Sample Apartments	***Cork City,*** ***Galway City,*** Limerick City, Waterford City, Dun Laoghaire Rathdown, Dublin City, ***Fingal,*** ***South Dublin***	Four local authorities carry out the surveys in year 1*, and four in year 2
26 Mixed Rural and Urban Local Authorities	1 Sample Rural And 1Sample Town	***Carlow, Cavan, Clare,*** Cork, Donegal, ***Galway,*** Kildare, ***Kilkenny,*** ***Kerry, Laois,*** Leitrim, Limerick ***Longford,*** Louth, ***Mayo, Meath,*** Monaghan, ***Offaly,*** Roscommon, Sligo, North Tipperary, ***South Tipperary,*** Waterford, Westmeath, Wexford, ***Wicklow***	13 local authorities carry out the survey in year 1*, and 13 in year 2.

*It is recommended that a number of surveys are completed in each waste planning region every year. This would be achieved if the counties highlighted in Bold above were nominated as 'year 1' locations.

It is recommended that the EPA nominate which the Local Authorities must conduct the surveys in 2006 and 2007, and make the survey a formal requirement.

For consistency with the methodology derived in this project, and to avoid the peaks of seasonal variation, it is recommended to carry out the surveys in October/ November and March/ April of every year. (With the above programme, there would be surveys in 9 Local Authorities every spring and 8 Local Authorities every autumn).

The cost of a survey, assuming the local authority has free access to a facility, a RCV and a JCB, is estimated at between €5,000 (for a one-bin survey) and €10,000 (for a 3-bin survey). To fulfil the entire programme over two years would cost in the region of € 500,000.

7.3.2 Role of the EPA in Household Surveys

Between 1996 and 2004/2005, there has been limited involvement of local authorities in waste characterisation, with a few exceptions. The project considered whether or not the EPA, rather than the local authorities, should assume the role of controlling and carrying out waste composition surveys. On balance this is not recommended, because many advantages flow to local authorities by carrying out waste composition surveys. They gain an appreciation of the waste stream, develop expertise in waste characterisation, see at first hand the level of participation in recycling, and can gain useful information for waste planning.

In order to ensure the programme as outlined above is adhered to, and in order to ensure a systematic approach to household waste characterisation, we recommend the EPA plays a more active role in co-ordinating and facilitating surveys. Table 7.3 below identifies some of the barriers and the recommended action by the EPA to address these.

Table 7.3: Actions recommended to support Local Authority programmes

	Barrier to Local Authority Involvement	Recommended EPA Action
1	**Lack of know how** – the concept of carrying out a waste survey is daunting unless there is some prior experience	EPA makes available a waste characterisation officer who would be made available to local authorities to assist in planning and executing household surveys. This would be a pro-active role.
2	**Lack of equipment** – although the individual elements are simple, this is another barrier	EPA purchases and maintains a number of sets of equipment for waste characterisation studies, which can be loaned out to local authorities
3	**Privatisation of waste collection** – In some counties the council staff play a purely administrative role and have limited technical resources or input into household waste collection logistics	The survey can be completed in partnership with the private waste collection company as long as there is an involvement by the local authority in ensuring appropriate route selection and survey methodology is followed
4	**Resources** – busy staff may be unlikely to prioritise a waste characterisation study	Availability of the EPA officer, and the revised Waste Characterisation Methodology, will reduce the time resource required.
5	**Cost** – for some local authorities the cost may be a deterrent.	A cost of up to €10,0000 every two years is not deemed excessive. There are other benefits from the survey e.g. in terms of optimising recycling collections, facilitating waste planning etc.

As an additional mechanism, it is recommended that the EPA has its own team of trained staff, so that if local authorities default on obligations, the EPA will complete the survey. The support services could be outsourced by the EPA.

7.3.3 Non-Household Survey Programme

Wastes arising from seven commercial sectors have been characterised based on the methodology developed in MS-7. The sectors characterised were; Transport/ Communication, Supermarkets, Financial Services, Restaurants, Wholesale, Hotels and Other Retailers. The results obtained during this study were relatively consistent with results obtained during MS-7. A summary of the sectors examined during both MS-7 and the current project are given in Table 7.3, along with sectors that are recommended for further investigations.

Table 7.4: Summary of Sectors Surveyed to Date and Sectors Recommended for Future Surveys

Sector	MS-7	RPS MCOS/CTC 2005	Future
Finance	√	√	
Restaurants	√	√	√
Hotels	√	√	
Wholesale		√	√
Supermarkets	√	√	
Retail	√	√	√
Education	√		√
Public Offices	√	(√)	√
Hospitals	√		√
Transport	√		√
Communication		√	

In order to obtain the best possible picture of the current national waste character, the results produced from this survey were combined with the results from MS-7. This allows characterisation of 89% of the national waste be determined using the results from 17 surveys.

It is envisaged that by combining additional survey data from future commercial waste characterisation surveys the accuracy of national commercial waste characterisations will improve. As the data set for a particular sector is increased so too should the accuracy of the results (i.e. if 5 separate surveys are performed within a particular sector then the average character will be more representative of that sector than using results from one or two).

For the best results, hundreds of surveys should be carried out on all sectors each year. A potential solution would be to put the onus on commercial enterprises to conduct and report their own waste characterisation surveys – similar to the Accredited Inspection Contractors (AIC) scheme for solvents. This scheme requires companies to perform self audits followed by independent verification by registered consultants. This would have the twin advantages of providing useful waste characterisation data while also providing essential information for commercial businesses to manage their own wastes more effectively. If such an option were to be considered then surveys would need to follow the methodology developed in this programme.

The extension of the data set – to include additional survey findings – should be made with caution. As data from 10 years ago is probably no longer representative of the waste character within a particular sector then it should be omitted. A timeframe for data inclusion should consider the accuracy of that data considering current conditions.

An additional issue is how data from future surveys is combined with previous results. In the current study this is done through simple averaging of the two data sets. This is believed to be the most

appropriate method as it overcomes the issue of facility size and allows easy and transparent inclusion of results.

Further investigation of the industrial non-process municipal waste (INPMW) needs to be conducted as this constitutes a significant portion of non-household waste nationally. This study examined four industrial sites and whilst there was no conclusive pattern (as expected considering the diversity of sites investigated), the similarity of waste profiles emanating from specific areas within the sites (e.g. canteens and offices) was noted.

Future work should concentrate on the mixed fraction of industrial wastes since segregated wastes (e.g. paper and cardboard, metallic packaging, etc.) are currently reported using the established EWC codes. On the assumption that INPMW quantities may be closely related to employee numbers the largest employing NACE codes should be considered initially. Once a statistically sound composition has been estimated this can then be applied to the mixed waste fraction within the EWC chapters 15 and 20.

7.4 IMPROVEMENTS IN DATA MANAGEMENT

A number of changes are recommended to the management of data at Local Authority, Industry and EPA level, in order to facilitate more accurate waste characterisation in the future. The recommended changes are outlined below:

Table 7.5: Improvements Required in Data Management

	Issue or gap identified	Recommendation
1	Ensure consistent data reporting and recording of waste composition studies	In order to obtain enough data to be able to compare surveys, it is recommended that waste composition surveys be reported using a standard document (included in the Local Authority Questionnaire). The information received should be input by the EPA in a database and this detailed information made available online. The combination of waste composition results from different waste streams has become very technical due to weighing; it may not be possible for staff without knowledge of waste statistics to combine results. A simple form where staff of local authorities only input waste composition results, waste quantities collected and number of households serviced should be used.
2	There is a lack of information on the composition of waste collected by Recycling Centres and Bring Banks, and bulky waste collected.	A better standard of data collection at the facilities is required. Further breakdown need to be provided in the type of waste collected by this facilities. This may be achieved by increasing the level of details of the information requested in the EPA Local Authority questionnaire to reflect the secondary categories in waste composition categories in Appendix D.
3	Scaling-up commercial waste arisings requires the relative contribution of waste for each sector (hotels, offices etc.) to be known	Require waste contractors to specify the sectoral sizes that they collect waste from each year in the Annual Environmental Report under Waste Licence. These will often be estimates but would provide a better information base from which to scale up using NWD data.
4	Ensure consistent reporting of commercial waste composition by business	Develop an audit system, such as that used in the AIC scheme for solvents, for commercial waste arisings. The AIC scheme involves self auditing (according a set methodology), followed by independent verification of results by registered consultants. This system should be phased in to initially target the largest waste producers in each sector (i.e. applying the 80: 20 rule) and in the long term include as many commercial sites as possible. To determine which are the large producers an appropriate cut-off point should be established (possibly in a manner similar to REPAK).
5	Inaccurate or over-generalised reporting of wastes by industry in the AERs and waste questionnaires returned to the EPA.	The industrial waste survey questionnaires and AERs should be amended to include a better description of the 'mixed wastes' as described in EWC codes 15 and 20 such that the information submitted is more useful for waste characterisations. This would require identification of the mixed wastes arising according to their source location. Provide training and guidance for companies in completing AERs and questionnaires properly.
6	Difficulty in calculating scale-up factors based on employment, turnover etc. in commercial and industrial sectors.	There is a need for more detailed information from the CSO. In some cases information available is not detailed enough for subsequent calculations e.g. employee numbers are available for the various NACE codes but a breakdown for the various subcategories is not. These needs should be communicated to the CSO.

It is recommended to integrate the waste composition form in the EPA local Authority Questionnaire. Each local Authority will only have to input results in the spreadsheets and the combination of results will done automatically using links to other sheets (e.g Municipal Collection SUMMARY, “Uncollected" household waste, Civic Amenity Sites in the 2004 Local Authority Questionnaire).

On reception of the waste composition reports (results and background information), the information should be transferred by the EPA into the waste composition database. This in turn should be linked to a GIS mapping system.

A more far-reaching option to improve data on commercial waste composition would be to require commercial businesses to record the weight of all wastes according to waste character produced each year (similar to the system in Finland – see literature review). This would facilitate generating sector-specific factors for scale up exercises (and would also be of benefit to those businesses). This could potentially be administered by the EPA on a questionnaire basis.

7.5 CONTAMINATION ASSESSMENT

This project has carried out an initial assessment of the level of contamination in packaging waste in both household and non-household municipal waste. Contamination levels vary with the type of packaging material and whether the survey is carried out on the mixed waste bin or on source-separated material. Some initial ‘correction factors’ have been developed for the main packaging categories. These must be employed with caution, and only to the results of waste characterisation studies (rather than to the tonnages reported at waste disposal or recovery facilities).

If correction factors for contamination are applied to our National waste statistics, there will be important implications including:

- The proportion of packaging waste estimated to be landfilled will decrease, and the recovery rate will increase: this has implications for national performance under the EU Packaging Directive.
- Since most contamination is biodegradable, the quantity of biodegradable waste being landfilled will increase. This has implications for national performance under the EU Landfill Directive, which restricts the landfilling of biodegradable waste.

A more in-depth examination of contamination is recommended. The actual measurement of contamination can be carried out according to the methodology developed in this report. The numbers of samples required to provide a specific level of accuracy of results has been outlined in Chapter 5.

The main implications for contamination measurement is at the level of landfill disposal, therefore a survey programme that focuses on the municipal landfill waste stream is required. As well as enabling an accurate estimation of packaging and biodegradable content, the results will be useful in modelling landfill gas and leachate generation.

The level of contamination in the recovery waste stream should also be examined at the end point in the recovery waste flow (e.g. output from MRFs).

7.6 AREAS FOR FURTHER RESEARCH OR INTERVENTION

Seasonal Variation in Household Waste: The effect of seasonal variation on waste composition and generation has not been studied in detail in Ireland. It can also be seen from Section 3.5, that some interactions vary between different types of waste collections during the year. Garden waste is the

main factor identified significantly affected by seasonal variations but there is little information on the others factors.

Surveying at the level of an individual household: Methodologies characterising the waste at source (individual bins) were not selected for this project, which instead continued to use the sampling of a number of houses mixed together in a RCV. The alternative approach whereby the waste produced by each household is separately sorted could be carried. This method would be more applicable to surveys on the waste generation patterns and lifestyles of specific study areas. In these cases it will yield more detailed results – for example the influence of the number of occupants, the age group of occupants, or the influence of the household type (terraced, detached etc.) on waste composition. However it does involve greater complexity and organisational challenges. Pilot studies would be useful to determine the cost, feasibility and possible differences in results compared with the existing methodology.

Wastes not included in the survey programme: Two elements of the waste generated by households are not included in this project:

Home Composting Activities: this project did not specifically examine the impact of home composting on household waste composition. It would be useful to carry out a separate study to consider how widespread usage is, and what type and quantity of waste is managed by this method.

Burning of Waste: the practice or burning household waste in fireplaces or in back gardens is an issue of concern, in particular in locations where the uptake of household waste collection is low. Surveys to examine householder behaviour and to quantify the quantity and type of waste burned, and how it is burned, would be beneficial in developing both information programmes and regulatory methods to address this problem.

Litter and Street Cleaning Waste: this comprises 2-3 % of the municipal waste stream. Litter bins were not surveyed as part of this study. Surveys on this waste stream would be useful in identifying the composition, and in particular if there are components that could be recovered, or if there is a significant proportion of hazardous waste (batteries etc.).

Use of Macerators to manage organic waste: The use of macerators as a waste management 'solution' (organic waste is macerated in the sink and goes to foul sewer) appears to be gaining momentum in commerce. This should be evaluated as it will simply redirect the organic problem from a solid one to a liquid one.

Compliance with Packaging Regulations: Commercial enterprises generally are not fully complying with the Waste Management (Packaging) Regulations 2003 which requires that the 7 main recoverable packaging waste streams be segregated at source. It was found that industrial sites were more diligent in this regard and this points to an area within the commercial sector that should be tackled.

APPENDIX A

Summary of International Methodologies for Household Waste Characterisation

Summary of International Municipal Waste Characterisation Methodologies

	Austria 1	Autria 2	Germany	Italy	Spain	United Kingdom	Belgium	Denmark	France	Netherlands	Pennsylvania	Minnesota	New Zealand
Method name			ARGUS				MODECOM	Nordtest Method (Unofficial standard)	MODECOM	AOO-IPA	Methodology developed by R. W. BECK	Methodology developed by R. W. BECK	Solid Waste Analysis Protocol
Spatial Dimension	City	Regional	Local & regional	No specification	City	Local authority level	Regional	National, regional or local investigations	Regional or local scale	Local investigations	Regional	Metropolitan and Regional	Regional or local scale
Temporal dimension	4 / year	2 / year	4 / year	No specification	Range from 1 / year to 6 / year	Range from single-phase to multi-phase programs (seasonal investigations)	Several time shifted analyses-campaigns over period of a year	Seasonal and weekday variations have to be considered	Multiple surveys are recommended	1 / year to 2 / year	4 seasonal investigations	One season sorting event	Surveys covering a period of 1 week are recommended, to ensure daily and weekly patterns
Waste type	Household and commercial Residual and separately collected waste	Mixture of residual household and commercial waste	Kerbside residual and separetely collected household waste	Urban solid waste, input of incineration plants	Mixture of daily residual household waste and daily commercial and service waste	Daily household and commercial waste, civic amenity waste and separately collected waste	Residual waste from households	Primarily residual waste from households and mixed waste from various enterprises	Daily household and commercial waste	Household waste	Municipal Solid Waste	Municipal Solid Waste	All solid wastes - municipal, commercial, industrial, C & D, mining wastes etc
Approach of analysis	Sampling & sorting	Sampling & sorting	Sampling & sorting	Sampling & Sorting	Sampling & Sorting	Sampling & Sorting Visual classification, Questionnaires	Sampling and sorting	Sampling and sorting	Sampling and sorting	Sampling and sorting	Sampling and sorting, Visual sampling	Sampling and sorting	Sampling and sorting
Stratification criteria	Income &housing structure, size of container	% agricultural, industrial, residential, office areas, density consumption patterns	Settlement structure, bin size, differences in waste collection schemes, tariff system	No specification	No standardised method	Social class, professional/economic status of household, family size, age of household, type of household, ethnicity	Age. Sex, income, eductational level, number of children, residential structure	Housing areas, bin sizes, size of households, housing structures, social and economic groups	Type of separate collection, type of habitat, association of municipalities	Settlement structure, collection system, socio-economic household structure	Targeted regions, demographic areas, waste collection types e.g. collected waste, self haul waste	Generator types (residential sector, industrial/commercial/institutional) and frequency of sampling	Seasonality, facilities available,
Level of sampling	Waste container	1994 waste container, 1998 bulk from truck	sample of a bin on the day of collection	Vehicle load (truck) or heap	Trucks and waste containers	Waste bins or black bags	Household level	Waste trucks	Waste collection trucks	Waste bins or sacks	Waste Collection Trucks	Waste Collection Trucks	Waste Collection Trucks and household at source
Preparation of sampling			1 m3	Initial sample (2-4 Mg) spread on plane surface, mixed by shovel. Coning and quartering leads to sample size of 200 kg to be manually sorted			Coning and quartering to reduce to sub sample	Coning and quartering to obtain smaller samples	Selection of 10 bucketloads of 50 kg at random, forming a sample of 500 kg	Sample taken by a collection vehicle, further preparation not necessary	Grab sampling - vertical slice taken from a pile in the selected quadrant of the load	Sample taken from a collection vehicle - mix, cone and quarter	Sorting of waste in refuse bags
Sampling units	Size of bin	240 lt Wheelie bin	1 m3	No specification		Households, Enumeration Districts	No specification	No specification	500 kg	No specification	No specification	No specification	
Sample size	200 samples per season		80 / year	100 -200 kg		A number of Enumeration Districts are selected	5,000kg	100 - 200 households/week	5 samples per survey	750 kg	200 to 250 pounds	200 pounds	300 - 500 households
Classification of waste	14 categories, 90 categories		3 level of aggregation:12, 41	5 main categories	11 categories	Various sorting classification used	13 main categories	11 main categories	13 main categories	99 main categories	37 defined material categories	59 main categories	12 primary classifications, secondary classifications also
Evaluation/ extrapolation	Seasonal result is based on weight data from LA, Socio-economic result is based on container volume/ year / stratum		Ratio estimation	No specification		Ratio estimation or extrapolating on the basis of total % of various classifications within the whole local authority	Determination of ave waste compostion	No extrapolation is provided due to the proportional stratified random sample	2 methods 1. Calculation ofsample compsition in % of wet weight or dry weight of sample sorted 2. Calculation of waste composition in survey area by average or quantities produced	2 Methods 1. Results representative for the area under investigation 2. Ave for results of different strata correspond to no. of inhabitants per stratum			
Practical application													
Personnel	4 ops., 1 exec.		5-6 ops., 1 exec.	No specification		5 - 8 persons for sorting, 1 exec	4 persons for sampling, 6 persons for sorting, 2 execs	No specification	1 engineer, 1 technican, 6 labourers	1 supervisor, sorting staff	Field Supervisor, sorting staff	Supervisor, sorting staff	Supervisor, sorting staff
Equipment	3 tables, notebook			No specification						No specification	Sorting Table, 40 gallon bucket, bins,	No specification	Table, bins, knife, broom, rake, weighing scales
H&S				No specification			No specification			No specification	No specification	Site traffic and staffing were assessed prior to surveys	First aid kit and PPE required
QA	Photographic sorting guides for personnel, check list procedure			No specification			No specification		No specification	No specification	No specification	No specification	1 days training for all staff
Appraisal of method	Very work intensive, commercial waste not investigated separately		Comparable and reliable results	Simple method, The small sample size causes low accuracy for results		Very work-intensive approach, commercial waste is usually excluded	Household specific results, planning of sampling is very work intensive	Many-sided methodology, instructions are described superficially	Easily applicable. By taking samples from loads of collection vehicles, may be difficult to differentiate between household and commercial waste	Imprecise description of sampling procedure and evaluation.	Only Residual waste	Only Residual waste	

APPENDIX B

Demographic and Waste Management Data for each Local Authority in Ireland

						% Population per Social Class			Ave. no. of persons per private household			Private Households classified by type of accomodation										
County	Total Population	Surface	Density Pop/km2	Urban %	Rural %	A%	B%	C%	Agg. Rural	Agg. Urban	Total	Total	Sub-total House	Detached house	Semi-detached house	Terraced house	Sub-total flats/Appt	Flat or apartment in a purpose-built block	Flat or apartment in a converted or shared house	Flat or apartment in a commercial building	Caravan, mobile or other temporary structure	Not stated
Carlow	46,014	896	51	49%	51%	33	41	26	3.22	2.81	3.01	14,931	92%	51%	25%	16%	5%	2%	2%	1%	1%	2%
Cavan	56,546	1,891	30	17%	83%	31	44	25	3.05	2.8	3.01	18,340	93%	73%	12%	9%	4%	1%	1%	1%	1%	2%
Clare	103,277	3,188	32	36%	64%	38	40	22	2.97	2.83	2.92	33,874	93%	61%	19%	13%	5%	3%	1%	1%	1%	2%
Cork City	123,062	40	3107	100%	0%	34	39	27	0	2.75	2.75	42,742	84%	12%	32%	40%	14%	8%	5%	1%	0%	2%
Cork County	324,767	7,468	43	47%	53%	39	39	21	3.1	2.95	3.03	105,248	94%	61%	19%	14%	4%	2%	1%	1%	1%	2%
Donegal	137,575	4,830	28	24%	76%	31	41	28	3.08	2.83	3.02	44,713	93%	69%	15%	9%	4%	2%	1%	1%	1%	2%
Dublin City	495,781	118	4215	100%	0%	38	39	24	0	2.59	2.59	180,852	68%	5%	25%	38%	29%	20%	8%	1%	0%	3%
Dún Laoghaire-Rathdown	191,792	127	1511	99%	1%	56	31	13	3.12	2.9	2.9	64,132	88%	24%	46%	18%	11%	8%	2%	0%	0%	1%
Fingal	196,413	453	433	91%	9%	45	39	16	3.29	3.17	3.18	60,872	92%	24%	53%	16%	5%	4%	1%	0%	1%	2%
Galway City	65,832	51	1302	100%	0%	43	35	22	0	2.86	2.86	21,053	80%	24%	40%	16%	17%	12%	4%	1%	0%	2%
Galway County	143,245	6,100	23	15%	85%	36	41	23	3.12	2.78	3.06	45,253	93%	80%	10%	3%	3%	1%	1%	1%	1%	2%
Kerry	132,527	4,701	28	34%	66%	34	41	25	2.95	2.69	2.87	43,322	92%	67%	15%	11%	5%	2%	1%	1%	1%	2%
Kildare	163,944	1,694	97	65%	35%	40	39	20	3.27	3.15	3.19	50,477	93%	44%	40%	9%	5%	3%	1%	1%	1%	2%
Kilkenny	80,339	2,062	39	31%	69%	37	41	22	3.18	2.76	3.04	25,603	94%	63%	18%	14%	4%	2%	1%	1%	1%	2%
Laois	58,774	1,719	34	33%	67%	33	41	26	3.18	2.92	3.09	18,556	94%	65%	18%	10%	3%	1%	1%	1%	1%	1%
Leitrim	25,799	1,525	17	7%	93%	33	42	25	2.8	2.38	2.77	9,099	94%	77%	11%	6%	3%	1%	1%	1%	1%	2%
Limerick City	54,023	20	2655	100%	0%	31	40	29	0	2.71	2.71	18,945	83%	10%	32%	41%	15%	11%	3%	2%	0%	2%
Limerick County	121,281	2,740	44	29%	71%	38	39	23	3.08	2.93	3.04	38,378	94%	65%	21%	8%	3%	2%	1%	1%	1%	2%
Longford	31,068	1,044	30	24%	76%	33	42	25	2.98	2.78	2.93	10,375	93%	69%	13%	11%	3%	2%	1%	1%	1%	3%
Louth	101,821	823	124	64%	36%	33	41	26	3.23	2.87	2.99	33,495	94%	42%	26%	25%	4%	3%	1%	1%	0%	2%
Mayo	117,446	5,398	22	26%	74%	33	41	26	2.94	2.68	2.87	39,354	94%	72%	14%	8%	4%	2%	1%	1%	1%	2%
Meath	134,005	2,336	57	45%	55%	39	41	20	3.26	3.07	3.17	41,675	93%	62%	24%	7%	4%	3%	1%	1%	1%	2%
Monaghan	52,593	1,291	41	28%	72%	31	44	25	3.27	2.71	3.1	16,753	93%	67%	14%	13%	4%	1%	1%	1%	1%	2%
Offaly	63,663	1,998	32	40%	60%	32	42	26	3.2	2.96	3.1	20,144	92%	61%	21%	11%	4%	2%	1%	1%	1%	2%
Roscommon	53,774	2,463	22	20%	80%	34	43	22	2.93	2.68	2.88	18,142	95%	79%	12%	4%	3%	1%	1%	1%	1%	1%
Sligo	58,200	1,796	32	34%	66%	37	40	23	2.93	2.67	2.84	19,643	92%	59%	21%	12%	5%	3%	2%	1%	1%	2%
South Dublin	238,835	223	1071	97%	3%	38	43	19	3.19	3.21	3.21	73,516	95%	11%	57%	26%	3%	2%	0%	0%	0%	2%
Tipperary North	61,010	2,046	30	34%	66%	36	41	23	3.1	2.7	2.95	20,213	93%	64%	18%	12%	4%	1%	1%	2%	1%	2%
Tipperary South	79,121	2,258	35	41%	59%	33	40	26	3.05	2.72	2.91	26,410	93%	55%	18%	19%	5%	2%	1%	1%	1%	2%
Waterford City	44,594	42	1072	100%	0%	33	39	27	0	2.76	2.76	15,299	90%	20%	36%	34%	7%	5%	2%	1%	0%	3%
Waterford Coun	56,952	1,817	31	32%	68%	37	38	25	3.06	2.79	2.97	18,606	95%	63%	20%	12%	3%	1%	1%	1%	1%	1%
Westmeath	71,858	1,763	41	44%	56%	36	41	23	3.13	2.8	2.98	23,360	91%	56%	24%	11%	6%	4%	1%	1%	1%	2%
Wexford	116,596	2,351	50	33%	67%	33	42	26	3.16	2.75	3.01	38,011	93%	62%	18%	13%	4%	2%	1%	1%	2%	1%
Wicklow	114,676	2,025	57	60%	40%	41	38	21	3.14	3.03	3.07	36,572	92%	47%	29%	16%	5%	2%	2%	1%	1%	2%
State	3,917,203	70,282	56	40%	60%	37.7	39.7	22.6	3.09	2.86	2.95	1,287,958	89%	44%	27%	18%	9%	5%	2%	1%	1%	2%

