

**The WEEE Directive in Ireland:
Information Flows and Compliance Control**

By

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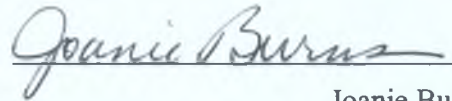
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DECLARATION

I hereby declare that, unless otherwise stated, the work included in this dissertation is my own and that it has not been submitted previously to any other University, college or academic institution.

A handwritten signature in black ink that reads "Joanie Burns". The signature is written in a cursive style and is positioned above a horizontal line.

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August 2005

ABSTRACT

The introduction of Council Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) marked the end of a long and complex process aimed at putting in place legislation to manage WEEE, one of eight priority waste streams identified by the European Union. Although the legislation is based on the premise of producer responsibility, many of the WEEE Directive's provisions will have a downstream impact on other parties or individuals including commercial retailers, the waste management industry and Government representatives at the local, regional and National levels.

The Directive requires Member States to take the necessary measures to ensure a minimum rate of separate collection of WEEE from private households and to ensure all WEEE is collected separately and managed in an environmentally sound manner. To this end, Member States must ensure producers meet specific targets for recovery and component, material and substance reuse and recycling. In order to calculate targets as well as track implementation generally, information on the quantities and categories of electrical and electronic equipment put on the market and WEEE collected and reused, recycled and recovered must be compiled and reported on a periodic basis. This is complicated by other provisions contained in the Directive, including the distinction of ten different categories of WEEE and different financing provisions depending on whether the WEEE originates from private households.

The purpose of this thesis was to examine the information, record-keeping and reporting requirements associated with the pending implementation of the WEEE Directive in Ireland. A number of important, if not critical considerations in the establishment of an effective WEEE reporting system have been identified, including several potentials for errors, omissions or duplications. Recommendations are provided to address some of the issues identified, as are suggestions for further work, including collective consideration of certain issues by relevant stakeholders.

In light of the above, a relatively simple, albeit standardised regulatory reporting system is recommended. Attention should be focused on making and continuing improvements to existing waste statistics and the associated reporting systems and to increasing awareness of the WEEE Directive and waste reporting requirements, generally. Having a centralised reporting system and limiting the number of categories of WEEE for which detailed monitoring is required would greatly facilitate the compilation of data, although sampling exercises and compositional surveys would still be necessary. This requires the active engagement of public and private sector stakeholders at a National level.

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LIST OF ACCRONYMS AND ABBREVIATIONS

CA	Civic Amenity
CFC	Chlorofluorocarbon
CRT	Cathode ray tube
CPU	Central processing unit
DEFRA	Department of Environment, Food and Rural Affairs
EEE	Electrical and electronic equipment
EMAS	Eco-Management Audit Scheme
EMS	Environmental Management System
EPA	Environmental Protection Agency
EWC	European Waste Catalogue
ICER	Industry Council for Electronic Equipment Recycling
ISO	International Standards Organisation
IT	Information technology
ODS	Ozone depleting substance
OHAS	Occupational Health and Safety
WEEE	Waste electrical and electronic equipment

The WEEE Directive in Ireland:

Information Flows and Compliance Control

1.0 INTRODUCTION

In 1990 the European Commission began to promote the concept of prioritising waste streams on the basis of the environmental impacts of the waste being created. Following on from this waste electrical and electronic equipment (WEEE) is mentioned in the EU's Fifth Environment Action Programme as a target area to be regulated, with particular reference to the application of the principles of prevention, recovery and safe disposal of waste. In a series of communications relating to prevention and recycling of waste, sustainable use of natural resources and integrated product policy (European Commission, 2003*a,b,c*) the Sixth Environment Action Programme further stresses the importance of a more holistic approach to waste management.

1.1 The WEEE Directive

The Commission initiated work on developing a Directive on WEEE in 1997. Three years later, on 13 February 2003 the European Directive on waste electrical and electronic equipment (WEEE)¹ entered into force. Member States were to have brought into force the laws, regulations and administrative provisions necessary to comply with the Directive by 13 August 2004. The main aims of the Directive include:

- the prevention of waste from EEE;
- reuse, recycling and recovery of WEEE in order to reduce the amounts disposed; and
- improved environmental performance of all operations involved in the life cycle of EEE.

The Directive covers ten categories of EEE. These are set out in Annex 1A of the Directive and are listed in Table 1.1 below.

¹ Council Directive 2002/96/EC on waste electrical and electronic equipment; OJ L 37, 13.02.2003, p. 24

Table 1.1

Categories of EEE covered by the WEEE Directive

1. Large household appliances
2. Small household appliances
3. IT & telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools
7. Toys, leisure and sports equipment
8. Medical Devices
9. Monitoring and control instruments
10. Automatic dispensers

A second annex to the Directive (1B) provides a fairly lengthy, though not inclusive list of products falling under the ten categories. The legal basis of the Directive (Article 175 of the Treaty Establishing the European Community) enables Member States to go beyond the scope of the Directive, including expanding the list of products to which the legislation applies in their National territory.

Key provisions of the WEEE Directive are listed in Table 1.2 below. Importantly, certain provisions of the Directive can be implemented by means of agreements between the competent authorities and the economic sectors concerned, provided the fundamental requirements of the Directive are met.

Table 1.2
Key provisions of the WEEE Directive

Producer responsibility	Producers must take the responsibility for managing waste from their products. To ensure obligations are met on a fair and proportionate basis, Member States must establish a Register of Producers. This will also facilitate information and reporting requirements.
Collection	Systems must be established to ensure separate collection so that users can return their WEEE free of charge. The Directive includes provisions for the collection of household WEEE through a network of public collection facilities and one-for-one retailer take-back. For so-called business-to-business (B2B) WEEE, collection must be provided by producers or third parties acting on their behalf when new equipment is being purchased. End users/last holders may be responsible if the WEEE is not being replaced with new products.
Treatment	Member States must ensure producers set up systems to provide for the treatment of WEEE and that they meet specified recycling and recovery targets. Minimum quality standards may be set and treatment plants must be appropriately permitted in accordance with existing waste legislation, namely, the Waste Framework Directive. ²
Financing	For the majority of WEEE, producers must provide financing for collection, treatment, and environmentally sound disposal. The introductory paragraphs to the Directive stress that financing schemes can and should contribute to high collection rates as well as to the implementation of producer responsibility. The financing provisions distinguish between household and B2B WEEE and, as noted above there are circumstances where the end user/final holder of B2B WEEE may be responsible for these costs.
Information	The Directive provides that users should be informed regarding their role, with a view to facilitating high rates of collection and recovery of WEEE.

² Council Directive 75/442/EC on waste (OJ L 194, 25.07.1975, p. 39) as amended by Council Directive 91/156/EC (OJ L 78, 26.03.1991, p. 32).

1.1.1 Targets and reporting requirements

Article 5(5) of the Directive requires Member States to take the necessary measures to ensure that a minimum rate of separate collection of four kilograms on average per inhabitant per year of WEEE from private households is reached. There are further provisions in Article 5(3) to ensure B2B WEEE is also collected separately. Member States must also ensure producers meet specific targets for recovery and component, material and substance reuse and recycling. Targets are expressed based on the ten products categories, as summarised in Table 1.3 below.

Table 1.3
Article 7(2) of the WEEE Directive: treatment and recovery targets

Categories 1 and 10 (large household appliances and automatic dispensers)	80% recovery 75% re-use and recycling
Category 3 (IT and telecommunications)	75% recovery 65% reuse and recycling
All other categories (e.g. small appliances, lighting, toys, tools, etc.), with the exception of Category 8 (medical devices)	70% recovery 50% re-use and recycling
Gas discharge lamps	80% reuse and recycling

In order to calculate targets as well as track implementation generally, information on the quantities and categories of electrical and electronic equipment put on the market and WEEE collected and reused, recycled and recovered (including that which is exported) must be provided to the Commission on a two yearly basis. Specific provisions pertaining to record keeping and reporting include the following:

Article 7 (3): Member States shall ensure that, for the purpose of calculating these targets, producers or third parties acting on their behalf keep records on the mass of WEEE, their components, materials or substances when entering (input) and leaving (output) the treatment facility and/or when entering (input) the recovery or recycling facility.

Article 12 (1): Member States shall draw up a register of producers and collect information, including substantiated estimates, on an annual basis on the quantities and categories of electrical and electronic equipment put on their market, collected through all routes, reused, recycled within the Member States, and on collected waste exported, by weight or, if this is not possible, by numbers.

It is important to note the distinction made in Article 7(3) between a treatment facility and a recovery or recycling facility. Based on other provisions of the Directive, in particular minimum treatment requirements specified in Article 6(1) and Annex II, the former would generally apply to facilities where basic dismantling and disassembly take place, whereas the latter would pertain to more complex facilities where materials and components arising from treatment facilities are processed and/or reprocessed.

Article 7(4) further stipulates that new targets shall be established by December 2008, including, as appropriate, for the reuse of whole appliances and for the products falling under Category 8.

1.1.2 Stakeholders

Based on the provisions made in the Directive, key stakeholders and some of the primary responsibilities are summarised in Table 1.4 below.

Table 1.4
Key stakeholders and primary responsibilities

Member States	<p>Ensuring adequate collection facilities</p> <p>Collection targets</p> <p>Establishing a Register of Producers</p> <p>Oversight of treatment e.g., monitoring, permitting, possible standards</p>
Producers	<p>Collection from central collection points and in many cases from users other than households</p> <p>Treatment, including making appropriate arrangements, ensuring targets are met and financing</p> <p>Provision of information regarding quantities of EEE placed on the market and product information to consumers and recyclers</p>
Distributors/ Retailers	<p>Take back of WEEE on purchase of a similar item</p>
Treatment operators	<p>Appropriate practices including specified storage, handling and pre-treatment requirements and compliance with other relevant legislation pertaining to e.g. pollution prevention and waste authorisations</p>

1.1.3 Irish Stakeholders

In February 2003 the Irish Government established a taskforce to develop recommendations and proposals for implementing the WEEE Directive; in particular, ensuring producer responsibility for WEEE. The taskforce comprised what are viewed as key stakeholders from the public and private sectors. Looking at the parties and interests represented (Table 1.5), it is clear that the implications of the WEEE Directive are extremely broad and crosscutting. A draft report prepared on behalf of the taskforce indicates the successful implementation of the Directive will pose a major challenge not only to the main (private sector) actors in the EEE industry, but also to central and local Government, as well as the general public (DEHLG, 2004a).

Table 1.5
The Irish WEEE Taskforce

Taskforce Representative(s)	Examples of parties/interests represented
The Irish Business and Employers Confederation (IBEC)	Private companies, many of whom supply to and/or distribute EEE
Information and Communications Technology (ICT) Ireland	The information and communications technologies sector including equipment manufacturers and component suppliers
The Irish Waste Management Association	Waste haulers, treatment operators, privately run waste collection facilities
Retail Ireland	Commercial distributors of EEE
The Departments of Environment, Heritage and Local Government and Enterprise, Trade and Employment	Government bodies with responsibilities for policies and legislation relating to, <i>inter alia</i> , the environment, the provision of infrastructure and certain public services and the oversight of private industry, including matters relating to competition
The Environmental Protection Agency	Ireland's primary environmental enforcement authority and the body responsible for providing National reports on areas such as waste generation and management
Representatives nominated by the City and County Managers Association (CCMA)	Local Authorities

In addition, the Department of Environment Northern Ireland was invited to participate in the taskforce, with a view to identifying any synergies with the United Kingdom's and/or Northern Ireland's implementation of the WEEE Directive and opportunities for cross-boarder cooperation.