	Wastes Arisings				Recycling Facilities 2003										
County	EPA NWD 2002	kg/hab/year	EPA NWD 2003	kg/hab/year	No. of CAs	CA Tonnes Collected	No. of BB	BB Tonnes Collected	% collected by CA+BB	Persons per BB	Kerbside	KerbsideTonnes collected	Number of household serviced	Containers bags/ WB	Environmental Charges
Carlow	16,167	351	18,169	395	3	998	37	451	9%			0		WB	F
Cavan	9,820	174	13,362	236		305			3%			1,675		WB	
Clare	35,540	344	30,913	299	3	1,096	52	1,169	6%	1,986	R/O	6,138		WB/bags	F
Cork City	50,173	408	48,803	397	1	4,859	52	1,494	13%		O/CD	2,502		WB/bags	F
Cork County	117,185	361	109,679	338	4	1,987	133	8,232	9%	2,442	R	1,284	63,500	WB/bags	W/U/F
Donegal	34,982	254	27,006	196	1	819	50	1,084	5%		R	102		WB/bags	F/U
Dublin City	247,653	500	195,610	395	1	2,215	73	4,856	3%	6,792	R	34,250		WB/bags	F
Dún Laoghaire-Rathdown	78,099	407	75,975	396	1	6,201	64	4,432	14%	2,997	R	6,397		WB	W
Fingal	70,195	357	65,473	333	2	479	80	3,346	5%	2,455	R	18,462		WB	W
Galway City	16,120	245	18,825	286	1	157	13	1,301	9%	5,064	R/O	7,977		WB	F
Galway County	51,794	362	30,050	210	2	654	100	1,055	3%	1,432	R/O	4,992		WB	F
Kerry	55,659	420	31,445	237	5	560	56	1,865	4%	2,367	R/O	1,120		WB	F
Kildare	75,814	462	62,636	382	1	4,340	51	1,070	7%	3,215	R	5,102	29,000	WB	
Kilkenny	19,372	241	14,860	185	3	214	42	949	6%	1,913	R	1,147		Bags/WB	F/U
Laois	19,669	335	21,691	369	1	752	57	445	6%	1,031	R	1,852		WB	W/U/F
Leitrim	9,309	361	5,095	197	0	703	37		8%	697	R	15		WB/bags	F/U
Limerick City	22,552	417	23,176	429	1	327	19	527	4%	2,843	R/o	8,945		WB/bags	F/U
Limerick County	29,370	242	33,128	273	1	133	47	1,413	5%	2,580	R	0		WB/bags	F/U
Longford	12,455	401	8,462	272	0		22	189	2%	1,412	r/o/BW	1,028	5,844	WB/bags	F/U
Louth	32,981	324	37,997	373	1	7,445	20	731	25%		R/CD	5,740		WB/bags	F/U
Mayo	52,792	450	26,137	223	2	2,588	81	1,102	7%		R	2,107		WB	F
Meath	57,304	428	47,061	351	2	2,916	26	1,389	8%		R	8,769		WB/bags	W/U
Monaghan	12,889	245	15,031	286	1	1,352	22	381	13%	2,391	R	1,403		WB	W
Offaly	25,030	393	11,698	184	1	0	38	2,268	9%		R	884		WB	F
Roscommon	10,158	189	10,416	194	2	546	30	498	10%		R	560		WB/bags	F/U
Sligo	10,439	179	13,478	232	1	1,079	42	270	13%		R	477		Bags	U
South Dublin	88,745	372	90,463	379	2	2,068	45	2,003	5%	5,307	R	7,512		WB	U
Tipperary North	25,168	413	23,260	381	3	2,197	29		9%		R	1,456		WB	F
Tipperary South	23,083	292	26,996	341	2	690	55	1,104	8%		R	1,172		WB/bags	F
Waterford City	15,407	345	15,358	344	1	532	24	1,043	10%		R/O	2,180		WB	U
Waterford Coun	12,767	224	22,307	392	3	2,878	43	920	30%		R/O	2,476		WB/Bags	F/U
Westmeath	15,414	215	22,468	313	2	824	60	1,088	12%					WB	F/U
Wexford	32,044	275	37,636	323	2	85	122	1,982	6%		R	139		WB	F/U
Wicklow	38,423	335		0	3		56		0%	2,048	R		800		
State	1,528,314	390	1,214,662	310	60	27,115	1692	51,897	5.2%						

APPENDIX C

Statistical Principles for Use in Waste Composition Analyses

Statistical Principles for Use in Waste Composition Analyses

Due to the variability of municipal solid waste materials, estimates of municipal solid waste composition are only approximate in nature. Similar to the methods used by statisticians in conducting opinion polls, for example, limited samples of solid waste must be used to describe the characteristics of the entire "population". While it may be desirable to sort every load of solid waste produced and collected by households and businesses to determine the "exact" composition of the waste stream, usually the entire quantity of solid waste being generated cannot be economically or practically sorted. Therefore, a representative sampling method must be used to obtain study samples and these samples must be analysed to estimate the composition of the entire waste stream.

Sampling methods for characterising solid waste have evolved significantly since the early 1970's. Today, the industry offers mathematically advanced, yet practical and economically viable techniques to characterise municipal solid waste.

The statistical terms that are the most commonly used to characterise solid waste (and terms used in throughout this Report) are explained below.

Population: A collection of items of interest in research. In this project it is the municipal solid waste generated in Ireland.

Mean: the mathematical average of all the items in a sample. The formula is

$$\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$$

Weighted Mean: The weighted mean is a mean where there is some variation in the relative contribution of individual data values to the mean. Each data value (Xi) has a weight assigned to it (Wi). Data values with larger weights contribute more to the weighted mean and data values with smaller weights contribute less to the weighted mean. The formula is

$$\overline{X}_w = \frac{\sum W_i X_i}{\sum W_i}$$

Standard Deviation: it is the most commonly used measure of statistical dispersion. Simply put, it measures how spread out the values in a data set are. The formula is

$$S = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(X_i - \overline{X}\right)^2}$$

Coefficient of variation: Whilst the standard deviation is an absolute measure of the average dispersion of the individual contamination values around the mean contamination, the coefficient of variation is a relative measure of the dispersion. It allows for comparisons of the variations of populations with significantly different mean values, i.e. two sets of data could conceivably have the same standard deviation despite the mean values being very different. The coefficient of variation

allows comparison of these two data sets. The coefficient of variation is equal to the standard deviation divided by the mean.

Accuracy: An accurate measurement is one that is very close to the true value of a phenomenom

Confidence interval: The confidence interval is an expression of statistical accuracy. It provides the upper and lower limits of the "actual" population mean based on the sampled mean and variance of the observed sampled data. For example, sample mean for the waste category newspaper may be 5 % for a certain generator, with a confidence interval of +/- 1%. This implies that the true population mean for paper is between 4 and 6 percent.

Confidence level: given the limited sample size used in calculating the mean, it is also important to know how much confidence we have that the true population mean does in fact, fall within the 4% to 6% range. The term used to qualify the amount of confidence we have is the "level of confidence", an expression of how certain we are the true mean falls within the stated confidence interval. For example if the level of confidence is 95%, we are 95% certain that the true population mean is within the stated confidence interval. Combining the terms confidence interval and level of confidence, we use the phrase "95% confidence interval". Applying this term to the previous example, we would be 95% certain that the true population mean would fall within the 4% to 6% range.

Other levels of confidence could be calculated, such as 80% or 99%. However, the 95% level of confidence has been accepted as standard practice in waste composition studies by the industry.

Further, the level of confidence and the confidence interval have an inverse relationship. For example, for an 80 % level of confidence, the confidence interval will be narrower than if the level of confidence were 95 %.

In general, the more samples that are sorted, the narrower the confidence interval becomes for any given level of confidence.

Outlier: refers to individual samples that have uncharacteristic or extreme material composition. Sample variability. For example, it is common to find approximately 30% organic in any sorted household residual waste sample. However, a load may be selected and sorted that contains 20% organic. Statistically speaking, the sample that contains 20% organic would be considered an "outlier"

Stratification: It is a statistical subdivision of the in-homogeneous parent population (e.g. waste arising of an area) into (more) homogeneous sub populations (non overlapping groups, e.g. waste from a certain type of housing), called strata. It presents the advantage of increasing the accuracy of results and reducing the sample size.

APPENDIX D

Example of Waste Composition Surveys Risk Assessment

RPS MCOS Work activity Risk assessment Form				This form must be completed where RPS-MCOS personnel are required to carry out work on waste management sites, recycling facilities, bring centres, sampling etc	
Names of personnel involved					
Task/operation	**WASTE CHARACTERISATION**	**Location**		**Date:**	
HAZARDS	**RISK**		**Method Adopted to Avoid, Reduce or Control Hazard**		
Sharps and Needle stick injury (needles, syringes, glass, razor, nails)	Laceration, cuts and bruises, infection, lockjaw (tetanus) Hepatitis B,C ,		Vaccinations available. Visually check the work area; wear anti-syringe gloves and litter picker where possible. latex gloves, skin barrier creams, disposal clothing, safety shoes. Supervision is required to ensure that par time workers are not over exposed, particularly when vaccinations not practicable.		
Slips, trips and falls	Low		Regular cleaning regime		
Machinery	Low risk of hearing damage. Microbiological agents and organic dust Risk of crushing, hitting, bruising, amputation		PPE (Ear defenders) worn around noisy equipment; Dust mask Employees shall not enter unauthorised areas of the facility unless under supervision.		
Traffic	Low risk of Crushing, fractures, cuts, bruises, head injury		High visibility clothing worn at all times. Our staff separated from works traffic during study. Our staff to be warned of traffic risks.		
Manual Handling	Low risk of sprains, strains and back injury		Assess the load before lifting; Bend from the knees and keep the back straight. Carry two lots of buckets as opposed to one load Do not lift the load if you feel it is too heavy, get help from a colleague Do not reach into the bins, get help to tip the bin onto the table or use a litter picker		
Falling objects	Low risk of head injury		Set-up the waste characterisation table away from areas where there is a possibility of falling objects from overhead conveyors		
Temperature	Low		Wear suitable clothing for the weather; warm clothing usually required when working outside		

PERSONAL HYGIENE: Wash hands before and after visiting the lavatory and before any tea/coffee/lunchtime breaks or if smoking. Cover all cuts, grazes with band-aids before working on site. Showers are recommended asap upon completing the task.
FIRST AID: is available on-site, report to supervisor immediately should an incident/accident occur
FIRE ASSEMBLY POINTS: Supervisor will identify the assembly points for each site.
HAZARD REPORTING: Report any hazards you identify to your supervisor
PERSONAL PROTECTIVE EQUIPMENT: PPE is provided for you and it is company policy that it is worn at all times on site.
Includes ; High visibility clothing worn, Ear defenders, Dust mask, latex gloves, skin barrier creams, disposal clothing, safety shoes

I_____have read and understand the hazards, risks and control measures that are in place to protect me from any risks involved with this task.

Employee Signature: _____ ***Date:***_____

APPENDIX E

Classification of Waste in Sorting Exercise and Waste Composition Form

The waste categories were developed from the categories used in the EPA Municipal Waste Characterisation Manual, 1996, but they have been updated to take into account the evolution of waste materials and the change in EWC Codes (in force as of 01/01/2002). There are 13 principal categories and 57 secondary (instead of 55). It must be noted that:

- 'Vegetable oil', 'Office Papers', 'Tissue Papers' and 'Styrofoam' categories were created to identify more accurately some commercial wastes.
- A 'liquid waste' category was created for remaining liquid contained in beverage cartons or bottles.
- WEEE waste was not broken down into the categories recommended by the WEEE task force, as bulky items will be considered separately from the waste characterisation.
- Disposable Nappies are grouped with Healthcare Textiles.
- Clear PVC and Opaque PVC jars & bottles were combined into PVC Packaging
- Clear PET Bottles, Green PET jars and bottles and Brown PET jars and bottles were combined into PET Packaging
- A 'Wood non-packaging' category was created.

Important points of clarification for sorting and classification:

- *Packaging items with contents where the content of packaging item is suspected to weigh more than the packaging itself (e.g. full bottles):* the liquid content and the packaging shall be classified separately to the specific categories of the sorting catalogue. The liquid waste will be transferred to a separate container and recorded separately.
- *Fines (Fraction < 20 mm) in bags such as vacuum bags, house sweepings, pet litter etc:* The contents of such bags are often easy to classify as fines and the weight of the bags forms a relatively minor part of the waste stream. Therefore, these bags shall be classified with their content directly to the fraction < 20 mm. These bags shall not be emptied for hygienic reasons.
- *Composites or combined packaging (e.g. packets of cigarettes, bottles with cap, yogurt pots with aluminium lids etc.):* Where the compounds can be separated easily and which are larger than a packet of cigarettes, the compounds have to be classified to the specific categories. For composites that are smaller than a packet of cigarettes: the compounds shall be classified according to the dominant category.
- *Multi-material Items*; i.e. objects consisting mainly of pure categories and only small parts (<20% of weight) of another category (e.g. metal brush handle (with handles of plastic), hole puncher, cardboard ring binder etc…) shall be classified according to the category of its main component. The separation would only be possible with substantial effort.
- *Refuse sacks* are not packaging waste and shall recorded in the category 'other plastic waste' due to the fact that they do not satisfy the definition of packaging that has been placed on the market.

MUNICIPAL WASTE COMPOSITION FORM		
EWC CODES	**WASTE CATEGORIES**	**TYPICAL EXAMPLES**
ORGANIC WASTE		
20 01 08	Biodegradable kitchen & canteen waste	Bread, fruit, cooked or uncooked food items, meat and fish, pet foods, vegetable skins, tea bags
20 01 25	Vegetable oil	Waste cooking oil
20 02 01	Biodegradable waste from garden & park	Grass and bush cutting, twigs, soil, flowers, leaves, tree branches, weeds
21 01 08	Liquid fit for human consumption	Liquid contained in drink and milk containers

PAPERS		
15 01 01	Packaging	Brown or white paper bags, wrapping paper, fast food wrapping, egg cartons
20 01 01	Newspapers- Brochures	Local and national newspapers, newsprint-type advertising publications, other newsprint
20 01 01	Magazines & glossy paper	Magazines and ads on glossy paper , shop catalogues
20 01 01	Office papers	Envelopes, letters, print outs
21 01 01	Tissue papers	Tissue papers
20 01 01	Other papers	Till receipts, books, telephone directories, Golden Pages, non-glossy junk mail, loose leaf paper, non-glossy brochures and catalogues
CARDBOARDS		
15 01 06	Flat Packaging	Cornflake boxes, toy boxes, washing powder containers, food containers, cleaning product cartons
15 01 06	Corrugated packaging board	Corrugated packaging cardboard used for household items packaging (TVs, PCs, furniture)
20 01 01	Other cardboards	Birthday cards, postcards, files and folders, tickets
COMPOSITES		
15 01 05	Other non-packaging composite	Items of furniture, appliance parts, car parts, engine-parts, shoes (multi-material only)
15 01 05	Liquid packaging	Beverage cartons (Tetrapak)
15 01 05	Other composite packaging	Tablets packaging (“Blister packs”)
TEXTILES		
15 01 09	Textile Packaging	Nets for fruits and vegetables
15 01 09	Textiles Non-Packaging	Rags, household soft furnishings and upholstery, carpets, curtains, blankets, towels
20 01 11	Clothes	Clothes and canvas bags
20 01 11	Healthcare Textiles, disposable nappies	Nappies, plasters, sanitary towels, bandages
PLASTICS		
20 01 39	PVC packaging	Oil bottles, toiletries packaging,
20 01 39	PET packaging	Soft drinks bottles, water bottles, some ice-cream cartons
20 01 39	PE Jars& Bottles	Milk, detergent, bottle caps, household/pet/garden products, laundry liquid containers
20 01 39	PS packaging	Convenience food packaging (e.g. sushi)
15 01 02	Styrofoam	EPS foam (burger boxes, egg cartons)
15 01 02	Supermarkets bags and films (PE & PP)	Plastic shopping bags, fertiliser bags, cling film, compost/peat-moss bags, sandwich bags, cereal packets (inside box), biscuit wrappers
15 01 02	Mixed flexible plastic packaging	Crisp packaging, margarine tubs, toothpaste tubes
15 01 02	Mixed Rigid plastic packaging	Yoghurt pots without lid, ice creams, CD covers
20 01 39	Other plastic waste	Refuse bags, Clothes hangers, toys, air freshener holders, plant pots, seed trays, video cassettes, washing up bowls, racks, garden hoses, floor linoleum (lino), CDs, gardening equipment, hoses, disposable razor blades, tubes/pumps

GLASS		
15 0107	Green Glass packaging	Red wine bottles
15 0107	Clear Glass packaging	White/Rosé wine and water bottles, jam jars, flasks
15 0107	Brown Glass packaging	Beer bottles (e.g. Budweiser), medicine bottles
15 0107	Glass packaging other colours	Blue water bottles, medicine bottles
20 01 02	Non Packaging glass	Mirrors, plate glass, flat glass, cookware (pyrex), mixed broken glass, drinking glasses
METALS		
15 01 04	Ferrous metal packaging	Beverage and food cans, lids, biscuit containers
20 01 40	Other ferrous metal waste	Keys, nails, cutlery, paper clips, building/DIY materials, screws, tools, safety pins, metal shelves, old radiators (many new ones are plastic), pots and pans, locks
15 01 04	Aluminium packaging	Beverage and food cans, foil sheets and trays, shoe polish cans
20 01 40	Other aluminium waste	Cutlery, household wiring, crockery
15 01 04	Other metal packaging	Building/DIY material
20 01 40	Other metal waste	Cast items (taps, cooking pans), locks, building/DIY material, plumbing, bike parts
WOOD		
15 01 03	Wood packaging	Bottle corks, cork packaging, pallets, wine presentation boxes
20 01 38	Non Packaging wood	Wood fencing, wood from DIY, kitchen units, particle wood (chipboard, plywood, MDF)
SPECIAL MUNICIPAL WASTE		
20 01 27	Paint, ink pastes and resins	Paint
20 01 13	Solvents	Methylated spirits, glues and solvents, refrigerants
20 01 29	Detergents	Bleach
20 01 17	Photochemicals	Chemicals for photographic development
20 01 19	Pesticides	Garden/household insecticides & weedkiller
20 01 33	Batteries & Accumulators	Lead acid, nickel cadmium, other car and household batteries and accumulators (including rechargeable batteries)
20 01 21	Fluorescent tubes& bulbs	Light bulbs (normal, fluorescent, energy saving)
20 01 99	Aerosols	Deodorant, perfume, hairspray
21 01 35	Electronic equipment	Household appliances (toasters etc), toys, control instruments
20 03 99	Other special domestic waste	Medicine, fire extinguishers, motoring products
UNCLASSIFIED COMBUSTIBLES		
20 03 99	Unclassified combustibles packaging	
20 03 99	Other unclassified combustibles	Animal hair, contents of vacuum cleaner bags (that had remained in the bag, as opposed to such contents that form some of the “Fines < 20mm”), tennis balls, bones, rubber, leather, soap
UNCLASSIFIED INCOMBUSTIBLES		
20 03 99	Unclassified incombustibles packaging	
20 03 99	Other unclassified incombustibles	Ceramics, clay plant pots, crockery, stone/ceramic, floor and wall tiles, vases, stones, bricks, cinders, shells
COMPONENTS SMALLER THAN 20 MM ROUND MESH		
20 03 99	Fines smaller than 20mm round	Fragments of glass, yard waste, sand, ashes

APPENDIX F

Commercial Waste Composition Methodology

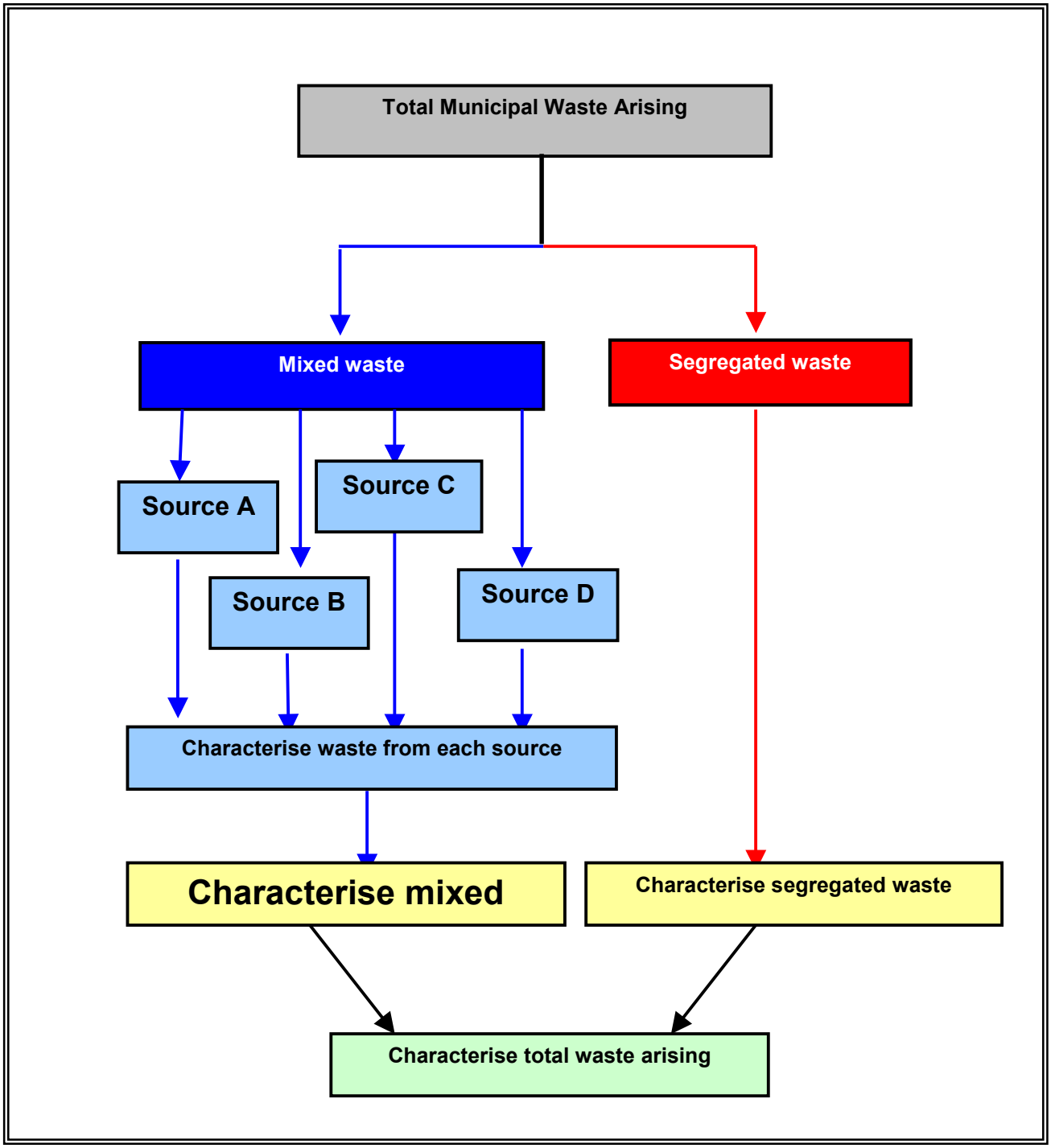
Detailed On -Site Methodology

CTC has previously devised a methodology to characterise commercial and industrial waste for the MS-7 study. This methodology was developed after an extensive review of existing waste characterisation practices in Ireland and abroad

In the current study that methodology has been retained, though with some variations and refinements.

The ***municipal*** waste arising from any commercial or industrial sector can be broadly divided into mixed waste and segregated waste as outlined in Figure A.1

Figure A.1 Flow diagram of waste characterisation methodology steps



Although the volume of mixed waste is usually known from waste disposal records the composition of this waste stream is often difficult to determine. Mixed waste consists of a wide number of waste materials and will vary in composition depending on the nature of the enterprise and its activities. For example the mixed waste stream arising from a hotel will contain a higher percentage of food waste than that from a public office. Mixed wastes also vary in character within an enterprise. For example, the waste from the kitchen of a hotel will vary considerably in composition to the waste arising from the bedrooms of the same hotel.

Wastes streams which are easily segregated include waste paper, cardboard, glass and metal. These segregated waste streams are often collected and sent for recycling. For the purposes of this study, the *segregated* waste is further sub-divided and characterised (e.g. cardboard).

This methodology requires that a waste characterisation survey of all the major waste sources within an organisation be conducted. The number of sources in an organisation will depend on the complexity of the activities and the associated waste. For example, municipal waste from an industrial site might be grouped into waste arising from the kitchen/canteen area, offices, grounds and general working areas.

Separation at source is the key to the methodology as this ensures that cross contamination is kept to a minimum. Cross contamination occurs when different fractions are mixed in a general bin (e.g. food and paper). This mixing has the tendency to yield somewhat ambiguous figures (in the case of food and paper, the paper weight may be recoded as heavier than the actual paper weight due to absorption of water) and is combated through separation of the individual streams, where possible, at source. Cross contamination is recognised as one of the main areas of error within municipal waste characterisations[25] and should not be confused with inherent contamination (e.g. residual liquid in a PET bottle).

Qualitative and quantitative data on the character of the waste arising from the main sources can thus be gathered to determine the character of the total waste stream.

Before the Survey Begins

Before beginning the waste characterisation survey there are a number of tasks that need to be conducted. These are outlined below:

1. **Meet with the management** of the enterprise whose waste is to be characterised. It is essential that management commitment is given to the waste characterisation study so that necessary resources are assigned during the study period.

2. Schedule the waste characterisation survey period:

   - Arrange to conduct the waste characterisation study during **typical business activities/operations**. Avoid scheduling the survey on or around any special events that would produce wastes not representative of a normal workday/workweek. For example, surveys should not be conducted during bank holidays, Christmas, Easter or public holidays (or special orders in the case of Industry).

[25] Characterisation of Municipal Solid Waste and its recyclable contents of Guangzhou, Chung S.S. and Poon C.S., Waste Management & Research 2001, 19 (6), 473-485.

- It is also important to select a survey **time period that is sufficiently long** to account for fluctuations in waste character and volume that occur in an organisation. For example the volume of waste produced from a hotel may increase at weekends. The recommended duration for the survey is 5 to 7 days. However the longer the survey period, the more accurate and reflective will be the results.

3. Divide the organisation into **areas with similar waste composition** (these are referred to as 'Waste Sources' for the purpose of this methodology). The number of sources will depend on the complexity of the organisation.

   - For example, waste arising from a small green grocer may be split into two waste areas: office and warehouse/shop-floor. Each of these 'waste sources' has a different waste composition – office (mostly waste paper), warehouse/shop floor (mostly organic waste and cardboard).
   - For example, waste arising from hotel bedrooms will be similar in composition. Bedrooms are then chosen as a 'waste source' within hotels from which a specific character of waste arises.

4. **Inform relevant staff** of their duties and responsibilities during the waste characterisation survey. They may be required to segregate waste, label waste arisings, etc.