1.1.4 Other potentially affected parties

The Directive's division of responsibilities between the different stakeholders is at times unclear (Orgalime, 2003) and is in some cases deliberately left open to allow Member States to adapt implementation measures for their particular situations. Examples of the latter can be seen throughout the Directive; many provisions are presented such that "Member States shall ensure" systems are put in place, measures are taken, attention is given, etc. In most cases these include reference to at least one other stakeholder, e.g., "Member States shall ensure that producers or third parties acting on their behalf..." This, along with provisions for collective cooperation between producers or other alternative arrangements, introduces at least the potential for parties other than what might be considered key stakeholders to play a key role in implementing the legislation and would appear to follow the model of existing systems for WEEE in other European Countries. Many of the existing WEEE schemes in Europe are operated by trade associations, third-party companies or membership organisations established by or in cooperation with the Government (Wilkinson and Duffy, 2003).

Many of the Directive's provisions are likely to have a downstream impact on parties or individuals who, again, may not be considered key stakeholders. For example, manufacturers or suppliers of EEE components would not be considered "producers" as defined in the Directive; however, the implications of the actions and responsibilities of the producers they supply could have an effect on their operations. This is demonstrated in the provisions relating to information requirements (Article 11 of the Directive); producers must provide reuse and treatment information and identify components and materials, including the location of certain hazardous materials. Clearly, much of this information will come from EEE components suppliers. Similarly, while producers are ultimately responsible for the treatment targets set out in the Directive, the information required to determine whether this has been accomplished is likely to come from treatment operators (Orgalime, 2003 and pers. comm., B. Meaney, 2004). As this Dissertation intends to demonstrate, there are many options for compiling, managing and reporting this information, with likely involvement of both public and private sector operators.

Despite the far-reaching implications of the WEEE Directive, a 2001 survey of 238 companies in the Irish EEE sector notes that a significant number (23%) of those surveyed were unaware of the forthcoming WEEE Directive and a further 34% knew the legislation was forthcoming but were unaware of any details (Wilkinson *et al*, 2002). This was cited as a matter of concern, particularly as there appeared to be little preparation for the Directive including, presumably, requisite record keeping and reporting systems. The survey also found that companies in the EEE industry had relatively poor communication on environmental information through the product chain. Again, the presumption is that this includes information on end of life products.

1.2 Aims and objectives of this study

This Dissertation examines the information, record-keeping and reporting requirements associated with the pending implementation of the WEEE Directive in Ireland. The primary aims of this work are:

- to evaluate potential means of and methods for reporting information pertaining to the collection and management of WEEE in Ireland, including progress towards achieving targets for recycling and recovery;
- to identify critical success factors and barriers to the effective, consistent and accurate reporting by stakeholders to the relevant authorities, as well as on a national basis, to the European Commission.

In order to achieve this, current practice and awareness levels of the subject were assessed, including:

- identifying potential sources of information and key stakeholders;
- gaining an understanding of waste and material flows associated with the collection and management of WEEE in Ireland;
- examination of current methods used by waste operators to monitor performance and track data – this includes private waste management companies, collective waste management organisations/schemes and regulatory authorities both in Ireland and in other countries;
- evaluation of experience gained managing other, specific waste streams such as packaging and hazardous waste;
- developing conceptual models and identifying essential criteria for a WEEE reporting system in Ireland, including highlighting important monitoring interfaces.

2.0 LITERATURE REVIEW

A literature review was undertaken to further examine the implications of the Directive's provisions relating specifically to record-keeping and reporting, as well as other provisions in the Directive that may have indirect effects on record keeping and reporting. In addition, existing systems and current practice for WEEE and other wastes management, including associated record keeping and reporting were examined. Following on from this, options for reporting and compliance control for the WEEE Directive in Ireland are explored and some preliminary conclusions are drawn. These serve as the basis for further work, as described in subsequent sections of this report.

2.1 Provisions with direct implications for record-keeping and reporting

2.1.1 Targets

On foot of plans for legislation regarding the management of WEEE, the European Commission published a Working Paper on the management of Waste from Electrical and Electronic Equipment (European Commission, 1997). The paper outlines various issues and considerations and presents preliminary proposals for WEEE collection targets.

2.1.1.1 Collection Targets

In the Commission's Working Paper, collection targets are expressed as a percentage of the total amount of waste arising in a given year. Acknowledging the variability of product life expectancies as well as variations in consumer use/consumption patterns, different collection rates are suggested for different product types/categories.

Following on from the Commission's Working Paper, a study was carried out to examine the feasibility of establishing collection targets, with a focus on the practicability of such targets in terms of future enforcement (Lohse *et al*, 1998). The study concludes that any attempt to measure potential WEEE arisings will be faced with great difficulty. Similarly, a more recent report by the European Topic Centre on Waste (Crowe *et al*, 2003) summarises the main findings of a 1997-2000 study aimed at the development of models and tools for the projection of WEEE amounts, dangerous substances contained in WEEE and the resulting emissions from waste treatment. This study concludes that projections or forecasts of potential WEEE arisings are simply too unreliable to be of any value. As a result of the Commission's and Member

States' evaluations, the targets in the WEEE Directive were ultimately based largely on the results of existing WEEE take-back/recycling systems (Stevens, 2002).

A brief comparison of the proposals in the Commission's Working Paper against those ultimately set out in the WEEE Directive highlights some interesting, very distinct differences in the approach taken and allows one to draw some conclusions as to why the proposals may have been changed or omitted during the later stages of legislative development. For example, if, as suggested in the Working Paper, collection targets were based on a proportion of total waste arisings in a given year, Member States would need to have fairly precise information, not only on how much WEEE was collected but also on how much was making it into the municipal waste stream, including a characterisation of same. Clearly, this would have resulted in an even greater degree of research, information gathering and record keeping than is required with the fixed collection target of 4kg per person per year that was ultimately established.

While analyses of the amount of WEEE in the domestic waste stream does not seem to be suited to routine monitoring due to the level of effort and the significant margin of error, the 1998 feasibility study concludes that such analysis does have a potential value for crosschecking the success of any WEEE collection in a qualitative way (Lohse *et al*, 1998). In light of the extent and complexity of the information requirements associated with the WEEE Directive, crosschecking would indeed appear to be an important element of any reporting system.

2.1.1.2 Treatment Targets

As part of the 1997-2000 study by the European Topic Centre on Waste, which examined dangerous substances in and emissions from the treatment of WEEE (Crowe *et al*, 2003), existing WEEE schemes in five countries were examined. While all of these had regulations or rules for the treatment of WEEE, none had established monitoring systems that provided sufficient information to describe a representative 'treatment scheme.' As such, sophisticated 'state of the art' recycling technologies and, presumably, equally sophisticated monitoring systems were universally applied to specific appliances in each country, with a view to gaining a better understanding of the effectiveness and outcomes (including negative effects) of the technology applied. Notably, recycling quotas (ratio of kg recycled material per average weight of appliance) observed in the study showed that targets for reuse and recycling in the then-proposed WEEE directive were achievable, again using these 'state of the art' technologies, for all but personal computers.

This study highlights three important issues: 1) the level of sophistication of the technology that may be required to achieve the targets set out in the WEEE Directive; 2) the degree of monitoring that may be required to ascertain this; and 3) the variability that can occur between different countries, systems and/or technologies in terms of monitoring and/or reporting outcomes (even with universal application of the same technologies, performance varied and figures from each of the countries involved were ultimately averaged).

Following on from this, if the targets in the WEEE Directive can only be met using state of the art technology, one has to question whether it is realistic to expect they will indeed be met, at least in the initial stages of implementation of the WEEE Directive. 'State of the art' would imply this is not necessarily the most common – and therefore the most widely available technology. Furthermore, even if the technology is technically available, it may be inaccessible in terms of the associated cost. Similarly, costs associated with an intensive monitoring regime – be it for sophisticated or relatively simple treatment technologies may be difficult to justify; measurement of results may need to be allowed enough margin of error that, should targets fail to be met by a small enough margin, this will still be considered as achieving the objectives of the Directive. Similarly, the use of averages and/or assumptions may be a more reasonable approach than close and constant measurement.

2.1.2 Monitoring and Compliance Control

Article 7 of the WEEE Directive includes provisions for the Commission to establish rules for monitoring compliance and formats for providing information. These were to be developed in cooperation with the Committee for the Adaptation to the Scientific and Technical Progress of EC Legislation (TAC), a technical committee of Member State representatives established under the waste framework Directive. A Decision on compliance monitoring and data formats has been agreed by the TAC (meeting of the TAC, 2004b). The decision has yet to be published in the Official Journal of the European Commission; however, based on the draft Decision issued by the Commission (European Commission, 2004a), reporting is likely to be in the form of two tables providing figures on 1) WEEE collected and exported and 2) rates of recovery, recycling and reuse. The tables, as presented in the draft Decision are reproduced in Appendix I.

The Commission's Directorate General for Environmental matters (DG-Env) has also prepared a draft reporting protocol (European Commission, 2004b), which, it is intended, may be used by Member States to determine the figures that will be reported in the aforementioned tables. It is important to note that use of the protocol would not be required; however, Article 3 of the

Decision on compliance monitoring and data formats indicates that Member States must provide the Commission with a detailed description of how the data have been compiled and give an explanation of estimates and methodology used and, if and when finalised, use of the protocol would presumably be considered as an acceptable methodology for this purpose. Significantly, while the Decision on compliance monitoring and data formats has been agreed by Member State representatives, the draft reporting protocol remains to be finalised or agreed.

The draft reporting protocol is based largely on a report prepared for the Dutch Ministry of Spatial Planning, Housing and the Environment, which describes activities needed to obtain traceable records for reporting final levels of recycling and recovery of WEEE by treatment operators (Ansems and van Leeuwen, 2003). The issues addressed in the report, outlined below, once again highlight the complex nature of the waste stream and monitoring.

Table 2.1
Monitoring protocol for the treatment of WEEE
Issues examined (Source: Ansems and van Leeuwen, 2003)

- Collection of different product categories from various sources i.e., from more than one producer or collective scheme
- Dismantling or pre-treatment activities
- The treatment of several product categories and/or with other waste streams
- Activities undertaken by third parties
- Final treatment of specific (material) fractions
- Determination of the quantity/composition of the (material) fractions obtained

Random sampling is suggested as a method for estimating recycling and recovery rates, although the report is somewhat inconclusive as regards the size of the samples. A sample size of 5% is suggested for “highly heterogeneous” streams and the report concludes that this must ultimately be considered from case to case.

The heterogeneous nature of WEEE and the way it is treated was once again exemplified in a tender process undertaken by a local authority involved in a collection trials pilot project in Ireland (Wilkinson and Duffy, 2003). Tenders received for the collection and management of WEEE varied widely and a number of assumptions had to be made in order to assess them, including average item weights, average composition of one tonne of WEEE, weight of an

average load and predicted collection quantity. These assumptions were tolerated by the local authority in the interest of selecting a contractor in a timely and, to the extent possible reasonable manner. Whether a similar degree of tolerance could be afforded in future, including any assumptions on the recycling and recovery of WEEE is unclear; not only does this carry with it the risk of under- or overestimating performance with respect to achieving targets, costs will be met by a large number of producers (as distinct from a relatively few number of local authorities) and each will want to know they are paying only for their “fair share.”

The studies discussed above as well as the aforementioned discussions at the European level demonstrate the importance of pragmatism in setting down requirements for monitoring and compliance reporting. The value of robust, detailed data must be balanced against what is actually necessary to achieve the fundamental objective of the Directive: a diversion away from landfill and the environmentally sound management of WEEE.

2.2 Other provisions affecting record-keeping and reporting

Although the reporting requirements for the WEEE Directive and the two data tables for doing this (Appendix I) appear to be relatively straight forward, gathering the data necessary to complete the tables is complicated by a number of factors, including those relating to other provisions in the Directive. Examples of this are described below.

2.2.1 Methods of WEEE collection

Article 5 of the WEEE Directive requires retailers and other distributors of EEE to accept household WEEE free of charge when a consumer purchases an equivalent item. Retailers may fulfil their obligations through various means, for example in-store collection, collection upon delivery of a new product, postal return service (e.g. for mobile phones) or third-party arrangements.

The potential for a variety of approaches and/or systems to facilitate retailer collection creates an equal potential for data gaps. Findings of a 1998 study conducted on behalf of the European Commission (Lohse *et al*, 1998) found that WEEE collected at such venues may actually be missed by reporting systems altogether because retailers are either not aware of or are deliberately circumventing the National or otherwise centrally organised systems for collection, management and associated documentation of WEEE.

The draft report of the Irish Government's taskforce on WEEE states that accurate verification of quantities collected by retailers must be guaranteed and suggests licensing or permitting issues, amongst others, require consideration (DEHLG, 2004a). Importantly, an Irish WEEE collection trials project (Wilkinson and Duffy, 2003) conducted by the Clean Technology Centre (CTC) found a general apathy in the retail sector towards the (one-for-one take back) requirements of the WEEE Directive and suggested urgent consultation with the retail sector in this regard. Based on this, it would appear this is an area that will require specific attention in terms of monitoring and data collection.

Local authority and retailer collection are only two of myriad ways in which household WEEE might be collected. Workplace collection trials in the Lothian region of Scotland and in Bilbao, Spain in the 1990s yielded high quantities of WEEE (Wilkinson and Duffy, 2003). Similarly, collection events organised by private waste or EEE companies in Ireland have also generated substantial amounts of WEEE. For example, recent event held by a major producer of IT

equipment in Ireland resulted in the collection of approximately 18-20 tonnes of WEEE, comprising mainly of personal computers, in a single day (pers. comm., A. O'Dea, 2005).

2.2.2 Household vs. B2B WEEE

The distinction between household and B2B WEEE further complicates the issue of how and where WEEE is collected. As previously indicated, arrangements for collection of B2B WEEE are largely left for producers and/or end users to arrange. This would imply that collection might be done on a less systematic, case-by-case basis. Furthermore, household WEEE must be accounted for in the context of National collection targets, which pertains only to household WEEE. However, recovery and recycling targets apply to all separately collected WEEE regardless of how or by whom it is collected.

A study examining statistics on WEEE in the Nordic Countries (Grünberger *et al*, 2002) recommends that for the purposes of providing comparable statistics on WEEE in the future, the distinction between household and B2B WEEE should be removed altogether. The report justifies this by stating that such a change is necessary to make it possible to monitor achievement of the goals of the Directive. The study notes that it is difficult to obtain statistics of good quality for electrical and electronic waste reported separately for household and small companies when the same type of waste can also come from other activities. While this may be true for the current situation, making this distinction in the Directive will likely drive improved, differentiated monitoring in the future and will enable both user groups (householders and businesses) to be held more closely accountable for their respective shares of WEEE. Appropriately, the Directive also enables different legislative instruments to be used for the different user groups; a collection target for household WEEE and a market incentive/corporate stewardship approach for B2B WEEE.

2.2.3 New vs. historic WEEE

The WEEE Directive makes a distinction between WEEE from products placed on the market before 13 August 2004 – so-called “historical” WEEE and that from products placed on the market after this date, or “new” WEEE. For historical WEEE, all producers existing on the market when the costs of managing the WEEE occur must contribute to the financing of one or more systems established for the treatment of that waste. The level of contribution from each producer will be in proportion to their respective share of the market.

For new WEEE, each producer is responsible for financing the operations (collection, treatment, recovery and environmentally sound disposal) related to the waste from his own products. The producer can, however, choose to fulfil these obligations for new WEEE by joining a collective scheme. This would typically involve removing the “own products” financial responsibility to a certain extent in the interest of facilitating collection and treatment and could go further to remove the distinction between new and historic WEEE altogether.

The distinction between new and historical WEEE is intended to give maximum effect to the concept of producer responsibility, with each producer responsible for financing the management of waste from his or her own products and to prevent the costs for managing “orphan” WEEE (that for which a responsible producer cannot be identified or no longer exists) from falling on society or a limited number of producers. This creates at least the potential for two additional sub-sets of WEEE waste streams, namely, new WEEE and historic WEEE. Furthermore, even though all producers must finance historical waste collectively, this does not necessarily preclude individual or collective groups of producers from choosing to manage their proportionate share of the historic WEEE in different ways, hence creating the potential for varying sources and formats of data to be generated.

None of the existing schemes for managing WEEE include this concept of new and historical WEEE (CECED, 2002, Grünberger *et al*, 2002, Wilkinson and Duffy, 2003) and several Member States’ proposals for implementing the Directive largely ignore this distinction or in some cases may prevent it from being made at all (Perchards, 2004a).

2.2.4 Collective or individual responsibility

Whether a producer participates in a collective scheme has implications with respect to many other critically important elements of the Directive. In the context of data and compliance monitoring, this will influence how and from whom WEEE is collected, which treatment operators/technologies are used to manage WEEE and ultimately how information is gathered and reported. Producers complying on an individual basis in Ireland will be solely responsible for ensuring their obligations are met, including management of their share of historical waste (based on current market share), achieving the rates of recycling and recovery necessary to meet the treatment targets set out in Article 7 of the Directive and the associated record-keeping and regulatory reporting (DEHLG, 2004b). Collective schemes, however, would organise much of this on behalf of a group of producers, enabling a more centralised system of arranging for and

documenting the collection and management of WEEE. Regardless of the chosen approach, documentation and reporting will need to be to the satisfaction of the competent authorities.

2.2.5 WEEE categories

A study conducted on behalf of the European Commission (Lohse *et al*, 1998) includes a survey of existing WEEE schemes and pilot projects. All of the concepts surveyed defined specific products, categories or sub-groups of WEEE to which the associated legislation or schemes applies. However, when attempts were made to present collection yields in a synoptical way, this had to be heavily qualified due to the variations in the systems and the scopes/products to which they applied. It also identified anomalies and problems within the schemes, for example items to which legislation applied could be excluded from collection schemes while other, non-regulated items were occasionally collected, hence, skewing the numbers. The study concluded that standardisation of sub-classes covered by the forthcoming Directive was required and highlighted the importance of information and awareness, for example:

“Sub-classes must be easily understandable for the consumers and at the same time make sense with respect to waste management practices.”

“If private households are requested to separately collect additional sub-classes of WEEE, these [...] must be clearly defined in an easily understandable way, based on the need for separate treatment during collection.”

Similar conclusions were drawn in a one-year pilot project on WEEE collection involving four Irish local authorities (Wilkinson and Duffy, 2003). In order to provide direct relevance to future reporting requirements of the WEEE Directive, the project divided monitoring requirements for test sites into the ten product categories distinguished in the Directive, although medical devices (Category 8, as provided in the WEEE Directive), monitoring and control instruments (Category 9) and automatic dispensers (Category 10) were excluded, as they were generally considered to represent commercial (B2B) WEEE.

The collection trials project found that where collection facilities existed, poor and inconsistent records of collected equipment prevented an accurate assessment of collection rates. Examples cited included reporting by number of items only (and not by weight), variations in definitions of equipment categories and mixing collected items with other, non-WEEE items e.g. scrap metal. Recommendations to address these issues include a standardised national monitoring method and

a National database on quantities of WEEE collected at local authority collection sites in the time leading up to the (presumed) establishment of a National WEEE collection system.

The potential for confusion is not limited to consumers and end users. Industry sources partaking in a Europe-wide study on WEEE indicated that classification of items as dictated in the study was at times confusing (Crowe *et al*, 2003). This led to the conclusion that waste treatment operators may supply incorrect data. Similarly, a study of WEEE arisings in Scotland conducted on behalf of the Scottish Research Executive found that information on the compositional breakdown of WEEE arisings was incomplete or unavailable for some products, despite the fact that several different sources including retailers, manufacturers, materials recyclers and local authorities were consulted (Entec UK Ltd., 2001). Furthermore, based on the findings of WEEE collection trials in Ireland, placing a requirement on local authorities and hence, collection/recycling contractors to distinguish and categorise WEEE resulted in increased costs/greater administrative burden and in some cases a change in the contractor(s) used by the local authority to handle the WEEE (Wilkinson and Duffy, 2003).

The targets set out in Article 7(2) are grouped, with more than one category being subject to the same requirements for recovery and recycling. To a certain extent this acknowledges that certain items are likely to be treated together and/or using the same processes and technologies. However, it is necessary to consider other scenarios, regardless of how seemingly unlikely they are. For example, some small, metal-rich appliances falling under Category 2 of the Directive may be managed (e.g. shredded for metal recovery) along with large household appliances, which are Category 1. However, Category 2 products have targets of 70% recovery and 50% reuse/recycling, while Category 1 products have much higher targets of 80% recovery and 75% reuse/recycling. Under this scenario, the performance of each category, individually, will somehow need to be verified. Without this, it is theoretically possible that higher rates of performance for some products might be “diluted” by the co-treatment of lower-performing products or, conversely, products that on their own may not achieve required targets might be co-treated with other waste simply to bring the numbers up. Furthermore, the treatment targets pertain to all WEEE collected in Ireland. It is, however, highly unlikely that only one system, contractor or operator will be capturing and hence managing all of one category of WEEE for the entire country. Data from all sources will have to be averaged, prorated or otherwise amalgamated to derive single, national per-category figures.

2.3 Other factors affecting reporting

2.3.1 Methods of measurement in Ireland

As previously mentioned, the Irish WEEE collection trials project (Wilkinson and Duffy, 2003) highlighted the degree of variability in existing record-keeping practices used for WEEE. The data made available during the study (Table 2.2) indicates that some local authorities and/or contractors working on their behalf are using estimates or averages, while some monitor the number of items and still others monitor weight. The extent to which WEEE is segregated and categorised also varies.

Table 2.2

Local Authorities with WEEE monitoring data available (2003)

Source: *WEEE Collection Trials in Ireland* (Wilkinson and Duffy, 2003), Table 3-b

Authority	Number of facilities	WEEE collected	Monitored by:	Details
Clare	3	White goods	Number	Annual total for 4 categories of white goods
Cork Co.	3	All	Number & weight	CTC collection trials project
Galway Co.	2	All	Weight	Estimated average monthly combined tonnage
Kerry	5	White goods	Weight	Annual combined tonnage from all facilities
Kildare	1	All	Number & total weight	CTC collection trials project
Kilkenny	1	All	Weight	Monthly combined tonnage
Limerick City	1	White goods	Number	Annual total for 5 categories of white goods
Louth	1	All	Weight	Annual combined tonnage
Mayo	1	All	Number & total weight	CTC collection trials project
Meath	1	All	Weight	
Monahan	1	All	Weight	Annual combined tonnage
Tipperary NR	1	All	Number	Monthly numbers for 4 categories of white goods and 1 'other' category

In terms of source or on-site segregation, the draft report of the Irish Government's WEEE taskforce (DEHLG, 2004a) notes practical limitations with this. In particular, space constraints i.e., the design and storage capacity of civic amenity (CA) sites and staffing, both in terms of numbers and competence e.g. awareness regarding how collected WEEE should be segregated, counted, weighed or otherwise documented. Noting the variety of types of WEEE that exist, the draft taskforce report states:

This has implications for how it is collected and subsequently treated, recycled or otherwise dealt with, all of which have knock-on effects on matters such as financing and data monitoring/reporting. Whereas total segregation of WEEE is the optimum solution partial segregation may be the only practical option.

In this context, the taskforce identified the following six model categories of WEEE in order to facilitate discussions and the examination of practical issues associated with implementing the WEEE Directive:

Table 2.3

Model categories identified by the WEEE taskforce

1. Refrigerators and freezers
2. White goods
3. TVs and PC monitors
4. Fluorescent tubes and lighting equipment
5. ICT equipment
6. Other WEEE

The draft taskforce report indicates these are based to a large extent on how WEEE arising in Ireland is, and can reasonably be expected to be, managed in the near future.

Regardless of how or by whom monitoring is undertaken (e.g., by local authorities and/or by waste contractors), the Irish WEEE collection trials project (Wilkinson and Duffy, 2003) recommended that in all cases monitoring should be on a per item and weight per category basis, at least initially, to gain a better understanding of the types and quantities of WEEE arising and to establish baseline data.