   - Staff should be encouraged to segregate as many waste streams as possible at each 'waste source' for the duration of the waste study. Staff should be encouraged to segregate waste streams which may not normally be segregated, for the duration of the waste study.
   - It is especially important to segregate 'wet' wastes (high water content, for example food waste) from 'dry' wastes. Combining 'wet' waste streams with 'dry' waste streams, results in moisture transfer and contamination of the waste. Once this occurs its is impossible to accurately determine individual waste material weights and thus characterisation is more difficult.
   - Staff should be discouraged from disposing of non-routine waste during the course of the study, for example, stockpiled electronic waste.

5. **Select a central 'waste collection area'** where all waste arisings can be collected, sorted weighted and characterised for the duration of the waste characterisation study. A parking garage, shipping area or other large flat area is preferable. This area should be covered, if possible to provide shelter from adverse weather conditions.

6. **Gather the necessary equipment** to aid in the waste characterisation survey.

   - Clear waste bags/boxes should be available at each 'waste source' to allow wastes to be collected. Pens and labels should also be distributed to each 'waste source'.
   - The 'waste collection area' should contain a weighing scales (with a range from 0 to 20kg, with accuracy to 0.1kgs)), several containers for holding and sorting the waste, shovels, a brush, a first aid kit, clipboard, labels, pens and worksheets. Several copies of the 'Waste Collection Area Worksheets' available in Appendix B should be on hand for each day of the survey.
   - Health and safety issues should also be considered. All members of the waste characterisation team should wear protective clothing (such as rubber gloves, heavy duty shoes, safety glasses and coveralls) and precautions should be taken to ensure that the waste does not come into contact with food or drink.

Conducting the Survey

Once these tasks have been addressed, the waste characterisation survey may begin. At each 'waste source', two categories of waste will be generated:

(a) Segregated waste streams – These waste streams will be homogenous and consist of material of a single type, for example cardboard, paper, plastic, food waste etc.

(b) Mixed waste streams – These waste streams will be heterogeneous in nature and consist of mixed waste of various types. The characterisation of this waste stream is more difficult.

The procedures involved in characterising each of these waste streams is presented below:

Segregated Waste

1. ***All*** segregated waste must be sorted and weighted.

2. Weigh the **empty containers** that the sorted waste will be placed into. Record these weights on each container.

3. The waste can then be **sorted**. Segregated wastes can be sorted easily. All segregated wastes should be sorted into the materials listed in the '*Waste Collection Area Worksheet – see Appendix B*. For example, waste glass must be sorted into 'glass packaging' and 'other glass'.

4. Each of these fractions must be weighted independently and the total values recorded (excluding the weight of the container) in the '*Waste Collection Area Worksheet.*

Mixed Waste

1. As the mixed waste is collected at each 'waste source', each bag/box of **waste should be labelled** with the day/date and source of the waste, as follows:

MIXED WASTE	
Day/Date	*Fri 29th April 05*
Waste Source	*Canteen*

2. As the labelled mixed waste arrives at the 'waste collection area' **all waste bags/boxes** should be weighted and the details recorded in the '*Waste Collection Area Worksheet*.

3. Weigh the **empty containers** that the sorted waste will be placed into. Record these weights on each container.

4. Only ***representative samples*** of mixed waste must be sorted and weighted.

- During the survey period randomly take samples of mixed waste (>10kg) from each of the 'waste sources'.
- The number of samples, which are sorted and characterised from each 'waste source', should be representative of the total volume of waste produced from each 'waste source'. For example, if ten bags of mixed waste arise from the offices of an organisation per day and only two bags of mixed waste are produced from the canteen then the sampling regime should reflect this ratio.
- The greater the number of mixed waste samples which are characterised, the more accurate the results will be. Attempt to characterise as many samples as time allows.

5. The waste samples can then be **sorted**.

- Sort the mixed waste into the waste materials specified in the '*Waste Collection Area Worksheet*. For example, waste wood must be sorted into 'wood packaging' and 'other wood'.
- Each of these fractions must be weighted independently and the total values recorded (excluding the weight of the container) in the '*Waste Collection Area*.

After the Survey

Following the waste characterisation survey, the collected data must be compiled into a useful format. The steps involved are different for mixed wastes and segregated waste.

Segregated Waste

1. From the '*Waste Collection Area Worksheet'* the daily totals of each material generated should be calculated.

2. The daily totals of segregated waste for each waste material will be transferred to an electronic spreadsheet which will display the data in graph form.

Mixed Waste

Each 'waste source' needs to be calculated separately. These values will be stored into an electronic spreadsheet similar to that shown in Appendix 2.

1. Determine total quantity generated from each 'waste source' (for example the canteen)

- From the '*Waste Collection Area Worksheet*', the total quantity of mixed waste generated each day from each 'waste source' must be calculated, for example total daily waste arisings from the canteen of 154 Kg.
- This figure should be entered into 'Total Waste Arisings' (sampled & non-sampled) box for each 'waste source' (i.e. canteen) in the electronic spreadsheet.

2. Determine composition of sorted mixed waste from each 'waste source' (for example the canteen)

- From the '*Waste Collection Area Worksheet'*, the daily totals of sorted mixed waste should be calculated.
- The daily totals of mixed sorted waste for each waste material should be transferred on to the 'Mixed Waste' tabs of the electronic spreadsheet (maximum of six 'waste sources'). For

example, mixed waste arising from the offices of an organisation will be input into a different 'mixed waste' tab than mixed waste arising from the canteen.

- The spreadsheets will then automatically calculate the composition of the waste (segregated waste and mixed waste) and the totals are presented in the 'Summary' tab of the electronic spreadsheet (see Appendix I, MS-7).

Establish the frequency of non-routine waste and record these details. Non-routine wastes arise as a result of non-routine activities such as stock clearance, maintenance, refurbishment of premises and so on. These waste are not typical of the daily wastes arising on site and may include waste such as construction and demolition waste, obsolete electrical equipment, obsolete furniture and so on. Based on this data, daily estimates of non-routine waste should be estimated and inserted onto the spreadsheet.

APPENDIX G

Results of Household Waste Composition Analysis

GALWAY CITY WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	19%	2%	77%	31%	4.9	0.0	4.9	**28%**
Papers	13%	52%	14%	21%	3.5	0.0	3.5	**20%**
Cardboards	4%	18%	1%	6%	0.9	0.0	0.9	**5%**
Composites	3%	3%	0%	2%	0.4	0.0	0.4	**2%**
Textiles	13%	2%	1%	8%	1.2	0.0	1.2	**7%**
Plastics	13%	13%	2%	10%	1.7	0.0	1.7	**10%**
Glass	4%	1%	0%	2%	0.4	1.2	1.6	**9%**
Metals	3%	7%	0%	3%	0.5	0.0	0.5	**3%**
Wood	0%	0%	0%	0%	0.0	0.0	0.0	**0%**
Special municipal was	3%	0%	0%	1%	0.2	0.0	0.2	**1%**
Unclassified Combusti	2%	0%	0%	1%	0.2		0.2	**1%**
Unclassified incombus	3%	0%	2%	2%	0.4	0.0	0.4	**2%**
Fines	20%	1%	2%	12%	1.9		1.9	**11%**
Bulky waste+WEEE						0.0	0.0	**0%**
	100%	100%	100%	100%	16.2	1.2	17.4	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	3%	3%	1%	2%	0.4		0.4	**2%**
Cardboard packaging	3%	18%	1%	5%	0.9	0.0	0.9	**5%**
Composites packagi	2%	3%	0%	2%	0.3	0.0	0.3	**2%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	11%	11%	1%	9%	1.4	0.0	1.4	**8%**
Glass packaging	4%	1%	0%	2%	0.4	1.2	1.5	**9%**
Metals packaging	2%	6%	0%	2%	0.3	0.0	0.3	**2%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	76%	57%	96%	78%	12.5	0.0	12.6	**72%**
TOTAL	100%	100%	100%	100%	16.2	1.2	17.4	**100%**

Comments

A Galway City Council compaction refuse vehicle was used to collect waste from the selected samples. The samples were delivered to the Sandy Road depot (EPA licence 166-2).

Two sets of results were obtained for each campaign (Spring, Autumn) and for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for Galway City.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables		Brown Bin (Organics)	
Newspapers and Magazines	√	Cooked and Raw Food	√
Plastic bottles and containers	√	Paper Towels and Tissues	√
Aluminium Cans	√	Garden Cuttings	√
Ferrous Cans	√	Prunings	√
Light Cardboard	√	Leaves	√
Beverage cartons (Tetra Pak)	√		
Textiles	-		

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat fee	√		√	
Mixed Dry Recyclables	Wheelie Bin			√		√
Organics Collection	Wheelie Bin			√		√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	8.6		3.3		4.2		16.15	
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	17%	1.5	1%	0.0	56%	2.4	24%	3.9
Liquid fit for human consumption	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Vegetable oil	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Biodegradable waste from garden & park	0%	0.0	0%	0.0	21%	0.9	6%	0.9
Organics	**19%**	**1.6**	**2%**	**0.1**	**77%**	**3.3**	**31%**	**4.9**
Packaging	3%	0.2	3%	0.1	1%	0.0	2%	0.4
Newspapers- Brochures	3%	0.3	34%	1.1	8%	0.3	11%	1.7
Magazines & glossy paper	2%	0.1	12%	0.4	1%	0.0	4%	0.6
Office papers	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Tissue Papers	4%	0.3	0%	0.0	3%	0.1	3%	0.4
Other papers	2%	0.2	3%	0.1	1%	0.1	2%	0.3
Papers	**13%**	**1.1**	**52%**	**1.7**	**14%**	**0.6**	**21%**	**3.5**
Flat Packaging	3%	0.2	6%	0.2	0%	0.0	3%	0.4
Corrugated packaging board	0%	0.0	12%	0.4	1%	0.0	3%	0.4
Other cardboards	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Cardboards	**4%**	**0.3**	**18%**	**0.6**	**1%**	**0.0**	**6%**	**0.9**
Non-packaging composite	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Liquid packaging	1%	0.1	2%	0.1	0%	0.0	1%	0.1
Other composite packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Composites	**3%**	**0.3**	**3%**	**0.1**	**0%**	**0.0**	**2%**	**0.4**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	2%	0.2	0%	0.0	0%	0.0	1%	0.2
Healthcare Textiles, disposable nappies	8%	0.7	0%	0.0	1%	0.1	5%	0.7
Clothes	3%	0.2	2%	0.1	0%	0.0	2%	0.3
Textiles	**13%**	**1.1**	**2%**	**0.1**	**1%**	**0.1**	**8%**	**1.2**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.1	5%	0.2	0%	0.0	2%	0.3
PE Packaging	1%	0.1	2%	0.1	0%	0.0	1%	0.2
PS Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	2%	0.1	1%	0.0	0%	0.0	1%	0.2
Mixed flexible plastic packaging	4%	0.3	1%	0.0	1%	0.0	3%	0.4
Mixed rigid plastic packaging	3%	0.2	2%	0.1	0%	0.0	2%	0.3
Other plastic waste	2%	0.2	2%	0.1	0%	0.0	2%	0.3
Plastics	**13%**	**1.1**	**13%**	**0.4**	**2%**	**0.1**	**10%**	**1.7**
Green Glass packaging	0%	0.0	1%	0.0	0%	0.0	0%	0.0
Clear Glass packaging	2%	0.2	0%	0.0	0%	0.0	1%	0.2
Brown Glass packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**4%**	**0.3**	**1%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Ferrous metal packaging	1%	0.1	4%	0.1	0%	0.0	2%	0.2
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	0%	0.0	2%	0.1	0%	0.0	1%	0.1
Other aluminium waste	1%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Metals	**3%**	**0.2**	**7%**	**0.2**	**0%**	**0.0**	**3%**	**0.5**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Wood	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	2%	0.2	0%	0.0	0%	0.0	1%	0.2
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**3%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.2**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	2%	0.2	0%	0.0	0%	0.0	1%	0.2
Unclassified Combustibles	**2%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.2**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	3%	0.3	0%	0.0	2%	0.1	2%	0.4
Unclassified incombustibles	**3%**	**0.3**	**0%**	**0.0**	**2%**	**0.1**	**2%**	**0.4**
Fines smaller than 20mm round	20%	1.8	1%	0.0	2%	0.1	12%	1.9
Fines	**20%**	1.8	**1%**	0.0	**2%**	0.1	**12%**	**1.9**
TOTAL	**100%**	**8.6**	**100%**	**3.3**	**100%**	**4.2**	**100%**	**16.2**

Table 4: Detailed Waste Composition per Sample

Local Authority		Galway City	Galway City	Galway City	Galway City	Galway City	Galway City
City/Urban / Rural		City	City	City	City	City	City
Collection System		3 Bin	3 Bin	3 Bin	3 Bin	3 Bin	3 Bin
Type of housing		Houses	Houses	Houses	Houses	Houses	Houses
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot
Team (RPS MCOOS staff in bold)		**M. Spillane, M. O'Sullivan, B. McIntyre,** S. Convery, T. Rolleston, A. Rolleston	**M. Spillane, M. O'Sullivan, B. McIntyre,** S. Convery, T. Rolleston, A. Rolleston	**M. Spillane, M. O'Sullivan, B. McIntyre,** S. Convery, T. Rolleston, A. Rolleston	**M. Spillane, M. O'Sullivan, B. McIntyre,** A. Carson, G. Clune, J. McKey, M. Kennedy, S. Mc Carthy	**M. Spillane, M. O'Sullivan, B. McIntyre,** A. Carson, G. Clune, J. McKey, M. Kennedy, S. Mc Carthy	**M. Spillane, M. O'Sullivan, B. McIntyre,** A. Carson, G. Clune, J. McKey, M. Kennedy, S. Mc Carthy
Local Authority Social Class A		43%	43%	43%	43%	43%	43%
Local Authority Social Class B		35%	35%	35%	35%	35%	35%
Local Authority Social Class C		22%	22%	22%	22%	22%	22%
Area surveyed / DED		St Nicholas	St Nicholas	St Nicholas	St Nicholas	St Nicholas	St Nicholas
Sample Social Class A		31%	31%	31%	31%	31%	31%
Sample Social Class B		36%	36%	36%	36%	36%	36%
Sample Social Class C		33%	33%	33%	33%	33%	33%
Required sample size		105	105	105	105	105	105
Weather (Dry / Rain)		Dry	Dry	Dry	Dry	Rain	Dry
Date of Collection		08/11/2004	14/03/2005	15/11/2004	07/03/2005	15/11/2004	07/03/2005
Quantity collected		5,220	3,580	2,500	2,300	4,140	3,520
Number of household		150	162	150	150	150	127
Collected/Household		34.8	22.1	16.7	15.3	27.6	27.7
Frequency of collection		2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks
Charges (for typical 240 lt bin)		Flat fee (€342)	Flat fee (€351)	Flat fee (€342)	Flat fee (€351)	Flat fee (€342)	Flat fee (€351)
Type of container		240 Lt Wb	240 Lt Wb	240 Lt Wb	240 Lt Wb	140 Lt Wb	140 Lt Wb
Bulk Density		0.158	0.10	0.080	0.07	0.258	0.150
Date of Waste characterisation		08/11/2004	14/03/2005	15/11/2004	07/03/2005	15/11/2004	07/03/2005
Quantity characterised		177.59	122.025	124.11	183.1682	108.27	202.42
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	17%	18%	1%	2%	47%	65%
21 01 08	Liquid fit for human consumption	1%	0%	1%	0%	0%	0%
20 01 25	Vegetable oil	0%	2%	0%	0%	0%	0%
20 02 01	Biodegradable waste from garden & park	0%	1%	0%	0%	28%	14%
Sub-Total - Organic waste		**18%**	**20%**	**2%**	**2%**	**74%**	**79%**
15 01 01	Packaging	2%	4%	4%	2%	1%	1%
20 01 01	Newspapers- Brochures	2%	4%	28%	39%	7%	9%
20 01 01	Magazines & glossy paper	2%	2%	13%	11%	1%	1%
20 01 01	Office papers	0%	0%	0%	0%	0%	0%
20 01 01	Tissue Papers	2%	5%	0%	0%	3%	3%
20 01 01	Other papers	2%	2%	4%	2%	1%	2%
Sub-Total - Papers		**10%**	**17%**	**50%**	**54%**	**12%**	**16%**
15 01 06	Flat Packaging	2%	4%	8%	4%	0%	0%
15 01 06	Corrugated packaging board	0%	0%	10%	13%	1%	0%
20 01 01	Other cardboards	1%	1%	1%	0%	0%	0%
Sub-Total - Cardboards		**2%**	**5%**	**19%**	**17%**	**2%**	**0%**
15 01 05	Non-packaging composite	1%	1%	1%	0%	0%	0%
15 01 05	Liquid packaging	1%	1%	3%	2%	0%	0%
15 01 05	Other composite packaging	1%	2%	0%	0%	0%	0%
Sub-Total - Composites		**3%**	**3%**	**3%**	**3%**	**0%**	**0%**
15 01 09	Textile Packaging	0%	0%	0%	0%	0%	0%
20 01 11	Textiles non-packaging	2%	2%	0%	0%	0%	0%
20 01 11	Healthcare Textiles, disposable nappies	11%	4%	1%	0%	1%	1%
20 01 10	Clothes	3%	2%	0%	3%	0%	0%
Sub-Total - Textiles		**17%**	**8%**	**1%**	**3%**	**1%**	**1%**
20 01 39	PVC Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 39	PET Packaging	0.7%	1.7%	5.6%	4.2%	0.1%	0.0%
20 01 39	PE Packaging	1.1%	0.9%	1.7%	2.0%	0.2%	0.0%
20 01 39	PS Packaging	0.1%	0.1%	0.3%	0.0%	0.0%	0.0%
15 01 02	Styrofoam	0.1%	0.3%	0.3%	0.3%	0.1%	0.0%
15 01 02	Supermarkets bags and films	0.8%	2.4%	1.3%	1.2%	0.1%	0.1%
15 01 02	Mixed flexible plastic packaging	3.2%	4.9%	1.7%	1.0%	1.1%	0.6%
15 01 02	Mixed rigid plastic packaging	1.9%	3.8%	1.6%	1.9%	0.1%	0.3%
20 01 39	Other plastic waste	2.5%	2.0%	2.1%	1.6%	0.1%	0.4%
Sub-Total - Plastics		**10%**	**16%**	**15%**	**12%**	**2%**	**1%**
15 0107	Green Glass packaging	0.3%	0.2%	1.1%	0.7%	0.0%	0.0%
15 0107	Clear Glass packaging	2.4%	2.3%	1.0%	0.0%	0.0%	0.0%
15 0107	Brown Glass packaging	1.7%	0.3%	0.0%	0.0%	0.0%	0.0%
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 02	Non Packaging glass	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%
Sub-Total - Glass		**5%**	**3%**	**2%**	**1%**	**0%**	**0%**
15 01 04	Ferrous metal packaging	1.4%	1.0%	3.3%	5.1%	0.0%	0.0%
20 01 40	Other ferrous metal waste	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
15 01 04	Aluminium packaging	0.3%	0.5%	2.1%	1.8%	0.1%	0.0%
20 01 40	Other aluminium waste	0.4%	0.6%	0.0%	0.0%	0.2%	0.0%
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 40	Other metal waste	0.8%	0.4%	0.3%	0.4%	0.0%	0.0%
Sub-Total - Metals		**3%**	**3%**	**6%**	**7%**	**0%**	**0%**
15 01 03	Wood packaging	0%	0%	0%	0%	0%	0%
20 01 38	Non Packaging wood	0%	0%	0%	0%	0%	0%
Sub-Total - Wood		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
20 01 27	Paint, ink pastes and resins	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 29	Detergents	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 33	Batteries & Accumulators	0.2%	0.2%	0.0%	0.0%	0.0%	0.1%
20 01 21	Fluorescent tubes& bulbs	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
20 01 99	Aerosols	0.2%	0.7%	0.2%	0.0%	0.1%	0.0%
21 01 35	Electronic equipment	0.7%	2.9%	0.0%	0.0%	0.0%	0.0%
20 01 99	Other special domestic waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sub-Total - Special Municipal Waste		**1%**	**4%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%	0%	0%
20 03 99	Other unclassified combustibles	2%	2%	0%	0%	0%	0%
Sub-Total - Unclassified combustibles		**2%**	**2%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Unclassified incombustibles packaging	0%	0%	0%	0%	0%	0%
20 03 99	Other unclassified incombustibles	5%	1%	1%	0%	4%	0%
Sub-Total - Unclassified incombustibles		**5%**	**1%**	**1%**	**0%**	**4%**	**0%**
20 03 99	Fines smaller than 20mm round	23%	17%	0%	1%	3%	1%
Sub-Total - Fines smaller than 20mm		**23%**	**17%**	**0%**	**1%**	**3%**	**1%**
TOTAL		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

FINGAL WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	40%	0%	0%	36%	7.5	0.0	7.5	**34%**
Papers	18%	68%	0%	24%	4.9	0.1	5.0	**23%**
Cardboards	3%	21%	0%	5%	1.1	0.0	1.1	**5%**
Composites	2%	2%	0%	2%	0.5	0.0	0.5	**2%**
Textiles	7%	1%	0%	7%	1.4	0.0	1.4	**6%**
Plastics	15%	1%	0%	14%	2.9	0.0	2.9	**13%**
Glass	5%	1%	0%	4%	0.9	1.0	1.9	**9%**
Metals	3%	4%	0%	3%	0.6	0.0	0.7	**3%**
Wood	0%	0%	0%	0%	0.0	0.1	0.2	**1%**
Special municipal was	1%	0%	0%	1%	0.1	0.0	0.1	**1%**
Unclassified Combusti	1%	0%	0%	1%	0.2		0.2	**1%**
Unclassified incombus	1%	0%	0%	0%	0.1	0.0	0.1	**0%**
Fines	3%	1%	0%	3%	0.6		0.6	**3%**
Bulky waste+WEEE						0.0	0.0	**0%**
	100%	100%	0%	100%	20.8	1.2	22.0	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	3%	4%	0%	3%	0.6		0.6	**3%**
Cardboard packaging	3%	21%	0%	5%	0.9	0.0	0.9	**4%**
Composites packagi	2%	2%	0%	2%	0.4	0.0	0.4	**2%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	12%	1%	0%	11%	2.3	0.0	2.3	**11%**
Glass packaging	5%	1%	0%	4%	0.9	1.0	1.9	**9%**
Metals packaging	2%	4%	0%	2%	0.5	0.0	0.5	**2%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	74%	68%	100%	73%	15.2	0.2	15.4	**70%**
TOTAL	100%	100%	100%	100%	20.8	1.2	22.0	**100%**

Comments

A Fingal County Council compaction refuse vehicle was used to collect mixed residual waste from the selected area. The samples were delivered to the Oxigen depot on Robinhood Road (EPA licence 152-1). An Oxigen compaction refuse vehicle was used to collect mixed dry recyclables from the selected area The samples were delivered to the Oxigen depot on Robinhood Road (EPA licence 152-1) for the autumn surveys and JVC depot at the Clonshaugh Industrial Estate (Dublin City Waste Permit WPR023) for the spring campaign.
The sample was collected from Castleknock in the autumn campaign and from Swords Village during the spring campaign. Two sets of results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for Fingal County Council.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Newspapers and Magazines	√
Plastic bottles and containers	√
Aluminium Cans	√
Ferrous Cans	√
Light Cardboard	√
Beverage cartons (Tetra Pak)	√
Textiles	-

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Pay-by-use	√	√	√	√
Mixed Dry Recyclables	Wheelie Bin	Free	√			

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	18.6	89%	2.2	11%		0%	20.84	95%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	35%	6.5	0%	0.0	0%	0.0	31%	6.5
Liquid fit for human consumption	1%	0.3	0%	0.0	0%	0.0	1%	0.3
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	4%	0.7	0%	0.0	0%	0.0	3%	0.7
Organics	**40%**	**7.5**	**0%**	**0.0**	**0%**	**0.0**	**36%**	**7.5**
Packaging	3%	0.5	4%	0.1	0%	0.0	3%	0.6
Newspapers- Brochures	3%	0.5	39%	0.9	0%	0.0	7%	1.4
Magazines & glossy paper	3%	0.5	18%	0.4	0%	0.0	4%	0.9
Office papers	1%	0.1	1%	0.0	0%	0.0	1%	0.2
Tissue Papers	5%	0.9	0%	0.0	0%	0.0	4%	0.9
Other papers	5%	0.8	6%	0.1	0%	0.0	5%	1.0
Papers	**18%**	**3.4**	**68%**	**1.5**	**0%**	**0.0**	**24%**	**4.9**
Flat Packaging	2%	0.4	8%	0.2	0%	0.0	3%	0.6
Corrugated packaging board	1%	0.1	13%	0.3	0%	0.0	2%	0.4
Other cardboards	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Cardboards	**3%**	**0.6**	**21%**	**0.5**	**0%**	**0.0**	**5%**	**1.1**
Non-packaging composite	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Liquid packaging	1%	0.1	2%	0.0	0%	0.0	1%	0.2
Other composite packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Composites	**2%**	**0.4**	**2%**	**0.0**	**0%**	**0.0**	**2%**	**0.5**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Healthcare Textiles, disposable nappies	4%	0.7	0%	0.0	0%	0.0	3%	0.7
Clothes	2%	0.4	1%	0.0	0%	0.0	2%	0.4
Textiles	**7%**	**1.3**	**1%**	**0.0**	**0%**	**0.0**	**7%**	**1.4**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	2%	0.3	0%	0.0	0%	0.0	2%	0.3
PE Packaging	2%	0.3	0%	0.0	0%	0.0	1%	0.3
PS Packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Styrofoam	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Supermarkets bags and films	1%	0.3	0%	0.0	0%	0.0	1%	0.3
Mixed flexible plastic packaging	4%	0.7	0%	0.0	0%	0.0	3%	0.7
Mixed rigid plastic packaging	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Other plastic waste	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Plastics	**15%**	**2.8**	**1%**	**0.0**	**0%**	**0.0**	**14%**	**2.9**
Green Glass packaging	1%	0.3	1%	0.0	0%	0.0	1%	0.3
Clear Glass packaging	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Brown Glass packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**5%**	**0.9**	**1%**	**0.0**	**0%**	**0.0**	**4%**	**0.9**
Ferrous metal packaging	2%	0.3	2%	0.0	0%	0.0	2%	0.3
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	1%	0.1	1%	0.0	0%	0.0	1%	0.1
Other aluminium waste	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Metals	**3%**	**0.6**	**4%**	**0.1**	**0%**	**0.0**	**3%**	**0.6**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Wood	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Electronic equipment	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.1**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Unclassified Combustibles	**1%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.2**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Unclassified incombustibles	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Fines smaller than 20mm round	3%	0.6	1%	0.0	0%	0.0	3%	0.6
Fines	**3%**	0.6	**1%**	0.0	**0%**	0.0	**3%**	**0.6**
TOTAL	**100%**	**18.6**	**100%**	**2.2**	**0%**	**0.0**	**100%**	**20.8**