2.3.2 Differing practices between Member States

Compliance monitoring and the format of information submitted to the European Commission must be in line with any requirements or specifications set out by the Commission and, to the extent possible, should be consistent with that of other Member States to enable comparability. Similarly, reporting systems must be to the satisfaction of Irish stakeholders, including responsible producers and competent authorities. This is important not only in terms of ensuring accuracy and reliability, but also in the interest of keeping administrative requirements reasonable.

Taking the above into consideration, results achieved by existing systems for WEEE have been calculated and reported in varying ways, often applying different definitions of recycling and recovery (Stevens, 2002 and FES, 2003). Ongoing evaluation of WEEE related measures and transposition plans in other Member States on behalf of the UK Government (Perchards, 2003 and Perchards 2004a, b) clearly reflects that plans are varied and sometimes significantly so. Several different compliance schemes are operating, have recently been set up or are proposed. Obligations for elements like collection and take-back are placed upon different stakeholders, stakeholder groups or in some cases the Government. The operation and oversight of various elements including compliance schemes and the Register of Producers will be by Government in some Member States, the private sector in others and a combination of both in still others. This variability will inevitably contribute to difficulties in comparing data between Member States.

The 2003 report examining a monitoring protocol for WEEE (Ansems and van Leeuwen, 2003) suggests that treatment operators could follow an agreed upon protocol and implies that information could be reported by operators to “implementing bodies,” in other words, collective schemes or other third parties acting on behalf of producers. However, in practice this will ultimately depend on how the WEEE Directive is implemented in a particular Member State and/or Member States’ existing reporting systems. For example, in Ireland the EPA generally obtains data directly from treatment operators using a combination of returns required as a condition of a waste license or permit (the latter of which is submitted via the permitting local authority) and an annual waste questionnaire. In future, individual compliers with the WEEE Directive i.e., those not participating in a collective scheme and the involvement of implementing bodies in compliance reporting will need to be considered, as the current system used in Ireland generally relies upon waste treatment operators and not producers or other parties that have no direct involvement in waste management. Waste statistics reporting systems in Ireland are discussed further in Section 2.4.4 below.

At a wider level, harmonisation of the implementation of EU Waste Legislation across the EU Member States is increasingly highlighted by the European institutions, most notably in the eighth introductory paragraph to the WEEE Directive:

(8) *The objective of improving the management of WEEE cannot be achieved effectively by Member States acting individually. In particular, different national applications of the producer responsibility principle may lead to substantial disparities in the financial burden on economic operators. Having different national policies on the management of WEEE hampers the effectiveness of recycling policies. For that reason the essential criteria should be laid down at Community level.*

Similarly, a recently adopted EU Regulation on waste statistics³ stresses the importance of regular statistics on the production and management of waste for the purposes of monitoring the implementation of waste policy, monitoring compliance with the principles of maximisation of recovery and safe disposal and comparability of results in waste statistics.

Issues regarding the comparability of waste statistics between EU Member States have been identified in several recent reports pertaining to WEEE (e.g., Grünberger *et al*, 2002; Stevels, 2002; Ansems and van Leeuwen, 2003). For example, a 2002 study of statistics on WEEE in the Nordic countries, the Netherlands and Switzerland (Grünberger *et al*, 2002) notes that while the Dutch statistics are based on five categories of WEEE and calculations are based on either cubic meters or number of pieces, the amounts of some categories in the Swedish system are calculated based on both the number of pieces and an average weight. Similarly, two reports published in the late-1990s examining EU Member States' data and statistics on packaging waste (PricewaterhouseCoopers, 1998 and 1999) draw the following conclusions:

- Exact data on the amount of waste, packaging waste and recycling is hard to get and ambiguous.
- Data on the amount of waste, packaging waste and recycling is not comparable between Member States.
- Packaging waste management systems vary in cost from country to country and have different scopes.

³ Council Regulation 2150/2002 on waste statistics. OJ L 332, 9.12.2002, p. 1.

- Data accuracy remains in question; industry figures for packaging placed on the market and recovered/recycled varies from official figures, important data is sometimes omitted because system boundaries have been improperly defined and imports and exports confound data issues.
- Benchmarks are required in order to monitor trends; to get these, no major changes can occur in data collection and reporting during the initial years of implementing a system
- The nature of measurements of use, recovery and recycling and the obvious inaccuracies and non-comparability raises questions regarding their value as monitoring tools for the implementation of a Directive on limiting environmental effects. Monitoring (as distinct from calculating) quantities of a particular waste stream in residual waste may present a better assessment of the benefits (or not) of regulation.

2.3.3 Lack of existing data/benchmarks

One of the aforementioned studies on packaging statistics concludes that benchmarks are required in order to establish trends (PricewaterhouseCoopers, 1999). However, as previously noted, data and statistics relating to WEEE are often inconsistent, unreliable and difficult to reconcile and a detailed calculation of the total amount of WEEE arising is almost impossible because of the complex aspects related to products and the production and consumption of EEE (Crowe *et al*, 2003).

The amount of WEEE generated in the EU in the late-1990s was estimated at 6.5-7.5 million tonnes per year (AEA Technology, 1996). Based on information from various studies on WEEE in Ireland, the amount generated here in 2001 was between 35,000 and 82,000 tonnes (Wilkinson *et al*, 2001a). The substantial range in these figures can be attributed in large part to the reliance on a variety of calculations and in many cases extrapolations to come up with estimates as opposed to regular, harmonised waste-related data at a National or European Community level. Similarly, in its 2001 Topic Report on WEEE, the Irish EPA points out that while a number of studies have attempted to estimate the potential quantity of WEEE arising in Europe, results continue to vary widely and comparisons of the studies are difficult because of the differing methods used and assumptions made (Wilkinson *et al*, 2001b).

The 2001 National Waste Database (Meaney *et al*, 2003) notes that the availability and scope of information has improved over the last number of years but that the quality of that information still remains relatively poor for a number of waste streams. This is not a problem unique to Ireland. For example, experience in the UK has shown that there are differences in what is measured and how it is measured by local authorities (Edwards, 2004). Some authorities include school waste in their overall domestic waste figures, which is what the UK authorities have intended, while others regard it as commercial waste. Others do not include street sweeping wastes in their domestic figures and it is estimated this could potentially represent as much as ten percent of total waste collected. One municipal services contractor in the UK suggests this is due to the fact that most authorities do not currently have the time or resource to accurately measure what is collected and what is recycled.

In light of continuing information gaps in information pertaining to the composition of household and commercial waste generally, the 2001 National Waste Database (Meaney *et al*, 2003) recommends local authorities carry out characterisation surveys. Whether and to what extent these might be applied to WEEE and to mixed WEEE in particular requires consideration, as this may be a partial solution or an alternative to counting, weighing or otherwise documenting WEEE on an item-by-item basis.

2.3.4 Commercial Sensitivity

In a review of existing WEEE collection systems in other countries (Wilkinson and Duffy, 2003), those undertaking the review observe that issues regarding the proprietary nature of information may present potential barriers to obtaining full or otherwise necessary information. This appears to be most relevant to information such as sales figures and the amount of product placed on the market but also has implications at the end of products' lives in terms of contracts and associated costs for WEEE management, treatment technologies and outlets for materials arising.

2.3.4.1 Sales figures and EEE placed on the market

The costs of managing historical WEEE must be met by all producers existing on the market when those costs arise, based on the producers' respective market shares. In order for this to happen, producers have to provide information regarding the amount of product they are placing or have placed on the market in a given time period. The total amount of EEE placed on the Irish

market during a particular reporting period must also be reported to the European Commission (Table 1, Appendix I). Information must be presented on the basis of the ten WEEE categories.

A study conducted on behalf of the European Environment Agency (EEA) between 1997-2000 found that in some countries production data is not published due to confidentiality (Crowe *et al*, 2003), making it impossible to calculate sales (i.e. products placed on the market). Ireland was one of the countries cited in this context. Similarly, in a report prepared on behalf of the Scottish Research Executive (Entec, 2001), comprehensive production information (i.e., EEE placed on the market) was not made available and production levels were therefore based on estimates of retail sales. This is unlikely be an acceptable method to producers in the context of the WEEE Directive, particularly with respect to determining market share. In particular, this method highlights two potential data gaps: 1) exports, which may not be directly reported by manufacturers but could possibly be discerned by comparing production data with retail data (i.e., amount produced – amount sold = amount exported); and 2) off-spec material, which the study considered as contributing to WEEE production. In the context of the WEEE Directive, the latter might be considered as orphan B2B waste.

Based on the findings of an Irish EPA report on WEEE in Ireland (Wilkinson *et al*, 2001b), it would appear that attempts to calculate sales using Government statistics should also be approached with caution. For example, statistics on production and foreign trade obtained from the Central Statistics Office (CSO) were found to be problematic. The report notes that the CSO suppresses some data in order to preserve confidentiality and suggests the only solution to this is to supplement the CSO statistics with information obtained directly from manufacturers. However, consistent with the findings of the EEA report, companies contacted by the EPA were not always forthcoming with production data.

The aforementioned study on behalf of the EEA points out that market research companies are noted for their knowledge of the area of activity and the expertise in compiling and assessing results (Crowe *et al*, 2003). Similarly, the Irish EPA have found data from market research companies to be more realistic, noting that these statistics are quoted widely and considered as industry standard (Wilkinson *et al*, 2001b). The market research firms cited by the EPA typically carried out surveys of a particular industry or sector e.g., consumer goods, computer vendors, etc. on a regular basis, as well as undertook market forecasting to, for example, estimate annual sales for the major markets of the world.

Based on what is presented above, poor or incomplete data – if this is all that is available – should not be disregarded altogether. Rather, a degree of awareness or familiarity with the

information and how it is compiled is required in order to understand the quality and reliability of that information, any limitations associated with the information and to enable an appropriate amount of scrutiny and crosschecking. In the case of sales data, a combination of different sources for different EEE items appears to be the most appropriate way to establish representative figures.

2.3.4.2 WEEE management, treatment technologies and outlets for materials arising

One also cannot rule out the possibility that the choice of technologies or processes used to manage WEEE and the levels of performance they are able to achieve may also be subject to potential limitations due to issues of confidentiality. This would appear to be something that could be initiated by EEE producers who have developed a product which, using proprietary materials, production processes and/or waste processing technologies make it highly recyclable or, conversely, particularly unrecyclable, difficult to reuse or otherwise developed with a degree of built-in obsolescence. Similarly, treatment operators who have developed recycling technologies that give them a competitive advantage may not want details of this technology to be made public and hence, widely available. The latter point in particular carries implications for reporting performance in association with the WEEE Directive, as it would appear to create a potential barrier to any form of compliance checking or external audit.

2.3.5 Exports

Extensive uncontrolled and unrecorded transboundary movements of WEEE and/or its components were noted in a 1997-2000 study on behalf of the European Environment Agency (Crowe *et al*, 2003). The study cites this as a significant barrier to tracking WEEE and its final disposal routes. Even if done legally, WEEE exported to other countries for treatment is highlighted as a significant variable in the context of developing a standard monitoring protocol (Ansems and van Leeuwen, 2003). Efforts to overcome this are somewhat inconclusive; it has been suggested that additional (contractual) requirements could be made, for example specific provisions regarding fractions to be treated, the method or extent of final treatment or a requirement to use a particular company or operator. However, further details are needed regarding how it might be possible to guarantee that final treatment would count as environmentally sound (Ansems and van Leeuwen, 2003).

Based on a telephone survey conducted as part of the recent collection trials project in Ireland (Wilkinson and Duffy, 2003), export features as the chosen route for much of the WEEE generated in Ireland. The study notes:

Because of this reliance on export, the WEEE recycling industry in Ireland is becoming dominated by waste management companies that simply act as waste brokers. These companies often do not have treatment or storage facilities in Ireland, preferring to arrange the collection and transport of equipment directly to specialised recycling facilities in mainland Europe.