TABLE 4: DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Fingal	Fingal	Fingal	Fingal		
City/Urban / Rural		City	City	City	City		
Collection System		2 Bin	2 Bin	2 Bin	2 Bin		
Type of housing		Houses	Houses	Houses	Houses		
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot		
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan,** K. Kehoe, C. Boland	**M. O'Sullivan, B. McIntyre,** D. Cleary, L. Holland, P. Heduan	**M. Spillane, M. O'Sullivan,** K. Kehoe, C. Boland	**M. O'Sullivan, B. McIntyre,** G. O'Reilly, K. Monaghan, K. Garvey, P. Lambe, P. Heduan		
Local Authority Social Class A		45%	45%	45%	45%		
Local Authority Social Class B		39%	39%	39%	39%		
Local Authority Social Class C		16%	16%	16%	16%		
Area surveyed / DED		Castleknock	Swords	Castleknock	Swords		
Sample Social Class A		67%	39%	67%	39%		
Sample Social Class B		26%	39%	26%	39%		
Sample Social Class C		7%	22%	7%	22%		
Required sample size		120	86	120	86		
Weather (Dry / Rain)		Dry	Dry	Dry	Rain		
Date of Collection		25/11/2004	21/03/2005	25/11/2004	01/04/2005		
Quantity collected		2,020	5,740	2,900	1,840		
Number of household		73	173	139	90		
Collected/Household		27.7	33.2	20.9	20.4		
Frequency of collection		Weekly	Weekly	Monthly	Monthly		
Charges (for typical 240 lt bin)		Volume based	Volume based	Free	Free		
Type of container		240 Lt Wb	240 Lt Wb	240 Lt Wb	240 Lt Wb		
Bulk Density		0.123	0.14	0.101	0.09		
Date of Survey		25/11/2005	21/03/2005	25/11/2005	01/04/2005		
Quantity characterised		137.17	163.96	116.9	114.7		
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	42%	28%	0%	0%		
21 01 08	Liquid fit for human consumption	1%	2%	0%	0%		
20 01 25	Vegetable oil	0%	0%	0%	0%		
20 02 01	Biodegradable waste from garden & park	3%	4%	0%	0%		
Sub-Total - Organic waste		**46%**	**34%**	**0%**	**0%**		
15 01 01	Packaging	3%	3%	2%	5%		
20 01 01	Newspapers- Brochures	3%	3%	52%	27%		
20 01 01	Magazines & glossy paper	3%	2%	19%	16%		
20 01 01	Office papers	1%	1%	0%	3%		
20 01 01	Tissue Papers	5%	5%	0%	0%		
20 01 01	Other papers	5%	4%	8%	3%		
Sub-Total - Papers		**19%**	**17%**	**81%**	**54%**		
15 01 06	Flat Packaging	2%	2%	5%	10%		
15 01 06	Corrugated packaging board	0%	1%	5%	21%		
20 01 01	Other cardboards	1%	0%	0%	0%		
Sub-Total - Cardboards		**3%**	**3%**	**10%**	**32%**		
15 01 05	Non-packaging composite	0%	1%	0%	0%		
15 01 05	Liquid packaging	1%	1%	2%	1%		
15 01 05	Other composite packaging	1%	1%	0%	0%		
Sub-Total - Composites		**2%**	**2%**	**2%**	**2%**		
15 01 09	Textile Packaging	0%	0%	0%	0%		
20 01 11	Textiles non-packaging	0%	2%	0%	0%		
20 01 11	Healthcare Textiles, disposable nappies	2%	6%	0%	0%		
20 01 10	Clothes	2%	2%	0%	2%		
Sub-Total - Textiles		**4%**	**10%**	**0%**	**3%**		
20 01 39	PVC Packaging	0.0%	0.0%	0.0%	0.0%		
20 01 39	PET Packaging	1.7%	1.7%	0.4%	0.4%		
20 01 39	PE Packaging	2.1%	1.2%	0.2%	0.1%		
20 01 39	PS Packaging	0.0%	0.9%	0.0%	0.0%		
15 01 02	Styrofoam	0.3%	0.3%	0.1%	0.0%		
15 01 02	Supermarkets bags and films	0.8%	1.9%	0.1%	0.4%		
15 01 02	Mixed flexible plastic packaging	3.1%	4.0%	0.1%	0.4%		
15 01 02	Mixed rigid plastic packaging	3.2%	3.1%	0.2%	0.4%		
20 01 39	Other plastic waste	3.8%	2.2%	0.0%	0.1%		
Sub-Total - Plastics		**15%**	**15%**	**1%**	**2%**		
15 0107	Green Glass packaging	1.8%	1.0%	1.4%	0.0%		
15 0107	Clear Glass packaging	1.9%	4.0%	0.2%	0.4%		
15 0107	Brown Glass packaging	0.1%	0.6%	0.0%	0.0%		
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%		
20 01 02	Non Packaging glass	0.0%	0.3%	0.0%	0.0%		
Sub-Total - Glass		**4%**	**6%**	**2%**	**0%**		
15 01 04	Ferrous metal packaging	1.3%	1.7%	1.5%	2.8%		
20 01 40	Other ferrous metal waste	0.0%	0.4%	0.0%	0.0%		
15 01 04	Aluminium packaging	0.5%	0.5%	1.0%	2.0%		
20 01 40	Other aluminium waste	0.3%	1.1%	0.0%	0.0%		
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%		
20 01 40	Other metal waste	0.1%	0.0%	0.0%	0.5%		
Sub-Total - Metals		**2%**	**4%**	**3%**	**5%**		
15 01 03	Wood packaging	0%	0%	0%	0%		
20 01 38	Non Packaging wood	0%	0%	0%	0%		
Sub-Total - Wood		**0%**	**0%**	**0%**	**0%**		
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%		
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%		
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%		
20 01 17	Photochemicals	0.1%	0.0%	0.1%	0.0%		
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%		
20 01 33	Batteries & Accumulators	0.1%	0.2%	0.0%	0.0%		
20 01 21	Fluorescent tubes& bulbs	0.1%	0.1%	0.0%	0.0%		
20 01 99	Aerosols	0.4%	0.1%	0.1%	0.0%		
21 01 35	Electronic equipment	0.1%	0.1%	0.0%	0.0%		
20 01 99	Other special domestic waste	0.0%	0.0%	0.0%	0.0%		
Sub-Total - Special Municipal Waste		**1%**	**1%**	**0%**	**0%**		
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified combustibles	1%	1%	0%	0%		
Sub-Total - Unclassified combustibles		**1%**	**1%**	**0%**	**0%**		
20 03 99	Unclassified incombustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified incombustibles	1%	0%	0%	0%		
Sub-Total - Unclassified incombustibles		**1%**	**0%**	**0%**	**0%**		
20 03 99	Fines smaller than 20mm round	1%	6%	0%	1%		
Sub-Total - Fines smaller than 20mm		**1%**	**6%**	**0%**	**1%**		
TOTAL		**100%**	**100%**	**100%**	**100%**		

WATERFORD URBAN WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	47%	2%	0%	41%	8.9	1.0	10.0	**42%**
Papers	13%	67%	0%	20%	4.2	0.1	4.3	**18%**
Cardboards	3%	21%	0%	5%	1.1	0.0	1.1	**5%**
Composites	1%	2%	0%	2%	0.3	0.0	0.3	**1%**
Textiles	7%	1%	0%	6%	1.3	0.0	1.3	**6%**
Plastics	12%	2%	0%	10%	2.2	0.0	2.2	**9%**
Glass	5%	1%	0%	4%	1.0	0.6	1.6	**7%**
Metals	4%	3%	0%	4%	0.8	0.1	0.9	**4%**
Wood	1%	0%	0%	1%	0.3	0.1	0.3	**1%**
Special municipal was	1%	0%	0%	1%	0.3	0.0	0.3	**1%**
Unclassified Combusti	1%	0%	0%	0%	0.1		0.1	**0%**
Unclassified incombus	2%	1%	0%	2%	0.3	0.0	0.4	**2%**
Fines	4%	1%	0%	3%	0.7		0.7	**3%**
Bulky waste+WEEE						0.0	0.0	**0%**
	100%	100%	0%	100%	21.5	2.0	23.5	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	3%	0%	3%	0.6		0.6	**2%**
Cardboard packaging	3%	20%	0%	5%	1.0	0.0	1.0	**4%**
Composites packagi	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	10%	1%	0%	9%	1.8	0.0	1.9	**8%**
Glass packaging	5%	1%	0%	4%	0.9	0.6	1.6	**7%**
Metals packaging	3%	3%	0%	3%	0.6	0.1	0.7	**3%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	1%	0%	0%	1%	0.1		0.1	**1%**
Non packaging	76%	69%	100%	75%	16.1	1.2	17.3	**74%**
TOTAL	100%	100%	100%	100%	21.5	2.0	23.5	**100%**

Comments

A Dublin City Council compaction refuse vehicle was used to collect waste from the selected samples which were delivered to the Dublin City Grangegorman depot. The mixed dry recyclables were delivered to the JVC Depot at Clonshaugh Industrial Estate.

Results were combined taking into account social class breakdown in the Dublin region. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for the Dublin region.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Newspapers and Magazines	√
Plastic bottles and containers	√
Aluminium Cans	√
Ferrous Cans	√
Light Cardboard	√
Beverage cartons (Tetra Pak)	√
Textiles	-

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat fee (at the time of survey)	√	√	√	√
Mixed Dry Recyclables	Wheelie Bin	Free	√			

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	18.7	87%	2.8	13%		0%	21.53	92%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	23%	4.3	0%	0.0	0%	0.0	20%	4.3
Liquid fit for human consumption	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	24%	4.6	1%	0.0	0%	0.0	22%	4.6
Organics	**47%**	**8.9**	**2%**	**0.0**	**0%**	**0.0**	**41%**	**8.9**
Packaging	2%	0.5	3%	0.1	0%	0.0	3%	0.6
Newspapers- Brochures	3%	0.6	41%	1.1	0%	0.0	8%	1.7
Magazines & glossy paper	2%	0.4	12%	0.3	0%	0.0	3%	0.7
Office papers	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Tissue Papers	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other papers	5%	1.0	11%	0.3	0%	0.0	6%	1.3
Papers	**13%**	**2.4**	**67%**	**1.9**	**0%**	**0.0**	**20%**	**4.2**
Flat Packaging	2%	0.3	7%	0.2	0%	0.0	2%	0.5
Corrugated packaging board	1%	0.2	13%	0.4	0%	0.0	3%	0.5
Other cardboards	0%	0.1	1%	0.0	0%	0.0	0%	0.1
Cardboards	**3%**	**0.6**	**21%**	**0.6**	**0%**	**0.0**	**5%**	**1.1**
Non-packaging composite	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Liquid packaging	1%	0.2	2%	0.1	0%	0.0	1%	0.2
Other composite packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Composites	**1%**	**0.3**	**2%**	**0.1**	**0%**	**0.0**	**2%**	**0.3**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.1	1%	0.0	0%	0.0	1%	0.1
Healthcare Textiles, disposable nappies	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Clothes	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Textiles	**7%**	**1.3**	**1%**	**0.0**	**0%**	**0.0**	**6%**	**1.3**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
PE Packaging	1%	0.3	0%	0.0	0%	0.0	1%	0.3
PS Packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Mixed flexible plastic packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Mixed rigid plastic packaging	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Other plastic waste	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Plastics	**12%**	**2.2**	**2%**	**0.0**	**0%**	**0.0**	**10%**	**2.2**
Green Glass packaging	5%	0.9	1%	0.0	0%	0.0	4%	0.9
Clear Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Brown Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**5%**	**0.9**	**1%**	**0.0**	**0%**	**0.0**	**4%**	**1.0**
Ferrous metal packaging	1%	0.2	2%	0.1	0%	0.0	1%	0.3
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	1%	0.2	1%	0.0	0%	0.0	1%	0.3
Other aluminium waste	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Metals	**4%**	**0.7**	**3%**	**0.1**	**0%**	**0.0**	**4%**	**0.8**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	1%	0.2	0%	0.0	0%	0.0	1%	0.3
Wood	**1%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**1%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Unclassified Combustibles	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Unclassified incombustibles packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Other unclassified incombustibles	1%	0.2	1%	0.0	0%	0.0	1%	0.3
Unclassified incombustibles	**2%**	**0.3**	**1%**	**0.0**	**0%**	**0.0**	**2%**	**0.3**
Fines smaller than 20mm round	4%	0.7	1%	0.0	0%	0.0	3%	0.7
Fines	**4%**	0.7	**1%**	0.0	**0%**	0.0	**3%**	**0.7**
TOTAL	**100%**	**18.7**	**100%**	**2.8**	**0%**	**0.0**	**100%**	**21.5**

DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		DCC	DCC	DCC	DCC	DCC	DCC	DLRCC	SDCC	DCC		
City/Urban / Rural		City	City	City	City	City	City	City	City	City		
Collection System		2 Bin	2 Bin	2 Bin	2 Bin	2 Bin	2 Bin	2 Bin	2 Bin	2 Bin		
Type of housing		Houses	Houses	Houses	Houses	Houses	Houses	Houses	Houses	Houses		
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot		
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, 6 DCC staff	**M. Spillane, M. O'Sullivan**, S. Convery	**M. Spillane, M. O'Sullivan**, J. Cavanagh, T. Rolleston	**M. Spillane, M. O'Sullivan**, S. Convery		
Local Authority Social Class A		38%	38%	38%	38%	38%	38%	56%	38%	38%		
Local Authority Social Class B		39%	39%	39%	39%	39%	39%	31%	43%	39%		
Local Authority Social Class C		24%	24%	24%	24%	24%	24%	13%	19%	24%		
Area surveyed / DED		Dublin Pembroke East C	Dublin Rathfarnham	Dublin Cabra West A	Dublin Grange C	Dublin Drumfinn	Dublin Priorswood C	Dublin Blackrock	Dublin Limekiln	Dublin Drumfin		
Sample Social Class A		69%	70%	16%	20%	20%	11%	65%	35%	20%		
Sample Social Class B		23%	23%	50%	55%	45%	45%	24%	49%	45%		
Sample Social Class C		8%	7%	34%	25%	35%	44%	11%	16%	35%		
Required sample size												
Weather (Dry / Rain)												
Date of Collection		12/08/2004	19/08/2004	18/08/2004	09/08/2004	16/08/2004	10/08/2004	21/09/2004	06/10/2004	21/09/2004		
Quantity collected		2000	2740	1220	1980	2080	2240	3020	2740	2580		
Number of household		120	155	50	105	120	93	120	156	130		
Collected/Household		16.7	17.7	24.4	18.9	17.3	24.1	25.2	17.6	19.8		
Frequency of collection		Weekly	Weekly	Weekly	Weekly	Weekly	Weekly	Monthly	Monthly	Monthly		
Charges (for typical 240 lt bin)		Flat fee	Flat fee	Flat fee	Flat fee	Flat fee	Flat fee	Free	Free	Free		
Type of container		240 lt	240 lt	240 lt	240 lt	240 lt	240 lt	240 lt	240 lt	240 lt		
Bulk Density		0.08	0.10	0.12	0.11	0.10	0.14	0.10	0.85	0.11		
Date of Survey		12/08/2004	19/08/2004	18/08/2004	09/08/2004	16/08/2004	10/08/2004	21/09/2004	06/10/2004	21/09/2004		
Quantity characterised		126.62	157.02	163.15	90.94	156.45	106.67	214.22	205.69	174.55		
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MRW	MRW	MRW	MRW	MDR	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	10%	15%	25%	37%	11%	41%	0%	0%	0%		
21 01 08	Liquid fit for human consumption											
20 01 25	Vegetable oil											
20 02 01	Biodegradable waste from garden & park	43%	39%	18%	4%	40%	0%	4%	0%	0%		
Sub-Total - Organic waste		**53%**	**55%**	**43%**	**41%**	**51%**	**42%**	**4%**	**0%**	**0%**		
15 01 01	Packaging	2%	3%	2%	2%	2%	4%	3%	4%	4%		
20 01 01	Newspapers- Brochures	2%	4%	3%	3%	4%	1%	37%	45%	41%		
20 01 01	Magazines & glossy paper	3%	0%	4%	1%	1%	2%	9%	14%	11%		
20 01 01	Office papers											
20 01 01	Tissue Papers											
20 01 01	Other papers	6%	2%	3%	10%	4%	5%	13%	7%	12%		
Sub-Total - Papers		**12%**	**10%**	**13%**	**17%**	**12%**	**12%**	**63%**	**70%**	**68%**		
15 01 06	Flat Packaging	0%	2%	3%	2%	1%	2%	7%	8%	7%		
15 01 06	Corrugated packaging board	0%	2%	2%	0%	2%	1%	18%	10%	9%		
20 01 01	Other cardboards	1%	0%	0%	0%	0%	1%	1%	1%	1%		
Sub-Total - Cardboards		**1%**	**4%**	**4%**	**2%**	**4%**	**4%**	**25%**	**18%**	**18%**		
15 01 05	Non-packaging composite	0%	0%	0%	1%	0%	1%	0%	0%	0%		
15 01 05	Liquid packaging	1%	1%	1%	1%	1%	1%	2%	2%	1%		
15 01 05	Other composite packaging	1%	0%	0%	0%	0%	1%	0%	0%	0%		
Sub-Total - Composites		**2%**	**1%**	**1%**	**2%**	**1%**	**3%**	**2%**	**2%**	**2%**		
15 01 09	Textile Packaging	0%	0%	0%	0%	0%	1%	0%	0%	0%		
20 01 11	Textiles non-packaging	0%	0%	0%	0%	1%	5%	1%	0%	0%		
20 01 11	Healthcare Textiles, disposable nappies	2%	1%	5%	4%	1%	5%	0%	0%	0%		
20 01 10	Clothes	1%	2%	3%	7%	4%	0%	0%	0%	0%		
Sub-Total - Textiles		**3%**	**4%**	**8%**	**11%**	**6%**	**11%**	**1%**	**1%**	**0%**		
20 01 39	PVC Packaging	1%	0%	0%	0%	1%	0%	0.0%	0%	0%		
20 01 39	PET Packaging	1%	1%	0%	2%	1%	2%	0.1%	1%	0%		
20 01 39	PE Packaging	1%	1%	1%	3%	1%	2%	0.0%	0%	0%		
20 01 39	PS Packaging	0%	4%	1%	0%	0%	1%	0.0%	0%	0%		
15 01 02	Styrofoam											
15 01 02	Supermarkets bags and films	4%	4%	1%	5%	3%	4%	0.8%	0%	0%		
15 01 02	Mixed flexible plastic packaging	0%	0%	1%	0%	0%	0%	0.0%	0%	0%		
15 01 02	Mixed rigid plastic packaging	2%	2%	2%	3%	2%	2%	0.3%	1%	0%		
20 01 39	Other plastic waste	3%	3%	2%	1%	1%	2%	0.1%	0%	0%		
Sub-Total - Plastics		**11%**	**14%**	**7%**	**14%**	**9%**	**14%**	**1%**	**2%**	**1%**		
15 0107	Green Glass packaging	6%	4%	8%	4%	3%	4%	0.0%	0%	2%		
15 0107	Clear Glass packaging											
15 0107	Brown Glass packaging											
15 0107	Glass packaging - Other colours											
20 01 02	Non Packaging glass	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
Sub-Total - Glass		**6%**	**4%**	**8%**	**4%**	**3%**	**4%**	**0%**	**0%**	**2%**		
15 01 04	Ferrous metal packaging	2%	1%	1%	1%	1%	0%	0.6%	3%	3%		
20 01 40	Other ferrous metal waste	0%	0%	1%	0%	0%	0%	0.1%	0%	0%		
15 01 04	Aluminium packaging	1%	1%	1%	2%	1%	3%	0.4%	2%	2%		
20 01 40	Other aluminium waste	0%	0%	1%	1%	1%	0%	0.0%	0%	0%		
15 01 04	Other metal packaging	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 40	Other metal waste	0%	1%	1%	0%	0%	1%	0.0%	0%	0%		
Sub-Total - Metals		**3%**	**3%**	**4%**	**4%**	**3%**	**4%**	**1%**	**5%**	**5%**		
15 01 03	Wood packaging	0%	0%	0%	0%	0%	0%	0%	0%	0%		
20 01 38	Non Packaging wood	2%	1%	1%	0%	1%	2%	1%	0%	0%		
Sub-Total - Wood		**2%**	**1%**	**1%**	**0%**	**1%**	**2%**	**1%**	**0%**	**0%**		
20 01 27	Paint, ink pastes and resins	0%	0%	0%	0%	1%	0%	0.0%	0%	0%		
20 01 13	Solvents	1%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 29	Detergents	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 17	Photochemicals	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 19	Pesticides	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 33	Batteries & Accumulators	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
20 01 21	Fluorescent tubes& bulbs	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
	Aerosols	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
21 01 35	Electronic equipment	1%	0%	3%	0%	0%	0%	0.0%	0%	0%		
20 01 99	Other special domestic waste	0%	0%	0%	0%	0%	0%	0.0%	0%	0%		
Sub-Total - Special Municipal Waste		**2%**	**0%**	**3%**	**1%**	**1%**	**0%**	**0%**	**0%**	**0%**		
20 03 99	Unclassified combustibles packaging	0%	0%	1%	0%	0%	0%	0%	0%	0%		
20 03 99	Other unclassified combustibles	0%	0%	0%	0%	2%	0%	0%	0%	0%		
Sub-Total - Unclassified combustibles		**0%**	**0%**	**1%**	**0%**	**2%**	**0%**	**0%**	**0%**	**0%**		
20 03 99	Unclassified incombustibles packaging	0%	0%	2%	0%	0%	0%	0%	0%	0%		
20 03 99	Other unclassified incombustibles	1%	2%	0%	1%	3%	1%	0%	0%	3%		
Sub-Total - Unclassified incombustibles		**1%**	**2%**	**2%**	**1%**	**3%**	**1%**	**0%**	**0%**	**3%**		
20 03 99	Fines smaller than 20mm round	4%	3%	4%	4%	4%	3%	0%	0%	2%		
Sub-Total - Fines smaller than 20mm		**4%**	**3%**	**4%**	**4%**	**4%**	**3%**	**0%**	**0%**	**2%**		
TOTAL		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**		

CORK CITY WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual Waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	48%	0%	0%	37%	7.6	0.2	7.8	**35%**
Papers	12%	64%	0%	24%	4.8	0.1	4.9	**22%**
Cardboards	3%	10%	0%	4%	0.9	0.6	1.4	**6%**
Composites	1%	1%	0%	1%	0.1	0.0	0.1	**1%**
Textiles	6%	0%	0%	5%	1.0	0.0	1.0	**4%**
Plastics	15%	16%	0%	15%	3.1	0.0	3.2	**14%**
Glass	4%	0%	0%	3%	0.6	0.8	1.4	**6%**
Metals	4%	9%	0%	5%	1.0	0.1	1.1	**5%**
Wood	0%	0%	0%	0%	0.0	0.1	0.1	**1%**
Special municipal was	0%	0%	0%	0%	0.1	0.0	0.1	**0%**
Unclassified Combust	0%	0%	0%	0%	0.0		0.0	**0%**
Unclassified incombus	2%	0%	0%	1%	0.3	0.0	0.3	**1%**
Fines	5%	1%	0%	4%	0.9		0.9	**4%**
Bulky waste+WEEE						0.0	0.0	**0%**
	100%	100%	0%	100%	20.3	1.9	22.1	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual Waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	4%	0%	2%	0.5		0.5	**2%**
Cardboard packagin	3%	10%	0%	4%	0.9	0.6	1.4	**6%**
Composites packagi	1%	0%	0%	0%	0.1	0.0	0.1	**0%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	13%	14%	0%	13%	2.7	0.0	2.7	**12%**
Glass packaging	4%	0%	0%	3%	0.6	0.8	1.4	**6%**
Metals packaging	2%	9%	0%	4%	0.8	0.1	0.8	**4%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	76%	64%	100%	73%	14.8	0.4	15.2	**69%**
TOTAL	100%	100%	100%	100%	20.3	1.9	22.1	**100%**

Comments

Two Cork County Council compaction refuse vehicles were used to collect waste from the selected sample area (436 households). The collection was performed on Monday 25/04/05, a day that both the mixed residual waste and the mixed dry recyclables were scheduled to be collected; presented in wheelie bins and recycling bags respectively. The samples were delivered to the Kinsale Road Landfill (EPA licence 12-2). As no covered was available a marquee was hired and set up.

One set of results was obtained for each type of door-to door collection. They were combined with the figures for bring banks/civic amenities to obtain a profile for Cork City.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Clean Mixed Paper, Newspapers	√
Magazines and Brochures	√
Clean Cardboard	√
Aluminium Drink Cans	√
Ferrous Food Cans	√
Beverage cartons (Tetra Pak)	√
Plastic bottles and containers	√

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat fee plus Bin Tag	√	√	√	√
Mixed Dry Recyclables	Recycling Bag	Free		√		

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	15.7	77%	4.6	23%		0%	20.27	92%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	36%	5.7	0%	0.0	0%	0.0	28%	5.7
Liquid fit for human consumption	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	11%	1.7	0%	0.0	0%	0.0	8%	1.7
Organics	**48%**	**7.6**	**0%**	**0.0**	**0%**	**0.0**	**37%**	**7.6**
Packaging	2%	0.3	4%	0.2	0%	0.0	2%	0.5
Newspapers- Brochures	1%	0.2	47%	2.2	0%	0.0	12%	2.4
Magazines & glossy paper	2%	0.4	9%	0.4	0%	0.0	4%	0.8
Office papers	0%	0.1	2%	0.1	0%	0.0	1%	0.1
Tissue Papers	4%	0.7	0%	0.0	0%	0.0	3%	0.7
Other papers	1%	0.2	3%	0.1	0%	0.0	1%	0.3
Papers	**12%**	**1.8**	**64%**	**2.9**	**0%**	**0.0**	**24%**	**4.8**
Flat Packaging	2%	0.3	7%	0.3	0%	0.0	3%	0.6
Corrugated packaging board	1%	0.1	3%	0.1	0%	0.0	1%	0.2
Other cardboards	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Cardboards	**3%**	**0.4**	**10%**	**0.4**	**0%**	**0.0**	**4%**	**0.9**
Non-packaging composite	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Liquid packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Other composite packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Composites	**1%**	**0.1**	**1%**	**0.0**	**0%**	**0.0**	**1%**	**0.1**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Healthcare Textiles, disposable nappies	4%	0.6	0%	0.0	0%	0.0	3%	0.6
Clothes	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Textiles	**6%**	**1.0**	**0%**	**0.0**	**0%**	**0.0**	**5%**	**1.0**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	3%	0.5	5%	0.2	0%	0.0	4%	0.7
PE Packaging	2%	0.3	3%	0.1	0%	0.0	2%	0.4
PS Packaging	0%	0.1	1%	0.0	0%	0.0	1%	0.1
Styrofoam	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Supermarkets bags and films	2%	0.4	2%	0.1	0%	0.0	2%	0.5
Mixed flexible plastic packaging	2%	0.4	2%	0.1	0%	0.0	2%	0.5
Mixed rigid plastic packaging	3%	0.4	1%	0.1	0%	0.0	2%	0.5
Other plastic waste	2%	0.4	1%	0.1	0%	0.0	2%	0.4
Plastics	**15%**	**2.4**	**16%**	**0.7**	**0%**	**0.0**	**15%**	**3.1**
Green Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Clear Glass packaging	3%	0.5	0%	0.0	0%	0.0	3%	0.5
Brown Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**4%**	**0.6**	**0%**	**0.0**	**0%**	**0.0**	**3%**	**0.6**
Ferrous metal packaging	2%	0.3	2%	0.1	0%	0.0	2%	0.4
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	1%	0.1	7%	0.3	0%	0.0	2%	0.4
Other aluminium waste	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Metals	**4%**	**0.6**	**9%**	**0.4**	**0%**	**0.0**	**5%**	**1.0**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Wood	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Unclassified Combustibles	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Unclassified incombustibles	**2%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Fines smaller than 20mm round	5%	0.8	1%	0.0	0%	0.0	4%	0.9
Fines	**5%**	0.8	**1%**	0.0	**0%**	0.0	**4%**	**0.9**
TOTAL	**100%**	**15.7**	**100%**	**4.6**	**0%**	**0.0**	**100%**	**20.3**

Table 4: Detailed Waste Composition per Samp

Local Authority		Cork City	Cork City	
City/Urban / Rural		City	City	
Collection System		2 Bin	2 Bin	
Type of housing		Houses	Houses	
Project Manager RPS MCOS		O. Gaillot	O. Gaillot	
Team (RPS MCOOS staff in bold)		**M. Spillane, B. McIntyre,** T. Meade, E.Murnane, A. O'Neill, K. Condon, T. O'Sullivan	**M. Spillane, B. McIntyre,** T. Meade, E.Murnane, A. O'Neill, K. Condon, T. O'Sullivan	
Local Authority Social Class A		34%	34%	
Local Authority Social Class B		39%	39%	
Local Authority Social Class C		27%	27%	
Area surveyed / DED		Bishopstown B	Bishopstown B	
Sample Social Class A		36%	36%	
Sample Social Class B		39%	39%	
Sample Social Class C		25%	25%	
Required sample size		60	60	
Weather (Dry / Rain)		Dry	Dry	
Date of Collection		25/04/2005	25/04/2005	
Quantity collected		6,300	3,500	
Number of household		175	390	
Collected/Household		36.0	9.0	
Frequency of collection		Weekly	2 weeks	
Charges (for typical 240 lt bin)		€5/240 Lt wb €3/140Lt wb	Free	
Type of container		240 Lt Wb	Bags	
Bulk Density		0.131		
Date of Waste characterisation		25/04/2005	25/04/2005	
Quantity characterised		159.703	131.597	
EWC CODES	**WASTE CATEGORIES**	**MRW**	**MDR**	**BB**
20 01 08	Biodegradable kitchen & canteen waste	36%	0%	
21 01 08	Liquid fit for human consumption	1%	0%	
20 01 25	Vegetable oil	0%	0%	
20 02 01	Biodegradable waste from garden & park	11%	0%	
Sub-Total - Organic waste		**48%**	**0%**	
15 01 01	Packaging	2%	4%	
20 01 01	Newspapers- Brochures	1%	47%	
20 01 01	Magazines & glossy paper	2%	9%	
20 01 01	Office papers	0%	2%	
20 01 01	Tissue Papers	4%	0%	
20 01 01	Other papers	1%	3%	
Sub-Total - Papers		**12%**	**64%**	
15 01 06	Flat Packaging	2%	7%	
15 01 06	Corrugated packaging board	1%	3%	
20 01 01	Other cardboards	0%	0%	
Sub-Total - Cardboards		**3%**	**10%**	
15 01 05	Non-packaging composite	0%	0%	
15 01 05	Liquid packaging	0%	0%	
15 01 05	Other composite packaging	0%	0%	
Sub-Total - Composites		**1%**	**1%**	
15 01 09	Textile Packaging	0%	0%	
20 01 11	Textiles non-packaging	1%	0%	
20 01 11	Healthcare Textiles, disposable nappies	4%	0%	
20 01 10	Clothes	1%	0%	
Sub-Total - Textiles		**6%**	**0%**	
20 01 39	PVC Packaging	0.0%	0.0%	
20 01 39	PET Packaging	3.2%	5.1%	
20 01 39	PE Packaging	1.6%	3.1%	
20 01 39	PS Packaging	0.4%	1.1%	
15 01 02	Styrofoam	0.3%	0.1%	
15 01 02	Supermarkets bags and films	2.5%	1.8%	
15 01 02	Mixed flexible plastic packaging	2.4%	1.5%	
15 01 02	Mixed rigid plastic packaging	2.6%	1.4%	
20 01 39	Other plastic waste	2.3%	1.4%	
Sub-Total - Plastics		**15%**	**16%**	
15 0107	Green Glass packaging	0.1%	0.0%	
15 0107	Clear Glass packaging	3.3%	0.0%	
15 0107	Brown Glass packaging	0.2%	0.0%	
15 0107	Glass packaging - Other colours	0.0%	0.0%	
20 01 02	Non Packaging glass	0.0%	0.0%	
Sub-Total - Glass		**4%**	**0%**	
15 01 04	Ferrous metal packaging	1.7%	2.0%	
20 01 40	Other ferrous metal waste	0.3%	0.0%	
15 01 04	Aluminium packaging	0.6%	6.7%	
20 01 40	Other aluminium waste	1.1%	0.0%	
15 01 04	Other metal packaging	0.0%	0.0%	
20 01 40	Other metal waste	0.2%	0.0%	
Sub-Total - Metals		**4%**	**9%**	
15 01 03	Wood packaging	0%	0%	
20 01 38	Non Packaging wood	0%	0%	
Sub-Total - Wood		**0%**	**0%**	
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	
20 01 13	Solvents	0.0%	0.0%	
20 01 29	Detergents	0.0%	0.0%	
20 01 17	Photochemicals	0.0%	0.3%	
20 01 19	Pesticides	0.0%	0.0%	
20 01 33	Batteries & Accumulators	0.1%	0.0%	
20 01 21	Fluorescent tubes& bulbs	0.0%	0.0%	
20 01 99	Aerosols	0.2%	0.1%	
21 01 35	Electronic equipment	0.0%	0.0%	
20 01 99	Other special domestic waste	0.0%	0.0%	
Sub-Total - Special Municipal Waste		**0%**	**0%**	
20 03 99	Unclassified combustibles packaging	0%	0%	
20 03 99	Other unclassified combustibles	0%	0%	
Sub-Total - Unclassified combustibles		**0%**	**0%**	
20 03 99	Unclassified incombustibles packaging	0%	0%	
20 03 99	Other unclassified incombustibles	2%	0%	
Sub-Total - Unclassified incombustibles		**2%**	**0%**	
20 03 99	Fines smaller than 20mm round	5%	1%	
Sub-Total - Fines smaller than 20mm		**5%**	**1%**	
TOTAL		**100%**	**100%**	

DUBLIN APARTMENTS WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	22%	0%	0%	22%	3.6	1.0	4.7	**25%**
Papers	17%	0%	0%	17%	2.8	0.1	2.8	**15%**
Cardboards	9%	0%	0%	9%	1.5	0.0	1.5	**8%**
Composites	2%	0%	0%	2%	0.4	0.0	0.4	**2%**
Textiles	12%	0%	0%	12%	1.9	0.0	1.9	**10%**
Plastics	14%	0%	0%	14%	2.4	0.0	2.4	**13%**
Glass	9%	0%	0%	9%	1.5	0.6	2.2	**12%**
Metals	3%	0%	0%	3%	0.6	0.1	0.7	**4%**
Wood	6%	0%	0%	6%	1.0	0.1	1.0	**5%**
Special municipal was	0%	0%	0%	0%	0.1	0.0	0.1	**0%**
Unclassified Combust	1%	0%	0%	1%	0.2		0.2	**1%**
Unclassified incombus	1%	0%	0%	1%	0.2	0.0	0.2	**1%**
Fines	3%	0%	0%	3%	0.5		0.5	**2%**
Bulky waste+WEEE						0.0	0.0	**0%**
	100%	0%	0%	100%	16.6	2.0	18.6	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	0%	0%	2%	0.3		0.3	**2%**
Cardboard packagin	8%	0%	0%	8%	1.2	0.0	1.2	**7%**
Composites packagi	2%	0%	0%	2%	0.3	0.0	0.3	**2%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	12%	0%	0%	12%	2.0	0.0	2.0	**11%**
Glass packaging	9%	0%	0%	9%	1.5	0.6	2.1	**12%**
Metals packaging	3%	0%	0%	3%	0.4	0.1	0.6	**3%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	65%	100%	100%	65%	10.8	1.2	12.0	**65%**
TOTAL	100%	100%	100%	100%	16.6	2.0	18.6	**100%**

Comments

A Dublin City and Fingal City compaction refuse vehicles were used to collect waste from the selected samples. Collections were carried out on Thursday 12/08/04 (Social Class C), Tuesday 17/08/04 (Social Class B) and Thursday 25/11/04 (Social Class B). The August samples were analysed in the Grangegorman depot and the November samples were analysed at the Oxigen depot on Robinhood Road (EPA licence 152-1).

The results from the three collections were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for Dublin Apartments (garden waste delivered to Recycling Centres was not included).

Background Information

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Large Wheelie Bin	Flat fee	√	√	√	√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	16.6	100%		0%		0%	16.60	89%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	21%	3.4	0%	0.0	0%	0.0	21%	3.4
Liquid fit for human consumption	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Organics	**22%**	**3.6**	**0%**	**0.0**	**0%**	**0.0**	**22%**	**3.6**
Packaging	2%	0.3	0%	0.0	0%	0.0	2%	0.3
Newspapers- Brochures	6%	1.0	0%	0.0	0%	0.0	6%	1.0
Magazines & glossy paper	4%	0.6	0%	0.0	0%	0.0	4%	0.6
Office papers	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Tissue Papers	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other papers	4%	0.7	0%	0.0	0%	0.0	4%	0.7
Papers	**17%**	**2.8**	**0%**	**0.0**	**0%**	**0.0**	**17%**	**2.8**
Flat Packaging	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Corrugated packaging board	4%	0.7	0%	0.0	0%	0.0	4%	0.7
Other cardboards	2%	0.3	0%	0.0	0%	0.0	2%	0.3
Cardboards	**9%**	**1.5**	**0%**	**0.0**	**0%**	**0.0**	**9%**	**1.5**
Non-packaging composite	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Liquid packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other composite packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Composites	**2%**	**0.4**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Healthcare Textiles, disposable nappies	6%	1.0	0%	0.0	0%	0.0	6%	1.0
Clothes	4%	0.7	0%	0.0	0%	0.0	4%	0.7
Textiles	**12%**	**1.9**	**0%**	**0.0**	**0%**	**0.0**	**12%**	**1.9**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	3%	0.4	0%	0.0	0%	0.0	3%	0.4
PE Packaging	2%	0.3	0%	0.0	0%	0.0	2%	0.3
PS Packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	4%	0.6	0%	0.0	0%	0.0	4%	0.6
Mixed flexible plastic packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Mixed rigid plastic packaging	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Other plastic waste	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Plastics	**14%**	**2.4**	**0%**	**0.0**	**0%**	**0.0**	**14%**	**2.4**
Green Glass packaging	6%	1.0	0%	0.0	0%	0.0	6%	1.0
Clear Glass packaging	2%	0.3	0%	0.0	0%	0.0	2%	0.3
Brown Glass packaging	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**9%**	**1.5**	**0%**	**0.0**	**0%**	**0.0**	**9%**	**1.5**
Ferrous metal packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	2%	0.3	0%	0.0	0%	0.0	2%	0.3
Other aluminium waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Metals	**3%**	**0.6**	**0%**	**0.0**	**0%**	**0.0**	**3%**	**0.6**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	6%	1.0	0%	0.0	0%	0.0	6%	1.0
Wood	**6%**	**1.0**	**0%**	**0.0**	**0%**	**0.0**	**6%**	**1.0**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**0%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Unclassified Combustibles	**1%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.2**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Unclassified incombustibles	**1%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.2**
Fines smaller than 20mm round	3%	0.5	0%	0.0	0%	0.0	3%	0.5
Fines	**3%**	0.5	**0%**	0.0	**0%**	0.0	**3%**	**0.5**
TOTAL	**100%**	**16.6**	**0%**	**0.0**	**0%**	**0.0**	**100%**	**16.6**

DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Fingal	DCC	DCC				
City/Urban / Rural		City	City	City				
Collection System		1 Bin	1 Bin	1 Bin				
Type of housing		Apartments	Apartments	Apartments				
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot				
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan,** K. Kehoe, C. Boland	**M. Spillane, M. O'Sullivan,** 6 DCC staff	**M. Spillane, M. O'Sullivan,** 6 DCC staff				
Local Authority Social Class A		45%	38%	38%				
Local Authority Social Class B		39%	39%	39%				
Local Authority Social Class C		16%	24%	24%				
Area surveyed / DED		Blanchartdstown	Dublin St Teresas Garden - Apartments	Dublin Arran Quay B Apartments				
Sample Social Class A				44%				
Sample Social Class B				34%				
Sample Social Class C				22%				
Required sample size								
Weather (Dry / Rain)		Dry						
Date of Collection		25/11/2004	12/08/2004	17/08/2004				
Quantity collected		1,960	1600	2620				
Number of household		140	122	204				
Collected/Household		14.0	23.0	12.8				
Frequency of collection		Weekly	Weekly	Weekly				
Charges (for typical 240 lt bin)		Flat fee	Flat fee	Flat fee				
Type of container		1100 Lt Wb	1100 Lt Wb	1100 Lt WB				
Bulk Density		0.104	0.10	0.14				
Date of Survey		25/11/2004	12/08/2004	17/08/2004				
Quantity characterised		130.35	162.349	142.186				
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	23%	20%	19%				
21 01 08	Liquid fit for human consumption	3%						
20 01 25	Vegetable oil	0%						
20 02 01	Biodegradable waste from garden & park	0%	0%	1%				
Sub-Total - Organic waste		**26%**	**20%**	**20%**				
15 01 01	Packaging	2%	2%	1%				
20 01 01	Newspapers- Brochures	6%	5%	7%				
20 01 01	Magazines & glossy paper	5%	2%	4%				
20 01 01	Office papers	0%						
20 01 01	Tissue Papers	3%						
20 01 01	Other papers	2%	6%	4%				
Sub-Total - Papers		**18%**	**16%**	**16%**				
15 01 06	Flat Packaging	5%	3%	2%				
15 01 06	Corrugated packaging board	2%	4%	7%				
20 01 01	Other cardboards	0%	0%	4%				
Sub-Total - Cardboards		**7%**	**7%**	**13%**				
15 01 05	Non-packaging composite	0%	0%	1%				
15 01 05	Liquid packaging	1%	0%	2%				
15 01 05	Other composite packaging	1%	1%	0%				
Sub-Total - Composites		**3%**	**1%**	**3%**				
15 01 09	Textile Packaging	0%	0%	0%				
20 01 11	Textiles non-packaging	1%	1%	3%				
20 01 11	Healthcare Textiles, disposable nappies	10%	5%	3%				
20 01 10	Clothes	3%	9%	1%				
Sub-Total - Textiles		**14%**	**15%**	**7%**				
20 01 39	PVC Packaging	0.0%	0%	0%				
20 01 39	PET Packaging	3.7%	2%	2%				
20 01 39	PE Packaging	2.1%	1%	1%				
20 01 39	PS Packaging	0.0%	1%	1%				
15 01 02	Styrofoam	0.4%						
15 01 02	Supermarkets bags and films	0.9%	5%	5%				
15 01 02	Mixed flexible plastic packaging	2.7%	1%	0%				
15 01 02	Mixed rigid plastic packaging	2.2%	2%	3%				
20 01 39	Other plastic waste	2.4%	2%	3%				
Sub-Total - Plastics		**15%**	**13%**	**16%**				
15 0107	Green Glass packaging	1.8%	6%	10%				
15 0107	Clear Glass packaging	5.8%						
15 0107	Brown Glass packaging	2.8%						
15 0107	Glass packaging - Other colours	0.0%						
20 01 02	Non Packaging glass	0.0%	1%	0%				
Sub-Total - Glass		**10%**	**7%**	**10%**				
15 01 04	Ferrous metal packaging	1.3%	0%	1%				
20 01 40	Other ferrous metal waste	0.0%	0%	0%				
15 01 04	Aluminium packaging	1.0%	3%	1%				
20 01 40	Other aluminium waste	0.2%	0%	1%				
15 01 04	Other metal packaging	0.0%	0%	0%				
20 01 40	Other metal waste	0.0%	1%	0%				
Sub-Total - Metals		**3%**	**4%**	**3%**				
15 01 03	Wood packaging	0%	0%	0%				
20 01 38	Non Packaging wood	0%	8%	9%				
Sub-Total - Wood		**0%**	**8%**	**9%**				
20 01 27	Paint, ink pastes and resins	0.0%	0%	0%				
20 01 13	Solvents	0.0%	0%	0%				
20 01 29	Detergents	0.0%	0%	0%				
20 01 17	Photochemicals	0.0%	0%	0%				
20 01 19	Pesticides	0.0%	0%	0%				
20 01 33	Batteries & Accumulators	0.1%	0%	0%				
20 01 21	Fluorescent tubes& bulbs	0.1%	0%	0%				
20 01 99	Aerosols	0.1%	0%	0%				
21 01 35	Electronic equipment	0.2%	0%	0%				
20 01 99	Other special domestic waste	0.1%	0%	0%				
Sub-Total - Special Municipal Waste		**1%**	**1%**	**0%**				
20 03 99	Unclassified combustibles packaging	0%	0%	1%				
20 03 99	Other unclassified combustibles	1%	2%	1%				
Sub-Total - Unclassified combustibles		**1%**	**2%**	**2%**				
20 03 99	Unclassified incombustibles packaging	0%	0%	0%				
20 03 99	Other unclassified incombustibles	0%	3%	1%				
Sub-Total - Unclassified incombustibles		**0%**	**3%**	**1%**				
20 03 99	Fines smaller than 20mm round	3%	4%	2%				
Sub-Total - Fines smaller than 20mm		**3%**	**4%**	**2%**				
TOTAL		**100%**	**100%**	**100%**				

LIMERICK URBAN WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	39%	1%	0%	29%	6.8	0.0	6.8	**28%**
Papers	20%	55%	0%	29%	6.9	0.1	7.0	**29%**
Cardboards	4%	14%	0%	7%	1.6	0.0	1.6	**7%**
Composites	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textiles	10%	1%	0%	7%	1.7	0.0	1.8	**7%**
Plastics	13%	13%	0%	13%	3.0	0.1	3.1	**13%**
Glass	3%	9%	0%	4%	1.0	0.5	1.5	**6%**
Metals	2%	3%	0%	2%	0.6	0.0	0.6	**2%**
Wood	0%	0%	0%	0%	0.0	0.0	0.0	**0%**
Special municipal was	0%	0%	0%	0%	0.1	0.0	0.1	**0%**
Unclassified Combust	0%	0%	0%	0%	0.0		0.0	**0%**
Unclassified incombus	2%	0%	0%	2%	0.4	0.0	0.4	**2%**
Fines	5%	2%	0%	4%	1.0		1.0	**4%**
Bulky waste+WEEE						0.1	0.1	**0%**
	100%	100%	0%	100%	23.5	0.8	24.3	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	0%	3%	0%	1%	0.2		0.2	**1%**
Cardboard packagin	4%	14%	0%	7%	1.6	0.0	1.6	**7%**
Composites packagi	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	10%	11%	0%	10%	2.4	0.1	2.5	**10%**
Glass packaging	3%	9%	0%	4%	1.0	0.5	1.5	**6%**
Metals packaging	1%	3%	0%	1%	0.3	0.0	0.4	**2%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.1		0.1	**0%**
Non packaging	81%	58%	100%	75%	17.5	0.2	17.7	**73%**
TOTAL	100%	100%	100%	100%	23.5	0.8	24.3	**100%**

Comments

A split compartment compaction refuse vehicle was used to collect mixed residual waste and mixed dry recyclables from the selected sample. The samples were delivered to the Mr. Binman depot in Co. Limerick (EPA licence 61-2) where the characterisation took place.

Two sets of results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for towns in County Limerick.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Newspapers and Magazines	√
Plastic bottles and containers	√
Aluminium Cans	√
Ferrous Cans	√
Light Cardboard	√
Beverage cartons (Tetra Pak)	√
Glass	√
Textiles	-

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat Fee for 1st Campaign; Flat Fee plus Pay by Weight for 2ndCampaign	√	√	√	√
Mixed Dry Recyclables	Bags	Pay by Use	√	√	√	√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	17.3	74%	6.1	26%		0%	23.48	97%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	29%	5.1	1%	0.1	0%	0.0	22%	5.1
Liquid fit for human consumption	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Vegetable oil	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Biodegradable waste from garden & park	9%	1.6	0%	0.0	0%	0.0	7%	1.6
Organics	**39%**	**6.8**	**1%**	**0.1**	**0%**	**0.0**	**29%**	**6.8**
Packaging	0%	0.0	3%	0.2	0%	0.0	1%	0.2
Newspapers- Brochures	9%	1.6	37%	2.3	0%	0.0	17%	3.9
Magazines & glossy paper	4%	0.7	11%	0.7	0%	0.0	6%	1.4
Office papers	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Tissue Papers	4%	0.8	1%	0.1	0%	0.0	3%	0.8
Other papers	2%	0.4	2%	0.1	0%	0.0	2%	0.5
Papers	**20%**	**3.5**	**55%**	**3.4**	**0%**	**0.0**	**29%**	**6.9**
Flat Packaging	3%	0.5	9%	0.6	0%	0.0	5%	1.1
Corrugated packaging board	1%	0.3	4%	0.3	0%	0.0	2%	0.5
Other cardboards	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Cardboards	**4%**	**0.8**	**14%**	**0.8**	**0%**	**0.0**	**7%**	**1.6**
Non-packaging composite	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Liquid packaging	0%	0.1	2%	0.1	0%	0.0	1%	0.2
Other composite packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Composites	**1%**	**0.2**	**2%**	**0.1**	**0%**	**0.0**	**1%**	**0.3**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Healthcare Textiles, disposable nappies	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Clothes	6%	1.1	0%	0.0	0%	0.0	5%	1.1
Textiles	**10%**	**1.7**	**1%**	**0.0**	**0%**	**0.0**	**7%**	**1.7**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.2	4%	0.2	0%	0.0	2%	0.4
PE Packaging	1%	0.2	3%	0.2	0%	0.0	1%	0.3
PS Packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	1%	0.1	1%	0.0	0%	0.0	1%	0.2
Mixed flexible plastic packaging	4%	0.7	1%	0.1	0%	0.0	3%	0.8
Mixed rigid plastic packaging	3%	0.5	2%	0.1	0%	0.0	3%	0.6
Other plastic waste	3%	0.5	2%	0.1	0%	0.0	3%	0.6
Plastics	**13%**	**2.2**	**13%**	**0.8**	**0%**	**0.0**	**13%**	**3.0**
Green Glass packaging	0%	0.1	5%	0.3	0%	0.0	2%	0.4
Clear Glass packaging	2%	0.4	3%	0.2	0%	0.0	2%	0.6
Brown Glass packaging	0%	0.0	1%	0.1	0%	0.0	0%	0.1
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**3%**	**0.4**	**9%**	**0.6**	**0%**	**0.0**	**4%**	**1.0**
Ferrous metal packaging	1%	0.1	2%	0.1	0%	0.0	1%	0.2
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	0%	0.1	1%	0.0	0%	0.0	0%	0.1
Other aluminium waste	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Metals	**2%**	**0.4**	**3%**	**0.2**	**0%**	**0.0**	**2%**	**0.6**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Wood	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**0%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Unclassified Combustibles	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Unclassified incombustibles packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Other unclassified incombustibles	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Unclassified incombustibles	**2%**	**0.4**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Fines smaller than 20mm round	5%	0.9	2%	0.1	0%	0.0	4%	1.0
Fines	**5%**	0.9	**2%**	0.1	**0%**	0.0	**4%**	**1.0**
TOTAL	**100%**	**17.3**	**100%**	**6.1**	**0%**	**0.0**	**100%**	**23.5**