2.4 Current practice

2.4.1 Current practice in the EU

Experience in other countries, particularly those with existing schemes for managing WEEE will be valuable in terms of highlighting real or potential issues and possible means of dealing with these. Information and monitoring requirements associated with existing WEEE schemes are likely to provide insight and perhaps options for systems to monitor the implementation of WEEE in Ireland.

2.4.1.1 WEEE legislation and reporting requirements

As part of their study examining collection targets for WEEE, German research firm Ökopol conducted a review of some of the existing systems for WEEE collection in the EU (Lohse *et al*, 1998). Of the existing schemes surveyed, none had set quantitative targets for WEEE collection. One (Denmark) had intentions of setting collection targets through technical guidelines, as distinct from including them in National legislation. Flandria set criteria for recycling centres generally; recycling rates were set for ferrous metals, non-ferrous metals and plastics.

An examination of the requirements regarding monitoring and compliance control for existing WEEE schemes (Table 2.4) highlights the high degree of variability in the approach(es) which might be taken.

Table 2.4
Monitoring and compliance control for existing WEEE schemes in Europe
(Lohse *et al*, 1998; Stevels, 2003; Ansems and van Leeuwen, 2003)

Austria	Refrigerators and lamps: number of appliances taken back Refrigerator/freezers: treatment costs No reporting duties for other WEEE covered by legislation
Switzerland	Permits for management and disposal of WEEE include certain reporting duties Export permits and tracking documents for exported WEEE
Netherlands	Producers and importers must either collectively or individually “develop an adequate recording and control system that focuses on financial transactions as well as material input and output in terms of e.g. number of discarded appliances of a particular kind and tonnes of collected appliances of a particular kind and tonnes of recycled materials or residual waste of a particular kind, as the case may be”
Flandria	Amount of recycled, disposed and incinerated materials from WEEE must be reported, namely: <ul style="list-style-type: none"> • Retail outlets and wholesale trade must report the amount of WEEE they have taken back in kilograms, type and number of appliances; • Producers and importers must report the amount of WEEE they have taken back in kilograms, type and number of appliances, installations where collected WEEE has been treated and quantities of WEEE or its parts or materials that have been refurbished, recycled, incinerated or disposed of.
Germany	Producers and importers must individually or collectively through their organisations report the type, quantity and fate of WEEE taken back to their waste authority.
Denmark	Producers/importers who collect their own WEEE report type and quantity collected and treatment details. Similar information must be provided by companies/institutions who hand WEEE directly to a recycler. No reporting requirements for local authorities; documentation will be required for government subsidies and could be used for monitoring purposes.

2.4.1.2 Possible methods of performance monitoring and tracking data

Examination of WEEE reporting systems

In a 1998 review of existing schemes in other EU Member States (Lohse *et al*, 1998), it was found that the determination of the amount (weight) of collected WEEE was normally done by the recycler to whom collected appliances were handed over, although in some projects collected items were counted at municipal depots. Monitoring difficulties arose with the coexistence of collection routes; when large retailers and supplying firms (distributors) collected WEEE parallel to municipal authorities these items were not always counted in the national figures, partly because significant quantities were often transported from retail outlets directly to producers or recycling institutions. There were also issues with attributing retailer-collected WEEE to a particular jurisdictional area.

A more recent report by the European Committee of Manufacturers of Domestic Appliances (CECED) provides an overview of initiatives taken by affected countries in light of the then pending WEEE Directive (CECED, 2002). Based on the information provided, some countries had not put any provisions relating to performance into place, whilst some appeared to have put provisions in place specifically in anticipation of the forthcoming WEEE legislation, i.e. targets were generally along the same lines as those in the WEEE Directive. In most cases these had yet to be put into force, as the Directive had not been finalised at that stage. Countries which did appear to have some experience with targets and hence the reporting requirements necessary to prove compliance with them included the following:

Table 2.5
WEEE performance reporting in selected EU countries

Austria	The collection rate for refrigerators/freezers was reported to be “about 60%” of sales of new products.
Netherlands	Guidelines issued to affected companies/operators to assist in gaining approval from the authorities indicated minimum recovery percentages ranging from 63 to 76 percent, depending on the product category.
Belgium	90% recycling for large household appliances, 70% for all others. In addition, material-specific targets were set for ferrous and non-ferrous metals as well as plastics.
Denmark	Stated objective was to recycle 75% of all returned end-of-life equipment.

Experience gained in these countries will be valuable in examining a potential system for monitoring compliance in Ireland. In particular, the specificity of targets established in Belgium, including how this might have affected the reporting system already established in Flandria (Table 2.4), will receive further consideration as part of this Dissertation.

Examination of packaging reporting systems

In an examination of various elements of the packaging Directive, including targets, system performance and associated reporting requirements, RDC-Environment and Pira International undertook an exercise whereby a series of process trees laying out different scenarios for managing various types of packaging waste were developed (RDC and Pira, 2003). The scenarios were developed according to three key parameters: 1) population density, 2) National municipal waste management options available as an alternative to recycling and 3) where recycling is considered, the type of collective scheme. From this the authors develop generic process trees for household and industrial packaging, and a series of detailed process trees for different, specific packaging materials.

Some of the packaging process trees developed by RDC and Pira are reproduced in Appendix II. These serve as a useful model for developing similar process trees for WEEE. Process trees and other ways of modelling with respect to waste and material flows are discussed further in Section 2.5.4, below. In addition, current practice with respect to packaging reporting in Ireland is discussed below, in Section 2.4.4.

Examination of ELV reporting systems

The UK Government recently commissioned two related studies associated with that country's implementation of the end-of life vehicles (ELV) Directive⁴ which, similar to the WEEE Directive lays down targets for recovering and recycling ELVs. The first study was undertaken to identify the data required to monitor compliance with the Directive and the second with a view to developing a method by which obligated businesses can provide evidence that they are complying with the targets set out in the Directive.

The first study (Kollamthodi et al, 2003a) examined, *inter alia*, all potential sources of ELV arisings (for example, "premature" ELVs, "natural" ELVs, stolen cars, etc.) and all potential options for ELV processing and reprocessing (for example, salvage, scrapping and shredding, management of specific materials or components such as tyres, etc.) and also examines spare and replacement parts, an important issue that will also be encountered with WEEE monitoring. A summary of the material flows for ELV arisings, processing and reprocessing within the UK during the year 2002 is given in the form of four rather complex material flow diagrams. The diagrams are reproduced in Appendix III and, like the process trees for packaging, these serve as a useful model for developing material flow diagrams for WEEE arisings, processing and reprocessing.

Based on the authors' experience, the first report outlines a number of data management issues, many of which are similar to those encountered with WEEE data and compliance monitoring. For example, reasons cited for a lack of detailed information regarding ELV-derived materials include:

- Records are not kept separately for these material streams;
- The number of sites from which material originates is large and difficult to survey;
- Material is collected and mixed with other (non-ELV) sources making ELV material difficult to identify;
- In many cases, the number of reprocessing facilities is small (three or less) and data cannot be released for fear of releasing commercially sensitive information.

⁴ Council Directive 2000/53/EC on end-of life vehicles. OJ L 269, 21.10.2000, p.34.

Consequently, the study concludes “current estimates of the types and quantities of materials reprocessed are difficult to quantify with accuracy” and the authors suggest “it is unlikely that it will be easy to collect comprehensive data without further (legislative) provision being made for monitoring of ELV materials.”

The second study (Kollamthodi *et al*, 2003b) discusses various methods employed by other countries to overcome difficulties such as those cited in the first report. It evaluates similarities to and compatibilities (or not) with implementation of the packaging Directive⁵ and it outlines a step-by-step summary of how an ELV reporting system would work in reality.

Many of the issues identified and discussed above, the approach taken to compiling the necessary information and the process of evaluating options – as well as the options themselves – are relevant to information flows for WEEE and are likely to be applicable, at least in part, to establishing systems for monitoring compliance control with the WEEE Directive.

2.4.2 Policy and legislation

National waste management and recycling policies in Ireland have taken their lead largely from International developments and at an EU level in particular. In addition, as a member of the EU Ireland must implement and comply with European Directives, most notably the Waste Framework Directive and the landfill Directive⁶, the latter of which set out ambitious targets for the diversion of waste from landfill.

2.1.2.1 General waste management

The regulatory framework specifically for waste was formalized in 1996 with the introduction of the Waste Management Act. The Act gave effect to recycling policies, laid down a foundation for new waste management arrangements and is the basis for much of Ireland’s current waste management legislation.

Early implementation of the Waste Management Act resulted in many improvements, including the development and improvement of the waste management planning system and the creation of an effective and comprehensive waste licensing and permitting system. In addition, the Act allowed for the provision of producer responsibility organisations (PROs) where considered necessary and it was at this stage that producer responsibility initiatives began to be developed.

⁵ Council Directive 94/62/EC on packaging and packaging waste. OJ L 365, 31.12.94, p. 10

⁶ Council Directive 99/31/EEC on the landfill of waste (OJ L 182, 16.07.1999, p. 1)

In 1998 the Government published a policy document on waste management. "Changing our Ways" (DEHLG, 1998) was intended to provide a national policy framework for the adoption and implementation by local authorities of strategic waste management plans. In particular, it highlighted the need to develop and pursue integrated solutions and it strongly endorsed meaningful strategic planning and greater participation by the private sector, including extending the scope of producer responsibility initiatives. It also set ambitious recycling and recovery targets.

The Waste Management Act has been amended on two occasions, once in 2001 and again in 2003 via the Protection of the Environment Act 2003. An intensive programme of regulatory updating has also been carried out, with regulations addressing matters such as waste planning, producer responsibility obligations, movement of wastes both within Ireland and by way of export to other countries and waste licensing and permitting.

2.4.2.2 The European Waste Catalogue (EWC)

The European Waste Catalogue⁷ provides a uniform system for the classification and reporting of waste by all EU Member States and is the basis for waste reporting in Ireland. Different types of wastes are fully defined by six-digit codes falling under respective two-digit chapter headings and four-digit subheadings. Instructions on how to use the EWC, including the steps that should be taken to identify a waste in the list, are provided in the introduction as follows (paraphrased):

1. Identify the source of the waste in chapters 01 to 12 or 17 to 20 and identify the appropriate six-digit code falling under this;
2. If no appropriate waste code can be found in chapters 01 to 12 or 17 to 20, the chapters 13, 14 and 15 must be examined;
3. If none of these waste codes apply, the waste must be identified according to the codes specified in chapter 16 (wastes not otherwise specified);
4. If the waste is not in chapter 16, a '99' code must be used in the chapter of the list corresponding to the source identified in step one.

⁷ Commission Decision 2000/532/EC as regards the list of wastes (OJ L 226, 6.9.2000, p. 3) as amended by, *inter alia*, Commission Decision 2001/118/EC (OJ L 47, 16.2.2001, p. 1).

The EWC chapter that would apply to household WEEE is 20, *municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions*, further described by the sub-chapter 20 01, *separately collected fractions*. There are then four EWC codes that describe most household WEEE, as listed in Table 2.6 below.

Table 2.6
EWC codes most applicable to household WEEE

EWC Code	Waste Description
20 01 21*	Fluorescent tubes and other mercury-containing waste
20 01 23*	Discarded equipment containing chlorofluorocarbons
20 01 35*	Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	Discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35

* An asterisk (*) next to the code indicates this waste is classified as hazardous

There are then numerous codes under various EWC chapters that may apply to parts and components arising from WEEE.

For B2B WEEE, the most appropriate codes appear to be under chapter 16, *wastes not otherwise specified*, which includes a specific sub-chapter, 16 02, *wastes from electrical and electronic equipment*. The EWC codes and descriptions under this sub-chapter are listed in Table 2.7 below. It should be noted that some of these may also apply to components and materials arising from household WEEE (as distinct from whole items).