TABLE 4: DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Co. Limerick	Co. Limerick	Co. Limerick	Co. Limerick		
City/Urban / Rural		Town	Town	Town	Town		
Collection System		2 Bin	2 Bin	2 Bin	2 Bin		
Type of housing		Houses	Houses	Houses	Houses		
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot		
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan, B. McIntyre, C. Reilly,** T. Rolleston,	**M. Spillane, B. McIntyre,** T. Meade, A. Orr, E. McCarthy, E. Murnane, A. O'Neill, S. Kehoe	**M. Spillane, M. O'Sullivan, B. McIntyre, C. Reilly,** T. Rolleston,	**M. Spillane, B. McIntyre,** T. Meade, A. Orr, E. McCarthy, E. Murnane, A. O'Neill, S. Kehoe		
Local Authority Social Class A		39.9%	39.9%	39.9%	39.9%		
Local Authority Social Class B		38.6%	38.6%	38.6%	38.6%		
Local Authority Social Class C		21.5%	21.5%	21.5%	21.5%		
Area surveyed / DED		Adare	Adare	Adare	Adare		
Sample Social Class A		45%	45%	45%	45%		
Sample Social Class B		35%	35%	35%	35%		
Sample Social Class C		20%	20%	20%	20%		
Required sample size		75	75	75	75		
Weather (Dry / Rain)		Dry	Dry	Dry	Dry		
Date of Collection		03/11/2004	20/04/2005	03/11/2004	20/04/2005		
Quantity collected		6,207	5,742	525	930		
Number of household		297	200	245	107		
Collected/Household		20.9	28.7	2.1	8.7		
Frequency of collection		Weekly	Weekly	Weekly	Weekly		
Charges (for typical 240 lt bin)							
Type of container		240 Lt Wb	240 Lt Wb	Bags	Bags		
Bulk Density				0.134			
Date of Survey		03/11/2004	20/04/2005	03/11/2004	20/04/2005		
Quantity characterised		83.67	122.384	127.247	135.749		
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	32%	27%	1%	1%		
21 01 08	Liquid fit for human consumption	0%	0%	0%	0%		
20 01 25	Vegetable oil	0%	1%	0%	0%		
20 02 01	Biodegradable waste from garden & park	1%	17%	0%	0%		
Sub-Total - Organic waste		**33%**	**45%**	**1%**	**1%**		
15 01 01	Packaging	0%	0%	2%	3%		
20 01 01	Newspapers- Brochures	16%	3%	41%	34%		
20 01 01	Magazines & glossy paper	7%	1%	9%	13%		
20 01 01	Office papers	0%	0%	0%	1%		
20 01 01	Tissue Papers	1%	8%	1%	1%		
20 01 01	Other papers	3%	1%	3%	2%		
Sub-Total - Papers		**27%**	**13%**	**56%**	**54%**		
15 01 06	Flat Packaging	4%	2%	6%	12%		
15 01 06	Corrugated packaging board	2%	1%	4%	5%		
20 01 01	Other cardboards	0%	0%	0%	0%		
Sub-Total - Cardboards		**6%**	**3%**	**10%**	**18%**		
15 01 05	Non-packaging composite	0%	0%	0%	0%		
15 01 05	Liquid packaging	0%	1%	2%	2%		
15 01 05	Other composite packaging	0%	0%	0%	0%		
Sub-Total - Composites		**1%**	**1%**	**2%**	**2%**		
15 01 09	Textile Packaging	0%	0%	0%	0%		
20 01 11	Textiles non-packaging	0%	0%	0%	0%		
20 01 11	Healthcare Textiles, disposable nappies	2%	4%	0%	0%		
20 01 10	Clothes	5%	8%	0%	0%		
Sub-Total - Textiles		**8%**	**12%**	**0%**	**1%**		
20 01 39	PVC Packaging	0.0%	0.0%	0.0%	0.0%		
20 01 39	PET Packaging	1.4%	0.8%	3.6%	3.7%		
20 01 39	PE Packaging	0.4%	1.6%	3.1%	2.7%		
20 01 39	PS Packaging	0.0%	0.9%	0.4%	0.2%		
15 01 02	Styrofoam	0.0%	0.1%	0.1%	0.2%		
15 01 02	Supermarkets bags and films	0.9%	0.5%	0.4%	0.8%		
15 01 02	Mixed flexible plastic packaging	4.1%	4.1%	0.7%	1.2%		
15 01 02	Mixed rigid plastic packaging	2.8%	2.6%	1.9%	2.7%		
20 01 39	Other plastic waste	1.3%	4.2%	1.5%	2.3%		
Sub-Total - Plastics		**11%**	**15%**	**12%**	**14%**		
15 0107	Green Glass packaging	0.7%	0.0%	7.2%	3.0%		
15 0107	Clear Glass packaging	1.0%	3.4%	4.5%	1.3%		
15 0107	Brown Glass packaging	0.0%	0.0%	2.5%	0.5%		
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%		
20 01 02	Non Packaging glass	0.0%	0.0%	0.0%	0.0%		
Sub-Total - Glass		**2%**	**3%**	**14%**	**5%**		
15 01 04	Ferrous metal packaging	0.5%	0.6%	3.1%	1.1%		
20 01 40	Other ferrous metal waste	0.2%	0.0%	0.0%	0.4%		
15 01 04	Aluminium packaging	0.6%	0.2%	0.7%	0.8%		
20 01 40	Other aluminium waste	0.6%	1.2%	0.0%	0.2%		
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%		
20 01 40	Other metal waste	0.1%	0.0%	0.0%	0.3%		
Sub-Total - Metals		**2%**	**2%**	**4%**	**3%**		
15 01 03	Wood packaging	0%	0%	0%	0%		
20 01 38	Non Packaging wood	0%	0%	0%	0%		
Sub-Total - Wood		**0%**	**0%**	**0%**	**0%**		
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%		
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%		
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%		
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%		
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%		
20 01 33	Batteries & Accumulators	0.0%	0.0%	0.0%	0.0%		
20 01 21	Fluorescent tubes& bulbs	0.0%	0.0%	0.0%	0.0%		
Two sets o	Aerosols	0.4%	0.1%	0.0%	0.0%		
21 01 35	Electronic equipment	0.2%	0.0%	0.2%	0.6%		
Two sets o	Other special domestic waste	0.0%	0.0%	0.0%	0.0%		
Sub-Total - Special Municipal Waste		**1%**	**0%**	**0%**	**1%**		
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified combustibles	0%	0%	0%	0%		
Sub-Total - Unclassified combustibles		**0%**	**0%**	**0%**	**0%**		
20 03 99	Unclassified incombustibles packaging	0%	1%	0%	0%		
20 03 99	Other unclassified incombustibles	4%	0%	0%	0%		
Sub-Total - Unclassified incombustibles		**4%**	**1%**	**0%**	**0%**		
20 03 99	Fines smaller than 20mm round	6%	5%	0%	3%		
Sub-Total - Fines smaller than 20mm		**6%**	**5%**	**0%**	**3%**		
TOTAL		**100%**	**100%**	**100%**	**100%**		

WATERFORD URBAN WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual Waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	16%	1%	81%	25%	5.4	0.0	5.4	**22%**
Papers	12%	51%	10%	21%	4.5	0.1	4.6	**19%**
Cardboards	3%	17%	0%	6%	1.2	0.0	1.2	**5%**
Composites	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textiles	14%	4%	1%	9%	2.0	0.0	2.0	**8%**
Plastics	12%	18%	4%	12%	2.5	0.0	2.5	**10%**
Glass	4%	0%	0%	2%	0.5	1.0	1.5	**6%**
Metals	7%	6%	0%	6%	1.2	0.3	1.5	**6%**
Wood	1%	0%	0%	1%	0.1	0.1	0.2	**1%**
Special municipal was	1%	0%	0%	1%	0.1	0.0	0.1	**1%**
Unclassified Combusti	4%	0%	0%	2%	0.5		0.5	**2%**
Unclassified incombus	3%	0%	0%	2%	0.3	0.4	0.8	**3%**
Fines	22%	1%	4%	14%	3.0		3.0	**12%**
Bulky waste+WEEE						0.5	0.5	**2%**
	100%	100%	100%	100%	21.6	2.4	24.1	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual Waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	3%	1%	2%	0.4		0.4	**2%**
Cardboard packaging	2%	17%	0%	5%	1.1	0.0	1.1	**5%**
Composites packagi	1%	2%	0%	1%	0.2	0.0	0.2	**1%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	9%	15%	1%	9%	1.9	0.0	1.9	**8%**
Glass packaging	3%	0%	0%	2%	0.4	1.0	1.3	**5%**
Metals packaging	3%	6%	0%	3%	0.7	0.3	1.0	**4%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	80%	57%	97%	78%	16.9	1.2	18.1	**75%**
TOTAL	100%	100%	100%	100%	21.6	2.4	24.1	**100%**

Comments

A Waterford County Council split compartment compaction refuse vehicle was used to collect waste from the selected sample. The samples were delivered to the Dungarvan Waste Disposal site (EPA licence 32-2).

Two sets of results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for County Waterford.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables		Brown Bin (Organics)	
Newspapers and Magazines	√	Cooked and Raw Food	√
Plastic bottles and containers	√	Paper Towels and Tissues	√
Aluminium Cans	√	Garden Cuttings	√
Ferrous Cans	√	Prunings	√
Light Cardboard	√	Leaves	√
Beverage cartons (Tetra Pak)	√	Human and pet hair	√
Textiles	-	Biodegradable nappies	√

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Pay-by-use	√		√	
Mixed Dry Recyclables	Wheelie Bin	Pay-by-use		√		√
Organics Collection	Wheelie Bin	Pay-by-use		√		√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	12.4	57%	5.0	23%	4.2	20%	21.65	90%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	11%	1.4	1%	0.0	62%	2.6	19%	4.1
Liquid fit for human consumption	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	4%	0.5	0%	0.0	19%	0.8	6%	1.3
Organics	**16%**	**1.9**	**1%**	**0.0**	**81%**	**3.4**	**25%**	**5.4**
Packaging	2%	0.2	3%	0.2	1%	0.0	2%	0.4
Newspapers- Brochures	3%	0.4	33%	1.7	7%	0.3	11%	2.4
Magazines & glossy paper	1%	0.1	8%	0.4	0%	0.0	2%	0.5
Office papers	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Tissue Papers	3%	0.4	1%	0.0	2%	0.1	3%	0.5
Other papers	2%	0.3	5%	0.3	0%	0.0	3%	0.6
Papers	**12%**	**1.5**	**51%**	**2.6**	**10%**	**0.4**	**21%**	**4.5**
Flat Packaging	1%	0.2	9%	0.4	0%	0.0	3%	0.6
Corrugated packaging board	1%	0.1	8%	0.4	0%	0.0	2%	0.5
Other cardboards	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Cardboards	**3%**	**0.4**	**17%**	**0.8**	**0%**	**0.0**	**6%**	**1.2**
Non-packaging composite	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Liquid packaging	0%	0.0	1%	0.1	0%	0.0	0%	0.1
Other composite packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Composites	**1%**	**0.2**	**2%**	**0.1**	**0%**	**0.0**	**1%**	**0.3**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	3%	0.3	2%	0.1	0%	0.0	2%	0.4
Healthcare Textiles, disposable nappies	8%	1.0	0%	0.0	1%	0.0	5%	1.0
Clothes	4%	0.5	1%	0.1	0%	0.0	3%	0.6
Textiles	**14%**	**1.8**	**4%**	**0.2**	**1%**	**0.0**	**9%**	**2.0**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	0%	0.1	4%	0.2	0%	0.0	1%	0.2
PE Packaging	1%	0.1	4%	0.2	0%	0.0	1%	0.3
PS Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	3%	0.3	1%	0.1	0%	0.0	2%	0.4
Mixed flexible plastic packaging	3%	0.3	3%	0.2	0%	0.0	2%	0.5
Mixed rigid plastic packaging	2%	0.2	3%	0.2	0%	0.0	2%	0.4
Other plastic waste	3%	0.4	3%	0.1	3%	0.1	3%	0.6
Plastics	**12%**	**1.4**	**18%**	**0.9**	**4%**	**0.2**	**12%**	**2.5**
Green Glass packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Clear Glass packaging	2%	0.2	0%	0.0	0%	0.0	1%	0.2
Brown Glass packaging	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	1%	0.1	0%	0.0	0%	0.0	1%	0.2
Glass	**4%**	**0.5**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.5**
Ferrous metal packaging	2%	0.2	3%	0.2	0%	0.0	2%	0.4
Other ferrous metal waste	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Aluminium packaging	1%	0.2	2%	0.1	0%	0.0	1%	0.3
Other aluminium waste	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Metals	**7%**	**0.9**	**6%**	**0.3**	**0%**	**0.0**	**6%**	**1.2**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Wood	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.1**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Electronic equipment	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.1**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	4%	0.5	0%	0.0	0%	0.0	2%	0.5
Unclassified Combustibles	**4%**	**0.5**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.5**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	3%	0.3	0%	0.0	0%	0.0	2%	0.3
Unclassified incombustibles	**3%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.3**
Fines smaller than 20mm round	22%	2.8	1%	0.0	4%	0.2	14%	3.0
Fines	**22%**	2.8	**1%**	0.0	**4%**	0.2	**14%**	**3.0**
TOTAL	**100%**	**12.4**	**100%**	**5.0**	**100%**	**4.2**	**100%**	**21.6**

TABLE 4: DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford
City/Urban / Rural		Town	Town	Town	Town	Town	Town
Collection System		3 Bin	3 Bin	3 Bin	3 Bin	3 Bin	3 Bin
Type of housing		Houses	Houses	Houses	Houses	Houses	Houses
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot
Team (RPS MCOS staff in bold)		**M. Spillane, B. McIntyre, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, A. Wilson	**M. O'Sullivan, B. McIntyre,** C. Lee, C. O'Callaghan, K. Buckley, P. Piekarz	**M. Spillane, B. McIntyre, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, A. Wilson	**M. O'Sullivan, B. McIntyre,** C. Lee, C. O'Callaghan, K. Buckley, P. Piekarz	**M. Spillane, B. McIntyre, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, E. O'Brien	**M. O'Sullivan, B. McIntyre,** C. O'Callaghan, K. Buckley, P. Piekarz
Local Authority Social Class A		36%	36%	36%	36%	36%	36%
Local Authority Social Class B		39%	39%	39%	39%	39%	39%
Local Authority Social Class C		26%	26%	26%	26%	26%	26%
Area surveyed / DED		Dungarvan	Dungarvan	Dungarvan	Dungarvan	Dungarvan	Dungarvan
Sample Social Class A		30%	30%	30%	30%	30%	30%
Sample Social Class B		41%	41%	41%	41%	41%	41%
Sample Social Class C		29%	29%	29%	29%	29%	29%
Required sample size		98	98	98	98	98	98
Weather (Dry / Rain)		Dry	Dry / Cold	Dry	Dry / Cold	Wet	Dry / Cold
Date of Collection		20/11/2004	12/03/2005	20/11/2004	12/03/2005	27/11/2004	19/03/2005
Quantity collected		4,653	3,360	2,147	1,580	3,120	3,020
Number of household		99	81	99	101	98	80
Collected/Household		47.0	41.5	21.7	15.6	31.8	37.8
Frequency of collection		2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks
Charges (for typical 240 lt bin)		Volume based fee	Volume based fee	Volume based fee	Volume based fee	Volume based fee	Volume based fee
Type of container		240 Lt Wb	240 Lt Wb	Bags	Bags	240 Lt Wb	240 Lt Wb
Bulk Density		0.168	0.15		0.07	0.171	
Date of Survey		20/11/2004	12/03/2005	20/11/2004	12/03/2005	27/11/2004	19/03/2005
Quantity characterised		152.44	140.85	124.07	132.516	159.54	172.926
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	13%	10%	1%	0%	56%	68%
21 01 08	Liquid fit for human consumption	1%	0%	0%	0%	0%	0%
20 01 25	Vegetable oil	0%	0%	0%	0%	0%	0%
20 02 01	Biodegradable waste from garden & park	3%	5%	0%	0%	32%	6%
Sub-Total - Organic waste		**17%**	**15%**	**1%**	**0%**	**88%**	**73%**
15 01 01	Packaging	2%	1%	4%	3%	0%	2%
20 01 01	Newspapers- Brochures	5%	2%	26%	39%	5%	8%
20 01 01	Magazines & glossy paper	1%	0%	6%	11%	0%	0%
20 01 01	Office papers	0%	0%	0%	0%	0%	0%
20 01 01	Tissue Papers	3%	3%	1%	1%	0%	4%
20 01 01	Other papers	2%	3%	8%	3%	0%	0%
Sub-Total - Papers		**13%**	**10%**	**45%**	**57%**	**6%**	**14%**
15 01 06	Flat Packaging	2%	1%	10%	7%	0%	0%
15 01 06	Corrugated packaging board	1%	0%	6%	9%	0%	0%
20 01 01	Other cardboards	1%	0%	0%	0%	0%	0%
Sub-Total - Cardboards		**4%**	**1%**	**17%**	**17%**	**0%**	**0%**
15 01 05	Non-packaging composite	0%	0%	0%	0%	0%	0%
15 01 05	Liquid packaging	0%	1%	1%	1%	0%	0%
15 01 05	Other composite packaging	1%	0%	0%	0%	0%	0%
Sub-Total - Composites		**2%**	**1%**	**2%**	**1%**	**0%**	**0%**
15 01 09	Textile Packaging	0%	0%	0%	0%	0%	0%
20 01 11	Textiles non-packaging	3%	3%	4%	0%	0%	0%
20 01 11	Healthcare Textiles, disposable nappies	7%	8%	0%	0%	0%	1%
20 01 10	Clothes	4%	4%	3%	0%	0%	0%
Sub-Total - Textiles		**14%**	**15%**	**8%**	**0%**	**0%**	**1%**
20 01 39	PVC Packaging	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 39	PET Packaging	0.8%	0.1%	4.8%	2.6%	0.0%	0.0%
20 01 39	PE Packaging	1.0%	0.9%	4.7%	3.3%	0.0%	0.0%
20 01 39	PS Packaging	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%
15 01 02	Styrofoam	0.2%	0.1%	0.2%	0.1%	0.0%	0.0%
15 01 02	Supermarkets bags and films	1.8%	3.2%	1.5%	0.7%	0.9%	0.0%
15 01 02	Mixed flexible plastic packaging	2.7%	2.7%	3.7%	2.5%	0.5%	0.2%
15 01 02	Mixed rigid plastic packaging	1.8%	1.6%	4.0%	2.5%	0.1%	0.7%
20 01 39	Other plastic waste	3.9%	1.8%	2.2%	3.5%	0.5%	4.8%
Sub-Total - Plastics		**13%**	**10%**	**21%**	**15%**	**2%**	**6%**
15 0107	Green Glass packaging	0.4%	0.5%	0.0%	0.0%	0.0%	0.1%
15 0107	Clear Glass packaging	1.6%	2.2%	0.0%	0.0%	0.0%	0.0%
15 0107	Brown Glass packaging	0.8%	0.2%	0.1%	0.1%	0.0%	0.0%
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 02	Non Packaging glass	1.4%	1.0%	0.2%	0.0%	0.0%	0.0%
Sub-Total - Glass		**4%**	**4%**	**0%**	**0%**	**0%**	**0%**
15 01 04	Ferrous metal packaging	1.6%	1.9%	2.6%	3.8%	0.0%	0.0%
20 01 40	Other ferrous metal waste	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
15 01 04	Aluminium packaging	0.8%	1.9%	0.9%	3.8%	0.0%	0.7%
20 01 40	Other aluminium waste	1.1%	0.8%	0.3%	0.2%	0.0%	0.0%
15 01 04	Other metal packaging	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%
20 01 40	Other metal waste	0.4%	3.7%	0.0%	0.6%	0.0%	0.0%
Sub-Total - Metals		**6%**	**8%**	**4%**	**8%**	**0%**	**1%**
15 01 03	Wood packaging	0%	0%	0%	0%	0%	0%
20 01 38	Non Packaging wood	1%	2%	0%	0%	0%	0%
Sub-Total - Wood		**1%**	**2%**	**0%**	**0%**	**0%**	**0%**
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 33	Batteries & Accumulators	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%
20 01 21	Fluorescent tubes& bulbs	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
	Aerosols	0.6%	0.3%	0.0%	0.0%	0.0%	0.0%
21 01 35	Electronic equipment	0.3%	0.1%	0.3%	0.0%	0.0%	0.0%
20 01 99	Other special domestic waste	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Sub-Total - Special Municipal Waste		**1%**	**1%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%	0%	0%
20 03 99	Other unclassified combustibles	8%	1%	0%	0%	0%	0%
Sub-Total - Unclassified combustibles		**8%**	**1%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Unclassified incombustibles packaging	0%	0%	0%	0%	0%	0%
20 03 99	Other unclassified incombustibles	2%	4%	0%	0%	0%	0%
Sub-Total - Unclassified incombustibles		**2%**	**4%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Fines smaller than 20mm round	16%	28%	2%	0%	3%	4%
Sub-Total - Fines smaller than 20mm		**16%**	**28%**	**2%**	**0%**	**3%**	**4%**
TOTAL		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

LONGFORD (RURAL) WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	39%	0%	0%	33%	7.3	0.1	7.4	30%
Papers	9%	60%	0%	17%	3.8	0.0	3.8	16%
Cardboards	4%	22%	0%	7%	1.5	0.0	1.5	6%
Composites	4%	3%	0%	4%	0.8	0.0	0.8	3%
Textiles	13%	0%	0%	11%	2.5	0.0	2.5	10%
Plastics	14%	8%	0%	13%	2.9	0.0	2.9	12%
Glass	3%	1%	0%	2%	0.5	0.5	1.1	4%
Metals	4%	5%	0%	4%	0.8	0.0	0.9	4%
Wood	0%	0%	0%	0%	0.1	0.0	0.1	0%
Special municipal was	2%	0%	0%	2%	0.4	0.0	0.4	2%
Unclassified Combusti	0%	0%	0%	0%	0.0		0.0	0%
Unclassified incombus	1%	0%	0%	1%	0.3	0.0	0.3	1%
Fines	7%	1%	0%	6%	1.3		1.3	5%
Bulky waste+WEEE						1.6	1.6	7%
	100%	100%	0%	100%	22.3	2.3	24.6	100%

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	1%	0%	2%	0.4		0.4	**1%**
Cardboard packaging	3%	22%	0%	6%	1.3	0.0	1.3	**5%**
Composites packagi	2%	3%	0%	2%	0.5	0.0	0.5	**2%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	11%	7%	0%	11%	2.4	0.0	2.4	**10%**
Glass packaging	2%	1%	0%	2%	0.5	0.5	1.0	**4%**
Metals packaging	1%	5%	0%	2%	0.4	0.0	0.5	**2%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Non packaging	78%	61%	100%	75%	16.8	1.7	18.5	**75%**
TOTAL	100%	100%	100%	100%	22.3	2.3	24.6	**100%**

Comments

Mulleady's compaction refuse vehicles were used to collect waste from the selected sample. The samples were delivered to Mulleadys Ltd (EPA licence 169-1).

Two sets of results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for County Longford.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Clean Mixed Paper, Newspapers	√
Magazines and Brochures	√
Clean Cardboard	√
Aluminium Drink Cans	√
Ferrous Food Cans	√
Beverage cartons (Tetra Pak)	√
Plastic bottles and containers	√
Textiles	-

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat Fee for 1st Campaign; Flat Fee plus Pay by Weight for 2nd Campaign	√		√	
Mixed Dry Recyclables	Wheelie Bin	Free		√		√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	18.9	85%	3.4	15%		0%	22.32	91%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	36%	6.8	0%	0.0	0%	0.0	30%	6.8
Liquid fit for human consumption	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	2%	0.3	0%	0.0	0%	0.0	2%	0.3
Organics	**39%**	**7.3**	**0%**	**0.0**	**0%**	**0.0**	**33%**	**7.3**
Packaging	2%	0.3	1%	0.0	0%	0.0	2%	0.4
Newspapers- Brochures	1%	0.2	42%	1.4	0%	0.0	8%	1.7
Magazines & glossy paper	1%	0.1	11%	0.4	0%	0.0	2%	0.5
Office papers	0%	0.0	1%	0.0	0%	0.0	0%	0.0
Tissue Papers	3%	0.6	0%	0.0	0%	0.0	3%	0.6
Other papers	3%	0.5	6%	0.2	0%	0.0	3%	0.7
Papers	**9%**	**1.8**	**60%**	**2.1**	**0%**	**0.0**	**17%**	**3.8**
Flat Packaging	2%	0.4	6%	0.2	0%	0.0	3%	0.7
Corrugated packaging board	1%	0.2	15%	0.5	0%	0.0	3%	0.7
Other cardboards	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Cardboards	**4%**	**0.8**	**22%**	**0.8**	**0%**	**0.0**	**7%**	**1.5**
Non-packaging composite	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Liquid packaging	1%	0.3	2%	0.1	0%	0.0	1%	0.3
Other composite packaging	1%	0.2	1%	0.1	0%	0.0	1%	0.2
Composites	**4%**	**0.7**	**3%**	**0.1**	**0%**	**0.0**	**4%**	**0.8**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Healthcare Textiles, disposable nappies	11%	2.0	0%	0.0	0%	0.0	9%	2.0
Clothes	2%	0.4	0%	0.0	0%	0.0	2%	0.4
Textiles	**13%**	**2.5**	**0%**	**0.0**	**0%**	**0.0**	**11%**	**2.5**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.1	3%	0.1	0%	0.0	1%	0.2
PE Packaging	1%	0.2	3%	0.1	0%	0.0	1%	0.3
PS Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Mixed flexible plastic packaging	6%	1.1	0%	0.0	0%	0.0	5%	1.1
Mixed rigid plastic packaging	3%	0.5	0%	0.0	0%	0.0	2%	0.5
Other plastic waste	3%	0.5	1%	0.0	0%	0.0	2%	0.5
Plastics	**14%**	**2.7**	**8%**	**0.3**	**0%**	**0.0**	**13%**	**2.9**
Green Glass packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Clear Glass packaging	2%	0.3	1%	0.0	0%	0.0	1%	0.3
Brown Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**3%**	**0.5**	**1%**	**0.0**	**0%**	**0.0**	**2%**	**0.5**
Ferrous metal packaging	1%	0.2	4%	0.1	0%	0.0	2%	0.4
Other ferrous metal waste	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Aluminium packaging	0%	0.0	1%	0.0	0%	0.0	0%	0.1
Other aluminium waste	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Metals	**4%**	**0.7**	**5%**	**0.2**	**0%**	**0.0**	**4%**	**0.8**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Wood	**0%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.1**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**2%**	**0.4**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Unclassified Combustibles	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Unclassified incombustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified incombustibles	1%	0.3	0%	0.0	0%	0.0	1%	0.3
Unclassified incombustibles	**1%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Fines smaller than 20mm round	7%	1.2	1%	0.0	0%	0.0	6%	1.3
Fines	**7%**	1.2	**1%**	0.0	**0%**	0.0	**6%**	**1.3**
TOTAL	**100%**	**18.9**	**100%**	**3.4**	**0%**	**0.0**	**100%**	**22.3**

DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Co. Longford	Co. Longford	Co. Longford	Co. Longford	Co. Longford	Co. Longford
City/Urban / Rural		Rural	Rural	Rural	Rural		
Collection System		2 Bin	2 Bin	2 Bin	2 Bin		
Type of housing		Houses	Houses	Houses	Houses		
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot		
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan, B. McIntyre, M. Dineen**, T. Rolleston	**M. O'Sullivan, B. McIntyre,** A. Carson, D. Delaney, L. Holland, T. Kenny	**M. Spillane, M. O'Sullivan, B. McIntyre,** S. Convery, T. Rolleston	**M. O'Sullivan, B. McIntyre,** A. Carson, D. Delaney, L. Holland, T. Kenny		
Local Authority Social Class A		31%	31%	31%	31%		
Local Authority Social Class B		43%	43%	43%	43%		
Local Authority Social Class C		26%	26%	26%	26%		
Area surveyed / DED		Drumlish-Granard	Drumlish-Granard	Drumlish-Granard	Drumlish-Granard		
Sample Social Class A		30%	30%	30%	30%		
Sample Social Class B		42%	42%	42%	42%		
Sample Social Class C		28%	28%	28%	28%		
Required sample size							
Weather (Dry / Rain)							
Date of Collection		04/11/2004	03/03/2005	28/10/2004	10/03/2005		
Quantity collected		2,022	660	1,660	660		
Number of household		53	50	66	64		
Collected/Household		38.2	13.2	25.2	10.3	#DIV/0!	#DIV/0!
Frequency of collection		2 weeks	2 weeks	2 weeks	2 weeks		
Charges (for typical 240 lt bin)		Flat fee	Free	Pay by Weight	Free		
Type of container		240 Lt Wb	240 Lt Wb	Bags	Bags		
Bulk Density		0.142	0.13		0.08		
Date of Survey		04/11/2004	10/03/2005	28/10/2004	10/03/2005		
Quantity characterised		178.04	124.037	135.32	113.6728		
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	31%	41%	0%	0%		
21 01 08	Liquid fit for human consumption	0%	2%	0%	0%		
20 01 25	Vegetable oil	0%	0%	0%	0%		
20 02 01	Biodegradable waste from garden & park	4%	0%	0%	0%		
Sub-Total - Organic waste		**35%**	**42%**	**0%**	**0%**		
15 01 01	Packaging	3%	1%	2%	1%		
20 01 01	Newspapers- Brochures	1%	2%	37%	46%		
20 01 01	Magazines & glossy paper	1%	0%	13%	8%		
20 01 01	Office papers	0%	0%	0%	1%		
20 01 01	Tissue Papers	3%	3%	0%	0%		
20 01 01	Other papers	4%	2%	8%	4%		
Sub-Total - Papers		**11%**	**7%**	**59%**	**61%**		
15 01 06	Flat Packaging	3%	1%	6%	7%		
15 01 06	Corrugated packaging board	1%	1%	15%	15%		
20 01 01	Other cardboards	2%	0%	1%	0%		
Sub-Total - Cardboards		**6%**	**2%**	**22%**	**22%**		
15 01 05	Non-packaging composite	2%	2%	0%	0%		
15 01 05	Liquid packaging	0%	3%	0%	3%		
15 01 05	Other composite packaging	1%	1%	3%	0%		
Sub-Total - Composites		**2%**	**5%**	**3%**	**3%**		
15 01 09	Textile Packaging	0%	0%	0%	0%		
20 01 11	Textiles non-packaging	0%	0%	0%	0%		
20 01 11	Healthcare Textiles, disposable nappies	8%	13%	0%	0%		
20 01 10	Clothes	3%	1%	0%	0%		
Sub-Total - Textiles		**12%**	**14%**	**0%**	**0%**		
20 01 39	PVC Packaging	0.0%	0.3%	0.0%	0.0%		
20 01 39	PET Packaging	1.1%	0.2%	3.8%	3.0%		
20 01 39	PE Packaging	1.0%	1.1%	2.8%	3.0%		
20 01 39	PS Packaging	0.2%	0.0%	0.0%	0.0%		
15 01 02	Styrofoam	0.1%	0.0%	0.0%	0.0%		
15 01 02	Supermarkets bags and films	0.9%	0.6%	0.1%	0.1%		
15 01 02	Mixed flexible plastic packaging	5.7%	5.9%	0.1%	0.8%		
15 01 02	Mixed rigid plastic packaging	2.6%	2.7%	0.2%	0.5%		
20 01 39	Other plastic waste	2.5%	3.2%	0.1%	0.9%		
Sub-Total - Plastics		**14%**	**14%**	**7%**	**8%**		
15 0107	Green Glass packaging	0.3%	1.2%	0.0%	0.0%		
15 0107	Clear Glass packaging	1.1%	2.1%	0.9%	0.5%		
15 0107	Brown Glass packaging	0.2%	0.1%	0.3%	0.0%		
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%		
20 01 02	Non Packaging glass	0.0%	0.3%	0.0%	0.0%		
Sub-Total - Glass		**2%**	**4%**	**1%**	**1%**		
15 01 04	Ferrous metal packaging	1.3%	1.4%	4.7%	3.7%		
20 01 40	Other ferrous metal waste	0.7%	0.5%	0.0%	0.0%		
15 01 04	Aluminium packaging	0.3%	0.0%	0.9%	0.5%		
20 01 40	Other aluminium waste	0.8%	0.8%	0.0%	0.0%		
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%		
20 01 40	Other metal waste	1.2%	0.2%	0.0%	0.0%		
Sub-Total - Metals		**4%**	**3%**	**6%**	**4%**		
15 01 03	Wood packaging	0%	0%	0%	0%		
20 01 38	Non Packaging wood	0%	1%	0%	0%		
Sub-Total - Wood		**0%**	**1%**	**0%**	**0%**		
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%		
20 01 13	Solvents	1.2%	0.0%	0.0%	0.0%		
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%		
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%		
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%		
20 01 33	Batteries & Accumulators	0.0%	0.5%	0.3%	0.0%		
20 01 21	Fluorescent tubes& bulbs	0.0%	0.1%	0.0%	0.0%		
	Aerosols	0.2%	0.3%	0.1%	0.1%		
21 01 35	Electronic equipment	1.2%	0.9%	0.0%	0.0%		
20 01 99	Other special domestic waste	0.0%	0.0%	0.0%	0.0%		
Sub-Total - Special Municipal Waste		**3%**	**2%**	**0%**	**0%**		
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified combustibles	0%	0%	0%	0%		
Sub-Total - Unclassified combustibles		**0%**	**0%**	**0%**	**0%**		
20 03 99	Unclassified incombustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified incombustibles	2%	1%	0%	0%		
Sub-Total - Unclassified incombustibles		**2%**	**1%**	**0%**	**0%**		
20 03 99	Fines smaller than 20mm round	7%	6%	1%	1%		
Sub-Total - Fines smaller than 20mm		**7%**	**6%**	**1%**	**1%**		
TOTAL		**100%**	**100%**	**100%**	**100%**		

LIMERICK RURAL WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	29%	1%	0%	23%	5.6	0.0	5.6	**22%**
Papers	14%	54%	0%	23%	5.7	0.1	5.8	**23%**
Cardboards	8%	18%	0%	10%	2.5	0.0	2.5	**10%**
Composites	2%	2%	0%	2%	0.4	0.0	0.4	**2%**
Textiles	15%	5%	0%	13%	3.0	0.0	3.1	**12%**
Plastics	15%	12%	0%	14%	3.5	0.1	3.5	**14%**
Glass	3%	4%	0%	3%	0.7	0.5	1.2	**5%**
Metals	3%	3%	0%	3%	0.8	0.0	0.9	**3%**
Wood	1%	0%	0%	1%	0.3	0.0	0.3	**1%**
Special municipal was	2%	0%	0%	2%	0.4	0.0	0.4	**2%**
Unclassified Combusti	0%	0%	0%	0%	0.0		0.0	**0%**
Unclassified incombus	2%	0%	0%	1%	0.3	0.0	0.3	**1%**
Fines	5%	1%	0%	4%	1.1		1.1	**4%**
Bulky waste+WEEE						0.1	0.1	**0%**
	100%	100%	0%	100%	24.4	0.8	25.2	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	3%	0%	2%	0.4		0.4	**2%**
Cardboard packaging	7%	17%	0%	10%	2.4	0.0	2.4	**9%**
Composites packagi	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	12%	11%	0%	12%	2.9	0.1	3.0	**12%**
Glass packaging	3%	4%	0%	3%	0.7	0.5	1.2	**5%**
Metals packaging	2%	3%	0%	2%	0.6	0.0	0.6	**2%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	1%	0%	0%	1%	0.1		0.1	**1%**
Non packaging	72%	60%	100%	69%	16.8	0.2	17.0	**68%**
TOTAL	100%	100%	100%	100%	24.4	0.8	25.2	**100%**

Comments

Mr Binman's compaction refuse vehicle was used to collect waste from the selected sample. The samples were delivered to the Mr. Binman depot in Co. Limerick (EPA licence 61-2) where the characterisation took place.

Following the characterisation surveys, results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for rural areas in Limerick County.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables	
Newspapers and Magazines	√
Plastic bottles and containers	√
Aluminium Cans	√
Ferrous Cans	√
Light Cardboard	√
Beverage cartons (Tetra Pak)	√
Glass	√
Textiles	-

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Flat Fee for 1st Campaign; Flat Fee plus Pay by Weight for 2ndCampaign	√	√	√	√
Mixed Dry Recyclables	Bags	Pay by Use	√	√	√	√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	18.8	77%	5.6	23%		0%	24.36	97%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	27%	5.1	0%	0.0	0%	0.0	21%	5.2
Liquid fit for human consumption	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Organics	**29%**	**5.5**	**1%**	**0.0**	**0%**	**0.0**	**23%**	**5.6**
Packaging	2%	0.3	3%	0.2	0%	0.0	2%	0.4
Newspapers- Brochures	2%	0.4	37%	2.0	0%	0.0	10%	2.4
Magazines & glossy paper	1%	0.2	11%	0.6	0%	0.0	3%	0.8
Office papers	3%	0.6	1%	0.1	0%	0.0	3%	0.7
Tissue Papers	4%	0.7	1%	0.0	0%	0.0	3%	0.8
Other papers	2%	0.5	2%	0.1	0%	0.0	2%	0.6
Papers	**14%**	**2.7**	**54%**	**3.0**	**0%**	**0.0**	**23%**	**5.7**
Flat Packaging	4%	0.7	8%	0.5	0%	0.0	5%	1.2
Corrugated packaging board	3%	0.6	9%	0.5	0%	0.0	5%	1.1
Other cardboards	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Cardboards	**8%**	**1.5**	**18%**	**1.0**	**0%**	**0.0**	**10%**	**2.5**
Non-packaging composite	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Liquid packaging	1%	0.2	2%	0.1	0%	0.0	1%	0.3
Other composite packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Composites	**2%**	**0.3**	**2%**	**0.1**	**0%**	**0.0**	**2%**	**0.4**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.1	3%	0.2	0%	0.0	1%	0.3
Healthcare Textiles, disposable nappies	8%	1.6	1%	0.0	0%	0.0	7%	1.6
Clothes	6%	1.1	1%	0.0	0%	0.0	5%	1.1
Textiles	**15%**	**2.8**	**5%**	**0.3**	**0%**	**0.0**	**13%**	**3.0**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.2	4%	0.2	0%	0.0	2%	0.4
PE Packaging	2%	0.4	3%	0.2	0%	0.0	2%	0.6
PS Packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Styrofoam	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Supermarkets bags and films	2%	0.4	1%	0.0	0%	0.0	2%	0.4
Mixed flexible plastic packaging	4%	0.7	2%	0.1	0%	0.0	3%	0.8
Mixed rigid plastic packaging	2%	0.5	2%	0.1	0%	0.0	2%	0.5
Other plastic waste	3%	0.5	0%	0.0	0%	0.0	2%	0.6
Plastics	**15%**	**2.8**	**12%**	**0.7**	**0%**	**0.0**	**14%**	**3.5**
Green Glass packaging	1%	0.2	1%	0.0	0%	0.0	1%	0.3
Clear Glass packaging	2%	0.3	3%	0.1	0%	0.0	2%	0.4
Brown Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Glass	**3%**	**0.5**	**4%**	**0.2**	**0%**	**0.0**	**3%**	**0.7**
Ferrous metal packaging	2%	0.3	2%	0.1	0%	0.0	2%	0.4
Other ferrous metal waste	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Aluminium packaging	1%	0.1	1%	0.0	0%	0.0	1%	0.2
Other aluminium waste	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Metals	**3%**	**0.7**	**3%**	**0.2**	**0%**	**0.0**	**3%**	**0.8**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Wood	**1%**	**0.2**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**2%**	**0.4**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Unclassified Combustibles	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**	**0%**	**0.0**
Unclassified incombustibles packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other unclassified incombustibles	1%	0.2	0%	0.0	0%	0.0	1%	0.2
Unclassified incombustibles	**2%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Fines smaller than 20mm round	5%	1.0	1%	0.1	0%	0.0	4%	1.1
Fines	**5%**	1.0	**1%**	0.1	**0%**	0.0	**4%**	**1.1**
TOTAL	**100%**	**18.8**	**100%**	**5.6**	**0%**	**0.0**	**100%**	**24.4**

TABLE 4: DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Co. Limerick	Limerick	Limerick	Limerick		
City/Urban / Rural		Rural	Rural	Rural	Rural		
Collection System		2 Bin	2 Bin	2 Bin	2 Bin		
Type of housing		Houses	Houses	Houses	Houses		
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot		
Team (RPS MCOS staff in bold)		**M. Spillane, M. O'Sullivan, B. McIntyre, C. Reilly,** T. Rolleston,	**M. Spillane, B. McIntyre,** T. Meade, A. Orr, E. McCarthy, E. Murnane, A. O'Neill, S. Kehoe	**M. Spillane, M. O'Sullivan, B. McIntyre, C. Reilly,** T. Rolleston,	**M. Spillane, B. McIntyre,** T. Meade, A. Orr, E. McCarthy, E. Murnane, A. O'Neill, S. Kehoe		
Local Authority Social Class A		39.9%	39.9%	39.9%	39.9%		
Local Authority Social Class B		38.6%	38.6%	38.6%	38.6%		
Local Authority Social Class C		21.5%	21.5%	21.5%	21.5%		
Area surveyed / DED		Patrickswell	Patrickswell	Patrickswell	Patrickswell		
Sample Social Class A		37.5%	37.5%	37.5%	37.5%		
Sample Social Class B		38.8%	38.8%	38.8%	38.8%		
Sample Social Class C		23.6%	23.6%	23.6%	23.6%		
Required sample size		50	50	50	50		
Weather (Dry / Rain)		Dry	Dry	Dry	Dry		
Date of Collection		02/11/2004	19/04/2005	02/11/2004	19/04/2005		
Quantity collected		5,971	5,814	1,480	2,370		
Number of household		297	260	205	183		
Collected/Household		20.1	22.4	7.2	13.0		
Frequency of collection		Weekly	Weekly	Weekly	Weekly		
Charges (for typical 240 lt bin)							
Type of container		240 Lt Wb	Bags	240 Lt Wb	Bags		
Bulk Density		0.144		0.101			
Date of Survey		02/11/2004	19/04/2005	02/11/2004	19/04/2005		
Quantity characterised		111.11	122.388	152.83	109.0832		
EWC CODES	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	26%	29%	0%	1%		
21 01 08	Liquid fit for human consumption	0%	0%	0%	0%		
20 01 25	Vegetable oil	0%	0%	0%	0%		
20 02 01	Biodegradable waste from garden & park	4%	0%	0%	0%		
Sub-Total - Organic waste		**29%**	**29%**	**0%**	**1%**		
15 01 01	Packaging	2%	1%	3%	3%		
20 01 01	Newspapers- Brochures	1%	3%	33%	40%		
20 01 01	Magazines & glossy paper	1%	2%	12%	10%		
20 01 01	Office papers	0%	6%	0%	3%		
20 01 01	Tissue Papers	1%	6%	0%	1%		
20 01 01	Other papers	4%	1%	2%	2%		
Sub-Total - Papers		**9%**	**19%**	**50%**	**58%**		
15 01 06	Flat Packaging	5%	3%	10%	6%		
15 01 06	Corrugated packaging board	6%	1%	12%	7%		
20 01 01	Other cardboards	0%	1%	0%	0%		
Sub-Total - Cardboards		**12%**	**5%**	**22%**	**13%**		
15 01 05	Non-packaging composite	1%	0%	0%	0%		
15 01 05	Liquid packaging	1%	1%	2%	1%		
15 01 05	Other composite packaging	0%	0%	0%	0%		
Sub-Total - Composites		**1%**	**2%**	**2%**	**1%**		
15 01 09	Textile Packaging	0%	0%	0%	0%		
20 01 11	Textiles non-packaging	1%	0%	0%	7%		
20 01 11	Healthcare Textiles, disposable nappies	6%	11%	1%	0%		
20 01 10	Clothes	7%	5%	1%	1%		
Sub-Total - Textiles		**14%**	**16%**	**2%**	**8%**		
20 01 39	PVC Packaging	0.0%	0.0%	0.0%	0.0%		
20 01 39	PET Packaging	0.4%	1.2%	5.2%	2.5%		
20 01 39	PE Packaging	3.1%	1.2%	3.8%	2.9%		
20 01 39	PS Packaging	0.1%	0.8%	0.3%	0.1%		
15 01 02	Styrofoam	0.1%	0.6%	0.1%	0.2%		
15 01 02	Supermarkets bags and films	3.0%	1.4%	0.7%	0.4%		
15 01 02	Mixed flexible plastic packaging	4.3%	3.1%	1.4%	1.9%		
15 01 02	Mixed rigid plastic packaging	2.0%	2.8%	1.5%	1.7%		
20 01 39	Other plastic waste	3.6%	2.0%	0.1%	0.8%		
Sub-Total - Plastics		**17%**	**13%**	**13%**	**11%**		
15 0107	Green Glass packaging	1.7%	0.5%	0.6%	1.2%		
15 0107	Clear Glass packaging	1.5%	1.6%	2.7%	2.7%		
15 0107	Brown Glass packaging	0.2%	0.2%	0.1%	0.3%		
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.2%	0.0%		
20 01 02	Non Packaging glass	0.0%	0.0%	0.0%	0.0%		
Sub-Total - Glass		**3%**	**2%**	**4%**	**4%**		
15 01 04	Ferrous metal packaging	2.0%	1.1%	2.7%	1.5%		
20 01 40	Other ferrous metal waste	0.4%	0.3%	0.0%	0.0%		
15 01 04	Aluminium packaging	0.5%	0.8%	0.9%	0.5%		
20 01 40	Other aluminium waste	0.3%	1.1%	0.1%	0.0%		
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%		
20 01 40	Other metal waste	0.5%	0.1%	0.2%	0.0%		
Sub-Total - Metals		**4%**	**3%**	**4%**	**2%**		
15 01 03	Wood packaging	0%	0%	0%	0%		
20 01 38	Non Packaging wood	2%	0%	1%	0%		
Sub-Total - Wood		**2%**	**0%**	**1%**	**0%**		
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%		
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%		
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%		
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%		
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%		
20 01 33	Batteries & Accumulators	0.1%	0.0%	0.0%	0.0%		
20 01 21	Fluorescent tubes& bulbs	0.0%	0.0%	0.0%	0.0%		
20 01 99	Aerosols	0.2%	0.0%	0.2%	0.3%		
21 01 35	Electronic equipment	0.0%	3.6%	0.0%	0.0%		
20 01 99	Other special domestic waste	0.4%	0.1%	0.0%	0.0%		
Sub-Total - Special Municipal Waste		**1%**	**4%**	**0%**	**0%**		
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%		
20 03 99	Other unclassified combustibles	0%	0%	0%	0%		
Sub-Total - Unclassified combustibles		**0%**	**0%**	**0%**	**0%**		
20 03 99	Unclassified incombustibles packaging	0%	2%	0%	0%		
20 03 99	Other unclassified incombustibles	2%	0%	0%	0%		
Sub-Total - Unclassified incombustibles		**2%**	**2%**	**0%**	**0%**		
20 03 99	Fines smaller than 20mm round	7%	4%	2%	1%		
Sub-Total - Fines smaller than 20mm		**7%**	**4%**	**2%**	**1%**		
TOTAL		**100%**	**100%**	**100%**	**100%**		

WATERFORD RURAL WASTE COMPOSITION SCALE UP

Table 1: Summary of Primary Categories Combination

Primary Waste category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Organics	23%	1%	83%	28%	6.9	0.0	6.9	**25%**
Papers	12%	46%	8%	21%	5.1	0.1	5.2	**19%**
Cardboards	2%	16%	0%	6%	1.4	0.0	1.4	**5%**
Composites	1%	3%	0%	2%	0.4	0.0	0.4	**1%**
Textiles	17%	4%	0%	10%	2.6	0.0	2.6	**9%**
Plastics	12%	23%	2%	13%	3.3	0.0	3.3	**12%**
Glass	3%	0%	0%	2%	0.5	1.0	1.4	**5%**
Metals	4%	5%	0%	4%	0.9	0.3	1.2	**4%**
Wood	1%	0%	0%	1%	0.1	0.1	0.2	**1%**
Special municipal was	3%	1%	0%	2%	0.4	0.0	0.4	**2%**
Unclassified Combusti	1%	0%	1%	1%	0.2		0.2	**1%**
Unclassified incombus	2%	0%	0%	1%	0.3	0.4	0.7	**3%**
Fines	18%	1%	4%	11%	2.7		2.7	**10%**
Bulky waste+WEEE						0.5	0.5	**2%**
	100%	100%	100%	100%	24.7	2.4	27.1	**100%**

Table 2: Summary of Packaging Waste Composition Combination

Packaging Waste Category	Residual waste	Recyclables	Brown Bin	Combination Door-to-door	Door-to-door kg/wk/ hh	BB+CA+bulky waste kg/wk/ hh	Collected kg/wk/ hh	LA WASTE COMPOSITION
Paper Packaging	2%	4%	1%	2%	0.5		0.5	**2%**
Cardboard packaging	2%	16%	0%	6%	1.4	0.0	1.4	**5%**
Composites packagi	1%	2%	0%	1%	0.3	0.0	0.3	**1%**
Textile packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Plastic packaging	9%	20%	2%	11%	2.6	0.0	2.6	**10%**
Glass packaging	3%	0%	0%	2%	0.4	1.0	1.3	**5%**
Metals packaging	2%	5%	0%	2%	0.6	0.3	0.9	**3%**
Wood packaging	0%	0%	0%	0%	0.0		0.0	**0%**
Other packaging	1%	0%	0%	1%	0.2		0.2	**1%**
Non packaging	80%	54%	97%	76%	18.7	1.2	19.9	**73%**
TOTAL	100%	100%	100%	100%	24.7	2.4	27.1	**100%**

Comments

A Waterford County Council compaction refuse vehicle was used to collect waste from the selected sample (123 households). The samples were delivered to the Dungarvan Waste Disposal site (EPA licence 32-2).

Two sets of results were obtained for each type of door-to door collection. They were combined with the figures for materials collected at bring banks/civic amenities to obtain a profile for County Waterford.

Background Information

Materials Accepted in the Separate Collection System

Mixed Dry recyclables		Brown Bin (Organics)	
Newspapers and Magazines	√	Cooked and Raw Food	√
Plastic bottles and containers	√	Paper Towels and Tissues	√
Aluminium Cans	√	Garden Cuttings	√
Ferrous Cans	√	Prunings	√
Light Cardboard	√	Leaves	√
Beverage cartons (Tetra Pak)	√	Human and pet hair	√
Textiles	-	Biodegradable nappies	√

Details of Fees, Container and Frequency of Collection

Waste Type	Container	Payment system	Week 1	Week 2	Week 3	Week4
Mixed Residual Waste	Wheelie Bin	Pay-by-use	√		√	
Mixed Dry Recyclables	Wheelie Bin	Pay-by-use		√		√
Organics Collection	Wheelie Bin	Pay-by-use		√		√

Table 3: Detailed Results of Combination for Door-to-door Collection

	Residual waste	Residual waste	Recyclables	Recyclables	Brown Bin	Brown Bin	Combination Door-to-door Collection	
Quantity used for scale-up	13.4	54%	6.9	28%	4.4	18%	24.67	91%
WASTE CATEGORIES	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**	**% OF TOTAL**	**Kg / wk / hh**
Biodegradable kitchen & canteen waste	20%	2.6	0%	0.0	80%	3.6	25%	6.2
Liquid fit for human consumption	0%	0.1	1%	0.1	0%	0.0	0%	0.1
Vegetable oil	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Biodegradable waste from garden & park	3%	0.4	0%	0.0	4%	0.2	2%	0.6
Organics	**23%**	**3.1**	**1%**	**0.1**	**83%**	**3.7**	**28%**	**6.9**
Packaging	2%	0.2	4%	0.3	1%	0.0	2%	0.5
Newspapers- Brochures	4%	0.5	26%	1.8	6%	0.3	10%	2.5
Magazines & glossy paper	1%	0.2	9%	0.6	0%	0.0	3%	0.8
Office papers	0%	0.0	3%	0.2	0%	0.0	1%	0.2
Tissue Papers	3%	0.5	1%	0.1	1%	0.1	2%	0.6
Other papers	1%	0.2	4%	0.3	0%	0.0	2%	0.4
Papers	**12%**	**1.6**	**46%**	**3.1**	**8%**	**0.4**	**21%**	**5.1**
Flat Packaging	1%	0.2	10%	0.7	0%	0.0	4%	0.9
Corrugated packaging board	1%	0.1	5%	0.4	0%	0.0	2%	0.5
Other cardboards	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Cardboards	**2%**	**0.3**	**16%**	**1.1**	**0%**	**0.0**	**6%**	**1.4**
Non-packaging composite	1%	0.1	1%	0.0	0%	0.0	1%	0.1
Liquid packaging	0%	0.0	2%	0.2	0%	0.0	1%	0.2
Other composite packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Composites	**1%**	**0.2**	**3%**	**0.2**	**0%**	**0.0**	**2%**	**0.4**
Textile Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Textiles non-packaging	1%	0.1	0%	0.0	0%	0.0	0%	0.1
Healthcare Textiles, disposable nappies	11%	1.5	0%	0.0	0%	0.0	6%	1.5
Clothes	5%	0.7	4%	0.3	0%	0.0	4%	0.9
Textiles	**17%**	**2.3**	**4%**	**0.3**	**0%**	**0.0**	**10%**	**2.6**
PVC Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
PET Packaging	1%	0.1	4%	0.3	0%	0.0	1%	0.4
PE Packaging	1%	0.1	6%	0.4	0%	0.0	2%	0.5
PS Packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Styrofoam	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Supermarkets bags and films	2%	0.2	1%	0.1	1%	0.0	1%	0.3
Mixed flexible plastic packaging	3%	0.4	4%	0.2	1%	0.0	3%	0.7
Mixed rigid plastic packaging	2%	0.3	5%	0.3	0%	0.0	3%	0.7
Other plastic waste	3%	0.4	4%	0.2	0%	0.0	3%	0.7
Plastics	**12%**	**1.6**	**23%**	**1.6**	**2%**	**0.1**	**13%**	**3.3**
Green Glass packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Clear Glass packaging	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Brown Glass packaging	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Glass packaging - Other colours	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging glass	0%	0.1	0%	0.0	0%	0.0	0%	0.1
Glass	**3%**	**0.4**	**0%**	**0.0**	**0%**	**0.0**	**2%**	**0.5**
Ferrous metal packaging	2%	0.2	4%	0.3	0%	0.0	2%	0.5
Other ferrous metal waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aluminium packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.1
Other aluminium waste	1%	0.1	1%	0.0	0%	0.0	1%	0.2
Other metal packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other metal waste	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Metals	**4%**	**0.5**	**5%**	**0.4**	**0%**	**0.0**	**4%**	**0.9**
Wood packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Non Packaging wood	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Wood	**1%**	**0.1**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.1**
Paint, ink pastes and resins	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Solvents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Detergents	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Photochemicals	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Pesticides	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Batteries & Accumulators	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Fluorescent tubes& bulbs	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Aerosols	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Electronic equipment	2%	0.3	0%	0.0	0%	0.0	1%	0.3
Other special domestic waste	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Special municipal waste	**3%**	**0.4**	**1%**	**0.0**	**0%**	**0.0**	**2%**	**0.4**
Unclassified combustibles packaging	0%	0.0	0%	0.0	0%	0.0	0%	0.0
Other unclassified combustibles	1%	0.1	0%	0.0	1%	0.0	1%	0.1
Unclassified Combustibles	**1%**	**0.1**	**0%**	**0.0**	**1%**	**0.0**	**1%**	**0.2**
Unclassified incombustibles packaging	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Other unclassified incombustibles	1%	0.1	0%	0.0	0%	0.0	1%	0.1
Unclassified incombustibles	**2%**	**0.3**	**0%**	**0.0**	**0%**	**0.0**	**1%**	**0.3**
Fines smaller than 20mm round	18%	2.4	1%	0.1	4%	0.2	11%	2.7
Fines	**18%**	2.4	**1%**	0.1	**4%**	0.2	**11%**	**2.7**
TOTAL	**100%**	**13.4**	**100%**	**6.9**	**100%**	**4.4**	**100%**	**24.7**