Table 2.7
EWC codes under sub-chapter 16 02

EWC Code	Waste Description
16 02 09*	Transformers and capacitors containing PCBs
16 02 10*	Discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09
16 02 11*	Discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 12*	Discarded equipment containing asbestos
16 02 13*	Discarded equipment containing hazardous components ⁽⁸⁾ other than those mentioned in 16 02 09 to 16 02 12
16 02 14	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13
16 02 15*	Hazardous components removed from discarded equipment
16 02 16	Components removed from discarded equipment other than those mentioned in 16 02 15

* An asterisk (*) next to the code indicates this waste is classified as hazardous

2.4.2.3 Waste licensing, permitting and registration

The Waste Management Acts provide for a system of licensing by the EPA in respect of all significant waste recovery and disposal activities. The types of activities that require licenses include landfills, waste transfer stations, hazardous waste facilities and large-scale composting facilities. Detailed rules and requirements are further specified in Regulations and amendments under the Waste Management Acts, the European Communities Act and the Protection of the Environment Act. This system is intended to ensure that high environmental standards apply in relation to the establishment, management, operation, closure and aftercare of licensable waste facilities.

⁸ Hazardous components from electrical and electronic equipment may include accumulators and batteries mentioned in 16 06 and marked as hazardous, mercury switches, glass from cathode ray tubes and other activated glass, etc.

The Waste Management (Permit) Regulations (S.I. 165 of 1998) were introduced in 1998 and provide for the granting of waste permits or registration by local authorities in respect of specified waste recovery and disposal activities in their functional areas. These allow for certain waste activities that, due to the nature or scale of activity do not warrant licensing by the EPA; generally, they apply to activities where recovery does not exceed 5,000 tonnes per annum. In certain limited circumstances, such as the storage of limited quantities of hazardous waste on the premises where it was produced, permittees need only register with the local authority.

2.4.2.4 Waste collection

The Waste Management (Collection Permit) Regulations (S.I. 402 of 2001) put in place a system for the permitting of anyone involved in the collection of waste. Under the regulations collectors must obtain a permit from each and any of ten local authority regions in which they intend to operate. Permits specify the types of waste the collector is permitted to collect and the recovery/treatment or disposal routes allowed for each type of waste. Furthermore, collection dockets must record details of all waste types collected individually by EWC code. Information relating to the waste collection permit must be reported annually to the permitting authority by way of an Annual Environmental Report (AER). The information reported in an AER includes, *inter alia*, EWC codes, weights and recycling or disposal routes of all waste collected. Based on this, both the collection dockets and AERS represent potential sources of information on WEEE, albeit not based on the ten categories of the Directive.

2.4.2.5 Movements of hazardous waste

In addition to the Collection Permit regulations, movements of hazardous waste within Ireland are subject to the provisions of the Waste Management (Movements of Hazardous Waste) Regulations, 1998 (S.I. 147 of 1998). Under these regulations, movements of hazardous waste must be recorded using consignment notes known as C1 Forms. The forms are obtained from the Local Authority in whose jurisdiction the waste originates. Each form is uniquely numbered and is comprised of five carbon copies, which are distributed to and retained by the waste producer (consignor), the collector/carrier, the recoverer/disposer (consignee), the consignee's Local Authority and the Local Authority in whose jurisdiction the waste originated.

Notably, C1 Forms are not required for certain wastes or circumstances, including the movement of end of life vehicles and hazardous household, commercial or agricultural wastes collected at a bring facility or by means of a segregated collection service provided to members of the public. As such, most movements of WEEE that is considered hazardous e.g., CFC-containing

refrigerators or mercury-containing fluorescent lamps from CA sites, retailer premises and other central collection points to treatment facilities will not require C1 Forms.

2.4.2.6 Transfrontier shipments

Movements of any waste into, through or out of Ireland from and/or to other countries are subject to the provisions of Council Regulation 259/93 on the supervision and control of shipments of waste within, into and out of the European Community.⁹ The regulations provide *inter alia* for the application of the Basel Convention on the control of transboundary movements of hazardous waste and their disposal, of which the EU is a party, and the Organisation for Economic Cooperation and Development (OECD) Decision on the control of transboundary movements of wastes destined for recovery operations.¹⁰ Council Regulation 259/93 is transposed into Irish legislation by the Waste Management (Transfrontier Shipment of Waste) Regulations, 1998 (S.I. 149 of 1998).

Under the transfrontier shipment regulations, waste must be classified based on different lists/classifications provided in the Annexes to Council Regulation 259/93. For most wastes, the relevant Annexes are II, III and IV, also known as the green, amber or red lists, respectively. Different procedures are required depending on how the waste is classified, whether the waste will be recovered or disposed and whether it will be exported to another EU country or outside the EU.

Green list waste (Annex II) destined for recovery is generally excluded from the control procedures associated with the regulations, although these shipments must be accompanied by specified documentation. Exports of green list wastes for disposal and all amber (Annex III) and red list (Annex IV) wastes are subject to procedures involving notification to, and in some cases authorisation by, the authorities in country where the waste originates, the country of destination and in certain circumstances countries through which the waste will travel.

If a waste destined for recovery has not been assigned to Annex II, III or IV, it is generally subject to the same procedures as amber list (Annex III) waste, with an additional requirement regarding written consent of the competent authorities concerned.

A separate Annex in the Regulation, Annex V, contains various lists from and/or relevant to the Basel Convention, the EWC, Annexes III and IV of the Regulation and/or the OECD Decision. This does not have any bearing on which of the procedures (Annex II, III or IV) apply to a

⁹ OL J L 30, 6.2.1993, p. 1, as amended

shipment. It is only provided with a view to harmonising the different lists and ensuring all appropriate codes and waste descriptions are provided in the associated shipment and notification documents.

Entries in the waste lists that pertain to WEEE include, but are not limited to, the following:

Table 2.8
Waste classifications applicable to WEEE for the purposes of transfrontier shipments

Waste list	Code	Waste Description
Annex II	GC 010	Electrical assemblies consisting only of metals or alloys
	GC 020	Electronic scrap (e.g. printed circuit boards, electronic components, wire, etc.) and reclaimed electronic components suitable for base and precious metal recovery
Annex V	A1180	Waste electrical and electronic assemblies or scrap ⁽¹¹⁾ containing components such as accumulators and other batteries included on List A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on List B, B110) ⁽¹²⁾
	B1110	Electrical and electronic assemblies: <ul style="list-style-type: none"> – Electronic assemblies consisting only of metals or alloys – Waste electrical and electronic assemblies or scrap ⁽¹³⁾ not containing components such as accumulators and other batteries included on List A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on List A, A180) – Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct re-use ⁽¹⁴⁾ and not for cycling or final disposal ⁽¹⁵⁾

¹⁰ C(2001)107/Final

¹¹ This entry does not include scrap assemblies from electronic power generation

¹² PCBs are at a concentration level of 50 mg/kg or more

¹³ This entry does not include scrap assemblies from electronic power generation

¹⁴ Reuse can include repair, refurbishment or upgrading, but not major reassembly.

¹⁵ In some countries these materials destined for direct reuse are not considered waste.

Based on this, there are only limited instances where WEEE and/or materials and components arising there from can be exported without prior notification of the relevant authority(ies), i.e., as Annex II/green list waste. Indeed, it is difficult to think of any whole WEEE that could be described as an “electrical assembly consisting only of metals or alloys” and a degree of pre-treatment appears to be required for any materials or components of WEEE to be exported in this way. The majority of WEEE and WEEE-related waste would therefore be subject to the same procedures as amber list/Annex III waste, again, as indicated above, with an additional requirement regarding written consent of the competent authorities concerned.

Notably, a recent study involving six EU Member States by EU Network for the Implementation and Enforcement of Environmental Law (IMPEL), an informal Network of the environmental authorities of EU Member States, future Member States and candidate countries and Norway found that in an inspection of several hundred transfrontier shipments, the majority were either misclassified or were undertaken illegally (IMPEL, 2004). Although not acceptable, it is understandable that WEEE might be misclassified, in light of the complexity of the regulations and the associated waste lists and procedures.

2.4.3 Waste statistics reporting systems

2.4.3.1 The National Waste Database

The Environmental Protection Agency has published three National Waste Database (NWD) reports pertaining to the years 1995, 1998 and 2001 as well as interim reports pertaining to the years 2002 and 2003. The return rate from local authorities for the 2001 NWD was 100%, although it has been acknowledged that there is wide variance in the quality of information provided (Perchards and FMC, 2004).

The EPA have also published several sectoral reports relating to or containing waste statistics. For example, as previously referred, a topic report on WEEE in Ireland was prepared in 2001 (Wilkinson *et al*, 2001*b*) in advance of the forthcoming Directive. The topic report highlights the scarcity of reliable information regarding WEEE in Ireland and attempts to fill some of the information gaps by estimating and evaluating current and potential WEEE arisings and reviewing current WEEE management in Ireland. Information was gathered from a combination of different sources including telephone surveys, questionnaires and information reported by licensed or permitted operators. With the exception of the latter, this type of information gathering can be time consuming and the availability of reliable information on a consistent basis would appear to be questionable. Furthermore, in its analysis of Ireland’s packaging waste

management system, the European Topic Centre on Waste notes that under-reporting of waste tonnage recovery would not be unexpected in circumstances where this could result in enforcement action, for example if, in providing this information a breach in existing permit or license limits is discovered (Skovgaard *et al*, 2004).

The opening statements to the 2001 NWD report (Meaney *et al*, 2003) highlight that the quality and availability of information on waste generation and management had improved since the first report was prepared. Of note is that some of the information in the 2001 EPA topic report on WEEE appears to be the source of that presented in the 2001 NWD, which logically suggests that increased focus, time and effort in compiling statistics lead to better, more comprehensive information.

Information in the 2001 NWD regarding waste flows includes discussions of various specific waste streams including scrap metal and end-of-life vehicles (ELVs), waste and WEEE (Meaney *et al*, 2003). As regards the latter, the report indicates figures for WEEE generation based on information from various studies, some of which are included in this literature review. As previously mentioned, the range of values provided for Ireland (35,000 to 82,000 tonnes) is substantial and is attributed to the use of a number of methodologies used in other countries to make the estimation. This is also highlighted in 2001 EPA topic report on WEEE (Wilkinson *et al*, 2001b), which would again appear to be the source of much of the information in the 2001 NWD report. The topic report notes that each method requires some assumptions to be made and therefore contains some uncertainties, and none can be considered as the most realistic in lieu of reliable information on actual WEEE arisings. The report concludes that ideally, waste calculation models should be calibrated with actual WEEE arisings and for this limited existing statistics need to be enhanced.

In the discussion of scrap metal and ELVs, the 2001 NWD report points out that scrap metal is composed of two fractions: ferrous and non-ferrous metals (Meaney *et al*). The report notes that WEEE generally gives rise to ferrous metals, although copper wiring, which may also be contained in WEEE, is noted as being a source of non-ferrous metal. Despite the indication that information specifically regarding WEEE was not available from shredding and dismantling organisations, the report provides separate figures for total ferrous scrap and of that, an estimation of how much comes from ELVs. The discussion on ELVs refers repeatedly to items of WEEE as what would appear to be the dominant other source of ferrous scrap metal. For example: "... fragmented scrap from shredding machines (made up of metal from end-of-life vehicles and other light metal goods such as cookers and washing machines)..." and "scrap

metal in the form of end-of-life vehicles and white goods (e.g. fridges, freezers, washing machines and cookers)...” Based on this, it would appear estimations of how much of this ferrous scrap comes from WEEE could be possible.

2.4.3.2 Waste questionnaires

The principal sources of data on municipal waste for the NWD reports are local authorities and private waste operators, including recycling organisations and licensed waste treatment and disposal facilities (Meaney *et al*, 2003). Some information is extracted from AERs pertaining to EPA-licensed municipal waste operators and, to the extent possible, local authorities take information from AERs submitted by permitted waste collectors and treatment operators (pers. comm., B. Meaney, 2004). However, the primary source of information EPA uses are questionnaires geared towards local authorities and recyclers. The local authority and recycler questionnaires request information on municipal, industrial and other waste as well as the locations of all public and private waste disposal and recovery facilities (www.epa.ie).

The 2003 questionnaires

Both the local authority and recycler questionnaires request information specifically on WEEE. This was added for the 2003 questionnaire in light of the pending Directive (pers. comm., B. Meaney, 2004); however, the details requested in the two aforementioned questionnaires differ. Local authorities are asked to report quantities of fluorescent bulbs/lamps, fridges and freezers and “other electrical and electronic equipment” collected separately from other waste by private and public sector operators by various means e.g., kerbside collection, bring facilities, etc. The associated guidance to the questionnaire indicates that the format requested reflects the need to incorporate the non-traditional modes of waste collection now in use, such as recyclables collection at kerbside and at collection facilities, as well as the need for local authorities to apply the information that they generate using local knowledge and applying local assumptions to the calculations made. The questionnaire also seeks information, where available, on composition surveys carried out in 2002, 2003 and/or 2004.

Waste recyclers are asked to report quantities of the three types of WEEE on which local authorities must report (fluorescent bulbs/lamps, fridges and freezers and “other electrical and electronic equipment”). In addition, they are asked to provide information pertaining to the management of three other types of WEEE: white goods, TVs and PC monitors and ICT equipment, hence reducing the number and type of items reported as “other WEEE.” Information requested from recyclers includes quantities and origin (i.e., from within Ireland or another

country) of WEEE arising on site, whether it is recycled on the premises or by a third party, the amount of non-recyclable material disposed from the site and the method of quantity assessment. Options for reporting the latter include: (a) *Estimates*; (b) *Checked by weighbridge*; (c) *Independently audited*; or (d) *Other*.

Follow up on the questionnaires

Somewhat incidental to the EPA's annual questionnaires, recycling organisations are surveyed to obtain additional information regarding their activities (pers. comm., B. Meaney, 2004). While not included in the actual NWD report, the information obtained in the surveys frequently provides insight into the accuracy of that reported in the questionnaires, and whether this is truly reflective of the current situation. For example, the survey of recycling organisations regarding activities/information relating to 2003 revealed that, when compared with the figures for notified exports of waste reported by local authorities (in accordance with transfrontier shipment regulations), 3,345 tonnes of non-notified WEEE was exported by recyclers to other European countries (Collins *et al*, 2004).

Potential problems with WEEE reporting

The 2003 recycler questionnaire presents a number of opportunities for waste to be reported more than once. For example, information regarding WEEE is requested in two separate sections; one pertaining to packaging and non-packaging waste and another pertaining to ferrous and non-ferrous waste. In addition, there are several places where material streams that may result from WEEE and processing of WEEE might be reported (e.g., as metals, plastics, batteries, etc.). One can only assume that recyclers report the same figures in both sections and that, in compiling the data, anything to the contrary is followed up by the EPA to ensure accuracy.

In addition, the information regarding non-notified exports of WEEE is worth noting not only in the context of ensuring data capture, generally, but also as regards appropriate waste characterisation/classification and compliance with transfrontier shipment legislation. As noted in Section 2.4.2 and Table 2.7, WEEE can only be exported without notification to the competent authority i.e., as green list waste when it comprises either "electrical assemblies consisting only of metals or alloys" or "electronic scrap (e.g. printed circuit boards, electronic components, wire, etc.) and reclaimed electronic components suitable for base and precious metal recovery." Given Ireland's limited treatment infrastructure, which would generally be required in order to pre-treat WEEE such that it could be classified in either of the two ways noted above, and the relatively

large quantities of WEEE that were exported non-notified, a proportion of proportion of this may have been misclassified and, as such, exported illegally.

2.4.4 Producer Responsibility in Ireland

The Waste Management Acts reflect the importance of waste minimisation and recovery and specific obligations are imposed on agricultural, commercial and industrial activities to prevent or minimise the production of waste. As previously mentioned, the legislation also allows for the provision of PROs. This could be viewed as an alternative to the imposition of statutory controls and obligations and would generally be the Government's preferred approach, affording the relevant business sector(s) the opportunity to formulate and implement proposals for an appropriate voluntary initiative. This approach is intended to facilitate the business sector concerned by enabling it to bring its expertise to bear to devise workable and least-cost arrangements that are sensitive to both commercial and environmental requirements. In the absence of a satisfactory business-led initiative, it would then be open to the Minister to introduce mandatory producer responsibility obligations.

A wide range of PROs have been established or are proposed in respect to a number of individual waste streams. These are summarised in Table 2.9, below (www.environ.ie).

Table 2.9
Producer Responsibility Initiatives in Ireland

<p>Packaging</p>	<p>Under the Waste Management (Packaging) Regulations (S.I. 61 of 2003), businesses that place packaging on the market must segregate specified waste materials and have it collected for recycling. Similar to the WEEE Directive, the packaging Directive sets out targets for recycling and recovery.</p> <p>In a voluntary agreement with Government, Repak Ltd. was established in 1996 to promote, co-ordinate and finance the collection and recovery of packaging waste. Repak's objective is to organise and finance the systems needed to achieve specified recovery rates in relation to packaging waste and the scheme requires members to take steps to recover the packaging waste arising on their own premises, as well as make a financial contribution to Repak Ltd. Additional details regarding information and reporting requirements under the Regulations, as well as the information gathering and reporting undertaken by Repak, are provided in Section 2.4.4.1 below.</p>
<p>Farm plastics</p>	<p>The Waste Management (Farm Plastics) Regulations, 2001 place obligations on producers of farm plastics to operate a deposit and refund scheme. The Irish Farm Films Producers Group (IFFPG) is operating a recovery scheme for farm plastic waste, which represents almost all significant producers and importers of farm plastics.</p>
<p>Construction and Demolition (C&D) waste</p>	<p>The Government's policy statement, <i>Changing our Ways</i> specifically addressed the management of construction and demolition (C&D) waste and set out targets the recycling of at least 50% of C&D waste within a five year period, with a progressive increase to at least 85% over fifteen years.</p> <p>A taskforce was established to co-ordinate the development and implementation of a voluntary construction industry programme to meet the Government's objectives. Membership of the taskforce includes representatives from the construction industry, building design professionals, and representatives from various Government departments including the Department of the Environment, Heritage and Local Government, Local Authorities and the Environmental Protection Agency.</p>

Table 2.9
Producer Responsibility Initiatives in Ireland

<p>Construction and Demolition (C&D) waste (cont.)</p>	<p>Following on from this, the National Construction and Demolition Council (NCDWC) was established to oversee the implementation of recommendations made by the taskforce. A number of sub-committees comprised of key stakeholders have been established and several initiatives aimed at reducing and recycling C&D waste have been undertaken.</p>
<p>End-of-life vehicles</p>	<p>The ELV Directive came into force on 21 October 2000. The Directive lays down measures placing priority on the prevention of waste from vehicles and on the reuse, recycling and other forms of recovery of end-of-life vehicles and their components. The necessary enabling provisions to facilitate implementation of the ELV Directive in Ireland have been incorporated in the Protection of the Environment Act, 2003. The Government intends to make secondary legislation (Regulations) fully transposing the Directive's provisions in early 2005.</p> <p>The Department of the Environment has engaged with the Society of the Irish Motor Industry (SIMI), the Irish Motor Vehicle Recyclers Association (IMVRA), the Metal Merchants Association of Ireland (MMAI) and other concerned parties with a view to the development of a producer responsibility initiative and, at the time of writing, discussions with the stakeholders were ongoing.</p>

In terms of WEEE, as previously noted, the Government set up a taskforce to develop recommendations and proposals for producer responsibility in accordance with the obligations contained in the WEEE Directive. Based on the preliminary outcome of the work of the taskforce (DEHLG, 2004a), a collective scheme is suggested as the means for ensuring WEEE implementation and compliance in Ireland. Importantly, the taskforce notes in their draft report (DEHLG, 2004a) that the importance of accurate and transparent record keeping and reporting systems cannot be understated. The report suggests that any collective scheme that is established will be required to maintain systems to record waste collection and recycling and notes that these systems must be robust enough to demonstrate compliance with targets and to provide satisfactory National statistics on the generation and management of WEEE.

At the time of writing, legislation to implement the WEEE Directive had been published for consultation and the Government had received at least three expressions of interest from parties looking to establish collective compliance schemes in Ireland. Further information on the current status of measures to implement the Directive in Ireland is included in Sections 4.3.6 and 4.3.7.

Further PROs are anticipated for tyres, paper and batteries (www.environ.ie).

2.4.4.1 The Waste Management (Packaging) Regulations, 2003

Statutory record-keeping and reporting requirements

The producer obligations under the packaging Regulations are fairly stringent. For example, in accordance with Article 9:

(3) (a) A major producer who is an importer of packaged goods or is a packer/filler shall take such steps as are necessary to ensure that in any quarterly period, the aggregate weight of packaging waste which is accepted or collected by that major producer is not less than 50% of the aggregate weight of packaging material and packaging imported or packed/filled by the producer and supplied by that major producer in the preceding quarterly period; and

(3) (d) Where a major producer purchases packaging waste from any other source for the purpose of fulfilling its obligations under this subarticle, it shall keep a record of the type, amount and source of such packaging waste and shall include that information in the quarterly report to local authorities under article 12.

It is safe to assume that record-keeping and reporting requirements associated with obligations such as those described above would be quite onerous; however, language such as “shall take such steps as are necessary” is actually quite vague and, upon closer examination, the language throughout the Regulations relating to how information should be compiled and reported is left somewhat open. For example, Article 6 provides:

A producer who supplies to another producer packaging material, packaging or packaged products shall comply with any reasonable request from the latter producer for data on the weight of the material or packaging concerned sufficient to enable the latter producer to comply with these Regulations.

In addition, Article 12 includes the following provisions regarding reporting to local authorities:

(3) The information to be submitted by a major producer to a local authority under sub-article (1) shall, where the relevant local authority so requires, be in a form specified by the authority.

Similar language can be found in Article 22, which also relates to reporting to local authorities:

(1) Subject to article 15 and sub-article (4), a local authority may, by notice in writing, require a producer to furnish within a specified period of not less than four weeks -

(a) a packaging report in respect of a specified period,

(b) such information as may be specified in the notice regarding the use of packaging by that producer, the steps taken in order to comply with any requirement of these Regulations, and the results of those steps, or

(c) evidence of the turnover of the producer concerned.

(2) A notice under sub-article (1) may specify the manner in which any matter is to be set out or addressed in a packaging report, or the nature of the evidence to be furnished, as the case may be.

Sub-article 5 goes on to specify what information might be requested, e.g., packaging received and supplied, various details regarding waste packaging; however, details regarding how and in what format this information should be compiled and provided are not specified, leaving this open to the authority making the request and/or the individual responsible for providing the information.

Article 15 of the packaging Regulations, as referred in Article 22 (1), exempts producers from many of the reporting requirements if they are participating in a collective scheme operated by an approved body. Approval, which is granted by the Minister of Environment, Heritage and Local Government, is conditional upon, *inter alia*, providing acceptable proposals for a scheme to recover packaging waste on behalf of member producers and for determining and verifying the level of recovery of packaging waste of the proposed scheme. As such, it is once again left open for the scheme to propose a means of compiling the information necessary to satisfy the authorities.

Record-keeping and reporting in practice

The 2001 NWD report provides much more detailed information on packaging waste than on other specific waste streams such as WEEE or ELVs. The report (Meaney *et al*, 2003) attributes this to the introduction of a payment scheme by Repak, the only approved body to date for the recovery of packaging waste in Ireland.

The reporting system behind the Repak scheme is actually quite complex and will not be described in detail here. It is, however, worth noting that the key incentive for providing accurate and verifiable information to and through the Repak scheme appears to be the principle of collective producer responsibility itself, as well as the associated market/commercial drivers. Again, without getting into detail, payments and/or “credits” to and from the scheme are based on the amount of packaging placed on the market, collected and/or recovered, as reported by each stakeholder (namely, producers and contractors/recovery operators). It is therefore in the interest of each stakeholder, as well as the Repak scheme, which is accountable to its member producers as well as the Government, to ensure reliable record keeping and reporting practices. The operation of the system provides a parallel, commercially driven system of checks and balances. In this context, it is also important to note that Repak provides detailed guidance to its members and to Repak-approved recovery operators for completing the statistical return forms (examples are provided in Appendix IV). In addition, the organisation undertakes audits of those members/operators who submit data.