TABLE 4: DETAILED WASTE COMPOSITION 2004 / 2005

Local Authority		Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford	Co. Waterford
City/Urban / Rural		Rural	Rural	Rural	Rural	Rural	Rural
Collection System		3 Bin	3 Bin	3 Bin	3 Bin	3 Bin	3 Bin
Type of housing		Houses	Houses	Houses	Houses	Houses	Houses
Project Manager		O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot	O. Gaillot
Team (RPS MCOS staff in bold)		**M. Spillane, B. McIntyre, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, A. Wilson	**M. O'Sullivan, B. McIntyre,** C. Lee, C. O'Callaghan, K. Buckley, P. Piekarz	**M. Spillane, B. McIntyre, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, A. Wilson	**M. O'Sullivan, B. McIntyre,** C. Lee, C. O'Callaghan, K. Buckley, P. Piekarz	**M. Spillane, M. O'Sullivan,** M. Cullen, B. Sheehan, S. Campbell, E. O'Brien	**M. O'Sullivan, B. McIntyre,** C. O'Callaghan, K. Buckley, P. Piekarz
Local Authority Social Class A		36%	36%	36%	36%	36%	36%
Local Authority Social Class B		39%	39%	39%	39%	39%	39%
Local Authority Social Class C		26%	26%	26%	26%	26%	26%
Area surveyed / DED		Stradbally	Stradbally	Stradbally	Stradbally	Stradbally	Stradbally
Sample Social Class A		27%	27%	27%	27%	27%	27%
Sample Social Class B		45%	45%	45%	45%	45%	45%
Sample Social Class C		29%	29%	29%	29%	29%	29%
Required sample size		240	240	240	240	240	240
Weather (Dry / Rain)		Rain	Dry	Rain	Dry	Dry	Dry
Date of Collection		20/11/2004	12/03/2005	20/11/2004	12/03/2005	27/11/2004	19/03/2005
Quantity collected		4,420	3,820	2,220	2,280	4,880	1,520
Number of household		79	123	110	119	101	50
Collected/Household		55.9	31.1	20.2	19.2	48.3	30.4
Frequency of collection		2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks
Charges (for typical 240 lt bin)		Volume based fee	Volume based fee	Volume based fee	Volume based fee	Volume based fee	Volume based fee
Type of container		240 Lt Wb	240 Lt Wb	Bags	Bags	240 Lt Wb	240 Lt Wb
Bulk Density		0.17	0.15	None	0.10	0.153	
Date of Survey		20/11/2004	12/03/2005	20/11/2004	12/03/2005	27/11/2004	19/03/2005
Quantity characterised		158.71	138.9	133.801	118.0	155.35	150.5
EWC	**WASTE CATEGORIES**	MRW	MRW	MDR	MDR	BB	BB
20 01 08	Biodegradable kitchen & canteen waste	23%	16%	0%	0%	81%	78%
21 01 08	Liquid fit for human consumption	0%	1%	0%	1%	0%	0%
20 01 25	Vegetable oil	0%	0%	0%	0%	0%	0%
20 02 01	Biodegradable waste from garden & park	5%	1%	0%	0%	3%	5%
Sub-Total - Organic waste		**28%**	**18%**	**0%**	**2%**	**84%**	**83%**
15 01 01	Packaging	2%	2%	4%	4%	0%	1%
20 01 01	Newspapers- Brochures	4%	3%	30%	22%	7%	5%
20 01 01	Magazines & glossy paper	3%	0%	7%	10%	0%	0%
20 01 01	Office papers	0%	0%	1%	4%	0%	0%
20 01 01	Tissue Papers	3%	4%	1%	1%	0%	2%
20 01 01	Other papers	2%	1%	4%	3%	1%	0%
Sub-Total - Papers		**13%**	**10%**	**47%**	**44%**	**9%**	**8%**
15 01 06	Flat Packaging	1%	1%	10%	11%	0%	0%
15 01 06	Corrugated packaging board	1%	1%	8%	3%	0%	0%
20 01 01	Other cardboards	0%	0%	0%	0%	0%	0%
Sub-Total - Cardboards		**3%**	**2%**	**18%**	**14%**	**0%**	**0%**
15 01 05	Non-packaging composite	1%	1%	0%	1%	0%	0%
15 01 05	Liquid packaging	0%	0%	3%	1%	0%	0%
15 01 05	Other composite packaging	0%	1%	0%	0%	0%	0%
Sub-Total - Composites		**1%**	**2%**	**4%**	**2%**	**0%**	**0%**
15 01 09	Textile Packaging	0%	0%	0%	0%	0%	0%
20 01 11	Textiles non-packaging	1%	0%	0%	1%	0%	0%
20 01 11	Healthcare Textiles, disposable nappies	12%	11%	0%	0%	0%	0%
20 01 10	Clothes	5%	5%	7%	0%	0%	0%
Sub-Total - Textiles		**18%**	**16%**	**8%**	**1%**	**0%**	**0%**
20 01 39	PVC Packaging	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%
20 01 39	PET Packaging	0.9%	0.4%	4.0%	4.1%	0.0%	0.0%
20 01 39	PE Packaging	0.8%	0.6%	3.8%	7.4%	0.0%	0.0%
20 01 39	PS Packaging	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
15 01 02	Styrofoam	0.2%	0.2%	0.2%	0.3%	0.0%	0.0%
15 01 02	Supermarkets bags and films	0.9%	2.4%	1.7%	0.8%	0.0%	2.2%
15 01 02	Mixed flexible plastic packaging	4.3%	2.4%	2.6%	4.4%	0.9%	0.2%
15 01 02	Mixed rigid plastic packaging	3.1%	1.5%	3.6%	6.2%	0.2%	0.1%
20 01 39	Other plastic waste	4.1%	1.8%	2.6%	4.5%	0.8%	0.0%
Sub-Total - Plastics		**15%**	**9%**	**19%**	**28%**	**2%**	**3%**
15 0107	Green Glass packaging	0.0%	0.5%	0.0%	0.1%	0.0%	0.1%
15 0107	Clear Glass packaging	1.1%	3.3%	0.0%	0.1%	0.0%	0.0%
15 0107	Brown Glass packaging	0.2%	0.6%	0.0%	0.1%	0.0%	0.0%
15 0107	Glass packaging - Other colours	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 02	Non Packaging glass	0.4%	0.5%	0.0%	0.0%	0.0%	0.0%
Sub-Total - Glass		**2%**	**5%**	**0%**	**0%**	**0%**	**0%**
15 01 04	Ferrous metal packaging	1.4%	2.0%	3.6%	4.7%	0.2%	0.0%
20 01 40	Other ferrous metal waste	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
15 01 04	Aluminium packaging	0.3%	0.2%	0.4%	0.5%	0.0%	0.0%
20 01 40	Other aluminium waste	0.5%	1.4%	0.2%	0.8%	0.2%	0.0%
15 01 04	Other metal packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 40	Other metal waste	1.0%	0.8%	0.0%	0.2%	0.0%	0.0%
Sub-Total - Metals		**4%**	**4%**	**4%**	**6%**	**0%**	**0%**
15 01 03	Wood packaging	0%	0%	0%	0%	0%	0%
20 01 38	Non Packaging wood	0%	2%	0%	0%	0%	0%
Sub-Total - Wood		**0%**	**2%**	**0%**	**0%**	**0%**	**0%**
20 01 27	Paint, ink pastes and resins	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 13	Solvents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 29	Detergents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 17	Photochemicals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 19	Pesticides	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20 01 33	Batteries & Accumulators	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%
20 01 21	Fluorescent tubes& bulbs	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
	Aerosols	0.4%	0.3%	0.1%	0.2%	0.0%	0.0%
21 01 35	Electronic equipment	3.2%	1.0%	0.0%	0.9%	0.0%	0.0%
20 01 99	Other special domestic waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sub-Total - Special Municipal Waste		**4%**	**1%**	**0%**	**1%**	**0%**	**0%**
20 03 99	Unclassified combustibles packaging	0%	0%	0%	0%	0%	0%
20 03 99	Other unclassified combustibles	0%	1%	0%	0%	0%	1%
Sub-Total - Unclassified combustibles		**0%**	**1%**	**0%**	**0%**	**0%**	**1%**
20 03 99	Unclassified incombustibles packaging	0%	2%	0%	0%	0%	0%
20 03 99	Other unclassified incombustibles	2%	0%	0%	0%	0%	0%
Sub-Total - Unclassified incombustibles		**2%**	**2%**	**0%**	**0%**	**0%**	**0%**
20 03 99	Fines smaller than 20mm round	10%	26%	1%	2%	4%	4%
Sub-Total - Fines smaller than 20mm		**10%**	**26%**	**1%**	**2%**	**4%**	**4%**
TOTAL		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

APPENDIX H

Commercial Waste Composition Results per Sector

Commercial Waste Composition

	Financial		Hotel		Supermarket		Retail		Communication		Restaurant		Wholesale	
	Non-Packaging	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*
Cardboard	0.5%	13.2%	0.3%	7.2%	0.0%	48.4%	0.0%	83.8%	0.4%	13.7%	0.1%	11.1%	0.0%	26.9%
Composites	0.0%	0.4%	0.8%	0.3%	2.3%	0.1%	0.0%	0.0%	1.0%	0.6%	0.0%	0.4%	3.5%	1.3%
Glass	0.0%	1.0%	0.0%	21.5%	0.0%	0.3%	0.0%	0.0%	0.0%	1.4%	0.0%	24.4%	0.0%	1.5%
Metal	0.1%	1.3%	0.6%	0.5%	0.2%	0.3%	0.0%	0.0%	4.9%	1.2%	0.1%	0.8%	0.4%	1.3%
Organic	35.7%	0.0%	49.8%	0.0%	31.1%	0.0%	0.2%	0.0%	20.5%	0.0%	48.7%	0.0%	22.8%	0.0%
Others	1.4%	0.1%	2.5%	0.0%	0.7%	0.0%	0.2%	0.0%	9.8%	0.0%	2.2%	0.0%	1.9%	0.0%
Paper	35.6%	0.6%	10.7%	0.2%	7.8%	0.1%	0.3%	0.6%	31.2%	0.3%	5.0%	0.1%	13.5%	0.6%
Plastic	0.1%	9.9%	1.0%	3.6%	0.7%	7.0%	0.0%	14.6%	4.2%	4.7%	0.1%	4.7%	1.7%	23.5%
Textiles	0.3%	0.0%	1.0%	0.0%	0.5%	0.0%	0.2%	0.0%	0.6%	0.0%	0.3%	0.0%	0.4%	0.0%
Wood	0.0%	0.1%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	4.3%	1.1%	0.0%	2.0%	0.6%	0.2%

National Sectoral Total / kg	***62,613***		***90,668***		***121,273***		***89,849***		***92,033***		***53,315***		***37,587***	
	Non-Packaging	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*	*Non-Packaging*	*Packaging*
Cardboard	284	8,247	265	6,538	4	58,712	0	75,319	359	12,610	28	5,921	0	10,128
Composites	0	223	740	277	2,770	150	11	22	960	544	9	196	1,309	486
Glass	0	639	16	19,468	0	353	0	0	12	1,245	0	12,993	0	549
Metal	55	812	506	469	243	395	0	6	4,550	1,130	30	429	146	505
Organic	22,334	0	45,147	0	37,672	0	174	0	18,856	0	25,956	0	8,559	0
Others	903	74	2,284	0	888	0	156	0	9,046	0	1,194	0	698	0
Paper	22,299	387	9,678	148	9,426	148	253	583	28,687	306	2,681	66	5,065	225
Plastic	51	6,204	942	3,233	884	8,481	2	13,143	3,908	4,294	72	2,489	650	8,823
Textiles	163	11	936	12	571	7	180	0	544	5	152	17	142	6
Wood	0	89	0	9	0	570	0	0	3,990	989	0	1,083	216	79
Total	***46,090***	***16,687***	***60,513***	***30,155***	***52,457***	***68,816***	***775***	***89,074***	***70,911***	***21,122***	***30,122***	***23,193***	***16,786***	***20,801***

Industrial Waste Composition

	Pfizers			EMC			Heineken			Ship Co. Ltd		
	Mixed	***Segregated***	***Total***	***Mixed***	***Segregated***	***Total***	***Mixed***	***Segregated***	***Total***	***Mixed***	***Segregated***	***Total***
Cardboard	43.3	1,824.6	1,867.8	111.6	0.0	255.3	9.8	95.8	105.6	4.6	12.3	16.9
Composites	157.6	0.0	157.6	255.3	621.5	863.7	34.3	0.0	34.3	5.3	0.0	5.3
Glass	0.0	113.8	113.8	3.6	0.0	17.5	5.1	22.1	27.2	0.0	0.0	0.0
Metal	2.3	563.4	565.8	116.7	0.0	247.5	10.4	211.1	221.5	0.9	0.9	1.8
Organic	51.7	288.2	339.9	242.1	534.3	563.8	89.5	100.6	190.1	9.7	0.0	9.7
Other	28.6	16.0	44.6	247.5	472.0	816.0	12.8	4.4	17.2	2.1	23.4	25.5
Paper	128.4	235.2	363.5	344.0	718.2	1,144.4	52.2	295.1	347.2	11.8	34.0	45.8
Plastic	171.6	129.6	301.2	426.2	3,718.8	3,830.3	32.1	344.0	376.1	24.1	30.8	54.9
Textiles	71.3	4.8	76.2	17.5	43.0	46.6	15.4	1.9	17.2	2.6	0.5	3.1
Wood	2.2	925.3	927.5	29.5	37.0	153.7	0.1	95.8	95.9	0.5	0.1	0.6
	656.9	4,100.9	4,757.8	1,793.8	6,144.8	7,938.6	261.6	1,170.7	1,432.3	61.7	101.9	163.6

Table H.1: Financial services waste breakdown

	Packaging	Non-packaging	Total
Paper	0.6%	36.1%	36.7%
Organic	0.0%	36.1%	36.1%
Cardboard	12.0 %	0.5%	12.5%
Plastic	10.0%	0.1%	10.1%
Others	0.1%	1.5%	1.6%
Metal	1.3%	0.1%	1.4%
Glass	1.0%	0.0%	1.0%
Composites	0.4%	0.0%	0.4%
Textiles	0.0%	0.3%	0.3%
Wood	0.1%	0.0%	0.1%

Table H.2: Communication Sector waste breakdown

	Packaging	Non-Packaging	Total
Other	0.0%	38.1%	38.1%
Paper	0.2%	24.6%	24.8%
Organic	0.0%	12.8%	12.8%
Wood	1.5%	5.9%	7.4%
Cardboard	5.5%	0.5%	6.0%
Metal	1.2%	3.4%	4.6%
Plastic	3.1%	0.3%	3.4%
Glass	1.6%	0.0%	1.6%
Textiles	0.0%	0.8%	0.8%
Composite	0.3%	0.2%	0.5%

Table H.3: Communication Sector waste breakdown

	Packaging	Non-Packaging	Total
Paper	0.42%	26.53%	26.94%
Organic	0%	22.40%	22.40%
Cardboard	19.53%	0.00%	19.53%
Plastic	4.78%	8.12%	12.91%
Other	0%	9.53%	9.53%
Metals	0.75%	4.88%	5.63%
Composite	0.79%	1.80%	2.59%
Glass	0.44%	0%	0.44%
Textiles	0%	0.03%	0.03%
Wood	0%	0%	0%

Table H.4: Hotel Sector waste breakdown

	Packaging	Non-Packaging	Total
Organic	0.0%	49.8%	49.8%
Glass	21.5%	0.0%	21.5%
Paper	0.2%	10.6%	10.8%
Cardboard	7.2%	0.3%	7.5%
Plastic	3.6%	1.0%	4.6%
Other	0.0%	2.5%	2.5%
Composite	0.3%	0.8%	1.1%
Metal	0.5%	0.6%	1.1%
Textiles	0.0%	1.0%	1.0%
Wood	0.0%	0.0%	0.0%

Table H.5: Restaurant Sector waste breakdown

	Packaging	Non-Packaging	Total
Organic	0.0%	48.7%	48.7%
Glass	24.4%	0.0%	24.4%
Cardboard	11.1%	0.1%	11.2%
Paper	0.1%	5.0%	5.2%
Plastic	4.7%	0.1%	4.8%
Other	0.0%	2.2%	2.2%
Wood	2.0%	0.0%	2.0%
Metal	0.8%	0.1%	0.9%
Composites	0.4%	0.0%	0.4%
Textiles	0.0%	0.3%	0.3%

Table H.6: Wholesale Sector waste breakdown

	Packaging	Non-Packaging	Total
Cardboard	26.9%	0.0%	26.9%
Plastic	23.5%	1.7%	25.2%
Organic	0.0%	22.8%	22.8%
Paper	0.6%	13.5%	14.1%
Composite	1.3%	3.5%	4.8%
Other	0.0%	1.9%	1.9%
Metals	1.3%	0.4%	1.7%
Glass	1.5%	0.0%	1.5%
Wood	0.2%	0.6%	0.8%
Textiles	0.0%	0.4%	0.4%

Table H.7: Supermarket Sector waste breakdown

	Packaging	Non-Packaging	Total
Cardboard	48.41%	0%	48.42%
Organic		31.06%	31.06%
Paper	0.12%	7.77%	7.89%
Plastic	6.99%	0.73%	7.72%
Composite	0.12%	2.28%	2.41%
Other		0.73%	0.73%
Metals	0.33%	0.20%	0.53%
Textiles	0.01%	0.47%	0.48%
Wood	0.47%	0%	0.47%
Glass	0.29%	0%	0.29%

Table H.8: Retail Sector waste breakdown

	Packaging	Non-Packaging	Total
Cardboard	83.83%	0%	83.83%
Plastic	14.63%	0%	14.63%
Paper	0.65%	0.28%	0.93%
Textiles	0%	0.20%	0.20%
Organic	0%	0.19%	0.19%
Other	0%	0.17%	0.17%
Composite	0.02%	0.01%	0.04%
Metals	0.01%	0%	0.01%
Wood	0%	0%	0.00%
Glass	0%	0%	0.00%

Table H.9: Pharmaceutical Sector waste breakdown

	Packaging	Non-Packaging	Total
Cardboard	39.3%	0.0%	39.3%
Wood	19.4%	0.1%	19.5%
Metal	3.3%	8.6%	11.9%
Paper	0.1%	7.6%	7.6%
Organic	0.0%	7.1%	7.1%
Plastic	6.1%	0.2%	6.3%
Composites	3.3%	0.0%	3.3%
Glass	2.4%	0.0%	2.4%
Textiles	0.0%	1.6%	1.6%
Other	0.0%	0.9%	0.9%

Table H.10: Electronics Sector waste breakdown

	Packaging	Non-Packaging	Total
Cardboard	48.0%	0.2%	48.2%
Plastic	13.6%	0.6%	14.2%
Organic	0.0%	10.9%	10.9%
Paper	0.1%	10.2%	10.3%
Wood	7.1%	0.0%	7.1%
Other	1.5%	1.9%	3.4%
Composites	0.7%	2.5%	3.2%
Metal	0.5%	1.4%	1.9%
Glass	0.6%	0.0%	0.6%
Textiles	0.0%	0.2%	0.2%

Table H.11: SME (Electronics) Sector waste breakdown

	Packaging	Non-Packaging	Total
Paper	10.7%	22.8%	33.6%
Plastic	9.8%	18.2%	28.0%
Cardboard	15.2%	0.4%	15.6%
Other	0.0%	10.3%	10.3%
Organic	0.0%	5.9%	5.9%
Textiles	0.0%	3.3%	3.3%
Composite	1.2%	0.7%	1.9%
Metals	0.7%	0.4%	1.1%
Wood	0.0%	0.4%	0.4%
Glass	0.0%	0.0%	0.0%

Table H.12: Food & Beverage Sector waste breakdown

	Packaging	Non-Packaging	Total
Plastic	25.6%	0.6%	26.3%
Paper	0.3%	24.0%	24.2%
Metals	0.9%	14.6%	15.5%
Organic	0.0%	13.3%	13.3%
Cardboard	7.3%	0.1%	7.4%
Wood	0.1%	6.6%	6.7%
Composite	1.9%	0.5%	2.4%
Glass	1.9%	0.0%	1.9%
Textiles	0.0%	1.2%	1.2%
Other	0.0%	1.2%	1.2%

Table H.13: Comparison of MS-7 and 2004 results for the financial sector

	MS-7-2000	AIB (without canteen)
Paper	88.0%	67.7%
Cardboard	1.1%	12.6%
Glass	0.1%	0.8%
Plastic	5.6%	14.4%
Metal	0.4%	0.6%
Organic	4.5%	2.0%
Textiles	0.0%	0.5%
Wood	0.0%	0.0%
Composites	0.0%	0.2%
Other	0.3%	1.2%

Table H.14: Comparison of Hotel survey results from MS-7 and the current study

	Jurys Hotel (%)	Jurys Inn (%)	Brandon Hotel (%)	Carrigaline Court Hotel (%)
Food waste	49.2	36.7	53.5	45.8
Glass	13.4	11.4	12.0	21.5
Cardboard	7.5	8.9	7.8	7.5
Office Paper	4.6	5.5	2.7	1.3
Cooking Oil	1.3	4.3	5.9	4.0
Plastic	1.2	2.7	3.9	4.6
Aluminium and Tin Cans	0.5	2.3	2.3	1.1
Newspaper/ Mags	-	1.7	2.2	4.8
Tissue Paper	-	-	4.9	4.7
Mixed Waste	22.3	26.5	4.8	4.7

Table H.15: Comparison of Restaurant survey results from MS-7 and the current study

	Jacobs (%)	MS – 7 (average) (%)
Food Waste	46.4%	36.8%
Glass	24.4%	0.3%
Cardboard	11.2%	20.4%
Paper	5.2%	10.2%
Plastic	4.8%	12.8%
Vegetable Oil	2.2%	9.1%
Wood	2.0%	0.0%
Metal	0.9%	0.0%
Composites	0.4%	6.0%
Textiles	0.3%	4.4%

APPENDIX I

Persons in Employment (International Labour Organisation) Classified by NACE Economic Sector

Persons in employment(ILO) classified by NACE economic sector

NACE economic sector	2003q3	QNHS	2004q3
01 Agriculture	116.5		114.6
02 Forestry	2.3		2.2
05 Fishing	2.6		3
10 Mining of coal, lignite, peat	1.7		2.3
11 Crude petroleum	0.3		0.5
13 Mining of metal ores	1.4		0.4
14 Other mining and quarrying	3.3		3.4
15 Manufacture of food products and beverages	53.5		54.4
16 Manufacture of tobacco products	0.8		0.4
17 Manufacture of textiles	5.9		4.3
18 Manufacture of apparel	4.9		4.4
19 Tanning, etc	0.7		0.7
20 Manufacture of wood products excl. furniture	7.7		8
21 Manufacture of pulp, paper etc.	4.1		2.9
22 Publishing, printing, recorded media	20.5		19
23 Manufacture of coke etc.	0.5		1.3
24 Manufacture of chemicals / chem products	32.4		36.6
25 Manufacture of rubber and plastic products	9.4		9.4
26 Manufacture of non-metallic mineral products	14.8		14
27 Manufacture of basic metals	4.3		7.2
28 Fab. metal products excl machinery	23.7		18.3
29 Mfr. of machinery / equipment nec	12.7		11.1
30 Mfr. of office machinery / computers	17.1		19.9
31 Mfr. of electrical machinery / apparatus	8.7		10.7
32 Mfr. radio, tele, comm equipment	11.7		7.5
33 Mfr. medical, precision, optical etc.	24		24.7
34 Mfr. vehicles, trailers etc	3.5		5.2
35 Mfr other transport equipment	6.3		5
36 Furniture, manufacturing nec	18		19.3
37 Recycling	1.7		1.1
40 Electricity, gas, steam, hot water	13		13
41 Collection, purification, distr. of water	1		0.7
45 Construction	200.1		221.7
50 Sale, maintenance, repair of vehicles, fuel	37		40.2
51 Wholesaling excl, motor vehicles	47.6		48.3
52 Retailing except motor, repair of personal goods	176.4		181.6
55 Hotels / restaurants	123.7		116.1
60 Land transport, transport via pipelines	49.5		55.4
61 Water transport	3.6		4.4
62 Air transport	8.2		6.9
63 Supporting transport activities, travel agents	18.8		18.1
64 Post / telecommunications	32.7		29.9
65 Finance, excl. insurance / pensions	50.6		42.2
66 Insurance / pensions excl. social security	19.8		20.3
67 Auxiliary to financial intermediation	6.4		19.6
70 Real estate	8		7.2
71 Leasing...	6.3		9.7
72 Computers and related...	32.6		32.5
73 Research and development	2.2		2.7
74 Other business activities	104.7		108.9
75 PAD, social security	93.8		93.5
80 Education	110.1		112.3
85 Health and social work	173.8		182.1
90 Sewage etc.	3.4		5.9
91 Membership organisations	14.2		14.4
92 Recreation, culture, sport	41		41.4
93 Other services	27.5		37
95 Private households with employees	7.5		6.3
99 Diplomatic missions, etc.	0.5		0.3
88 Other and not stated	7.1		9.1
Total	**1,836.40**		**1,893.60**

Note: Data may be subject to future revision.

Note: Data may also be subject to sampling or other survey errors, which are greater in respect of smaller values and estimates of change.

Reference period: Q1: Dec-Feb, Q2: Mar-May, Q3: Jun-Aug, Q4: Sep-Nov.

Source: Quarterly National Household Survey, Central Statistics Office, Ireland.

APPENDIX J

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