Clearly, the attribution of the Repak scheme to better waste statistics indicates that the implementation of producer responsibility legislation such as the packaging Directive provide a driver for improving record keeping and reporting systems. Despite this, however, problems and discrepancies remain, some of which are discussed below.

In addition to Repak, EPA obtains data in relation to packaging waste from the local authority and recycler questionnaires discussed in Section 2.4.3, landfill records and waste characterisation studies conducted by local authorities and contractors of the EPA (Skovgaard *et al*, 2004). The latter two are used to get a best estimate of the total amount of packaging waste disposed in Ireland; composition surveys on a limited quantity of waste destined for landfill provide an indication of the proportion that comprises packaging and this information is used to extrapolate figures to all landfilled waste. However, the European Topic Centre on Waste points out some important limitations with the methodology used to compile information on packaging waste in Ireland (Skovgaard *et al*, 2004). For example, it notes that (as of September 2004, when the Centre’s report was published) breakdown per material landfilled is based on only ten

composition surveys conducted in 2001. In addition, EPA records indicated that the response rate for the waste questionnaires was only approximately 56% and, as previously noted, these may not be complete or accurate for a number of reasons, including under-reporting to hide breaches of permits or licenses.

The 2001 NWD (Meaney *et al*, 2003) also indicates that the EPA carried out its own audits on companies engaged in the recycling of packaging to ensure adequate recording systems are in place. Several issues common to a number of the recyclers were identified in the audits, including:

- Unclear differentiation between packaging and non-packaging waste;
- Submission of incomplete returns by either not reporting all packaging waste fractions accepted at the site or arising from activities on site;
- Insufficient details regarding the destination of waste forwarded for recycling.

The unclear differentiation between packaging and non-packaging waste seems to confirm the suggestion made in the preceding discussion of the EPA waste questionnaires (Section 2.4.3) that these present opportunities for errors and/or omissions. In addition, like the waste composition surveys, a further limitation associated with the audits would appear to be that a total of only 20 audits were undertaken in two year's time (2001 and 2002) (Meaney *et al*, 2003).

Current estimates of packaging placed on the market are made by adding together the quantities of packaging waste disposed and used packaging recovered. Packaging waste disposed is calculated based on the aforementioned landfill records and composition surveys. The estimates, which are used for the purposes of calculating producers' (and Ireland's) responsibilities under the packaging Directive, were recently examined by Perchards and FFact Management Consultants (Perchards and FMC, 2004). While direct application of systems managing packaging information flows and compliance control may not always be possible or, indeed, appropriate, for example due to the substantially longer average life of an item of EEE than that of packaging, the report highlights some key issues associated with data management, assumptions and projections, and scaling up statistics in the context of National reporting requirements. Based on these findings, the report recommends following the Dutch model for packaging, whereby NACE codes, turnover and tonnages of packaging places on the market are reported. The NACE codes determine in which sector the company is active, the total turnover per sector is compared with that for the sector as published by the National statistics office (the CSO) and this in turn provides an indication of the coverage of the survey i.e. how representative

the figures are of the overall packaging market. This model was applied in Ireland and, while the report notes the CSO figures do not provide a perfect fit for the scaling-up exercise, they were viewed as close enough to make this a viable approach.

Market data is not likely to be used by individual producers or treatment operators for the purposes of reporting on collection and treatment targets for WEEE; this information is relevant to sales, as distinct from arisings of end-of-life products and, as noted above, the time lapse between the two can be substantial. However, such information may have a role to play in terms of compliance monitoring and/or crosschecking national waste statistics. This was demonstrated in the study conducted on behalf of the Scottish Research Executive (Entec UK Ltd., 2001). The study undertook to determine WEEE arisings in Scotland and the fate thereof, and to produce a database for recording and processing of WEEE arisings. Most information was gathered by way of questionnaires and direct contact with retailers, manufacturers, materials recyclers and local authorities; however, response rates from retailers and manufacturers were “very poor,” and crosschecking using data modelling based on retail sales statistics collected from various market research reports was found to supplement and/or give confidence to some of the data obtained. Similarly, while a study was recently conducted with the aim of developing a methodology of determining packaging placed on the market in Ireland (Perchards and FMC, 2004), the EPA intends to maintain the existing methodology, which is based on waste arisings, as a crosschecking mechanism (Skovgaard *et al*, 2004).

Based on the 2001 NWD, record keeping and reporting of packaging waste statistics appears to be improving; however, the aforementioned Perchards/Fact Management report highlights ongoing issues regarding the availability, accuracy and comparability of data (Perchards and FMC, 2004). The problem is observed across Europe but was seen to be particularly pronounced in Ireland. Sources or reasons for data gaps included incompatible measuring systems and a lack of detail in local authorities’ reports. This is backed up by the aforementioned report by the European Topic Centre on Waste (Skovgaard *et al*, 2004). The report suggests that the division of responsibility for monitoring and control of the packaging Regulations in Ireland among central Government, 29 local authorities and five city councils is likely to result in differing practises (Skovgaard *et al*, 2004).

It is notable that local authorities have reported difficulties with both the EPA and Repak reporting requirements, noting that these are complex, confusing and very time-consuming (pers. comm., C. Clancey, 2005). The difficulty with this, however, is that the information requested in the EPA and Repak reporting systems is generally necessary in order to monitor performance

and in some cases regulatory compliance, as well as for the purposes of financial control i.e., charging producers and paying recycling contractors. Therefore, while the simplest reporting system possible is desirable, any reporting associated with producer responsibility legislation and/or involving specified recycling and recovery targets is likely to be somewhat complex as a matter of course.

2.4.5 WEEE management in Ireland

The 2001 NWD report (Meaney *et al*, 2003) identifies two sectors of the recycling industry involved in WEEE handling: 1) shredding and dismantling organisations and 2) specialist recyclers. Information from the former specifically regarding WEEE was not available for the 2001 NWD; obviously, this will have to change with implementation of the WEEE Directive.

Specialist recyclers are further distinguished in the 2001 NWD between those who export whole items/products abroad for recycling, those who extract valuable components and materials for recycling and those who refurbish equipment for reuse. In addition, a 2001 EPA topic report on WEEE identifies demanufacturing as a common method used in the Irish WEEE industry (Wilkinson *et al*, 2001*b*). For the purposes of the distinctions made in the 2001 NWD, this might be considered “those who extract valuable components and materials;” however, the NWD indicates this is done for the purposes of recycling, while the topic report notes that components may be repackaged and resold. Regardless of these distinctions, the 2001 NWD only provides data on the total amount of WEEE recycled by specialist recyclers and of that, the amount that was exported.

Information gathered for the 2003 National Waste Database Interim Report (Collins *et al*, 2004) identified 20 operators involved in the management of WEEE. A telephone survey conducted as part of the recent collection trials project in Ireland (Wilkinson and Duffy, 2003) found that there were 35 companies in Ireland involved in the recycling of one or more types of WEEE, with a further eleven in Northern Ireland. The Irish companies identified in the project ranged from scrap metal merchants to small charitable organisations involved in refurbishing specific items on a small scale.

As reflected in Table 2.9 below, several companies contacted during the collection trials telephone survey indicated they use a number of avenues for processing WEEE.

Table 2.10
Processing routes used by WEEE recycling companies in
Ireland and Northern Ireland (Source: Wilkinson and Duffy, 2003)

Processing Route	Number of Companies (Of 46 surveyed)
Refurbish	5
Resell in Ireland	3
Transfer within Ireland	13
Export whole for recycling	20
Export whole for resale	6
Dismantle in Ireland	9
Export components for recycling	11
Export components for resale	6
Export materials	10

As previously discussed, the current practice of exporting WEEE for treatment in other countries introduces a significant variable in the context of monitoring and compliance control (Ansems and van Leeuwen, 2003). The Irish collection trials report also notes that companies often “cherry-pick,” removing valuable components and materials before transferring less valuable and more problematic components to locations both within Ireland and to overseas facilities (Wilkinson and Duffy, 2003).

The potential implications of the fragmented waste industry in Ireland as regards information flows are obvious. The current practices used for managing Irish WEEE not only involve various options for processing, the options themselves highlight the importance of distinguishing between reuse or refurbishing WEEE and what would be considered recovery or recycling activities. Collection trials conducted in Ireland (Wilkinson and Duffy, 2003), as well as a report prepared for the Dutch Ministry of Spatial Planning, Housing and the Environment (Ansems and van Leeuwen, 2003) note that the varying and at times subjective definition of terms such as “recycling,” “recovery” and “disposal” may (further) limit the reliability of information submitted by various sources.

2.5 Evaluating the options for reporting and compliance control in Ireland

2.5.1 Potential role of Government; regulatory instruments and non-legislative incentives or voluntary initiatives

The WEEE collection trials report (Wilkinson and Duffy, 2003) recommends that specific recycler reporting requirements be developed under (Irish legislation implementing) the WEEE Directive. It also recommends a standardised national monitoring method; however, whether this would require legislation or even be led by the Government, as opposed to an industry-led initiative, requires further consideration. The draft WEEE taskforce report (DEHLG, 2004a) also recommends that provision of information should be made obligatory for all producers, regardless of whether they are members of a collective scheme, as well as for local authorities and waste management enterprises. Again, this will need to be examined further in order to identify the type and format of information, which may be available and/or required from the respective stakeholders.

The draft WEEE taskforce report suggests a centralised, preferably web-based national reporting system linked to waste permits and licenses (DEHLG, 2004a). Web-based reporting would appear to be an option worth exploring; however, the link to waste permits and licenses needs to be examined closely to ensure it captures all relevant stakeholders. In addition, any such system should be compatible with, if not directly linked to other reporting systems. For example, the 2001 National Waste Database (Meaney *et al*, 2003) also recommends a national web-based system for use at local authority level to collate and manage information on waste generation, collection, transport, authorised collectors and facilities and regulatory actions.

At a recent recycling and waste management exhibition, the Development Director of a large UK municipal services contractor suggested that municipal authorities appoint dedicated staff to handle measurement in a way that ensures data consistency and integrity (Edwards, 2004). He also suggests that authorities develop a successful partnership with their service providers i.e., waste collectors and treatment operators to work together on collecting and analysing this important information. This was presented in the context of instances where municipal services are privatized or outsourced; however, it could pertain to any relationship between contracting parties, including local authorities, collective schemes and/or WEEE treatment operators.

2.5.2 Potential role of producers or collective schemes

As previously indicated (Section 2.4.3), there have been at least three expressions of interest in forming a collective scheme for the purposes of implementing the WEEE Directive on behalf of participating producers/members in Ireland. Details of how the scheme will operate and who will participate are generally unclear at this stage. Ideally, the system will enable a relative centralisation of the collection and management of all or a majority of WEEE in Ireland; at a minimum, that which is collected at central collection facilities i.e., local authority collection sites and retail outlets. Clearly, the operation of collective schemes requires consideration in the context of reporting and, conversely, the schemes must consider any reporting requirements placed upon them or their members.

Even if collective schemes are to be introduced in Ireland, the Directive requires Member States to keep the option of self-compliance open to producers. Technically, this need only apply to new WEEE i.e., that which is placed on the market after 13 August 2005, as historical WEEE is to be financed collectively by all existing producers. Whether the proposed schemes will make this distinction and/or only serve to manage the collective i.e., historical proportion of WEEE is unknown. Furthermore, the collective financing provisions in the WEEE Directive relate only to household WEEE; as such, collection and recycling of B2B WEEE will likely continue to be arranged as it is currently, on a case-by-case basis.

A system in the Netherlands involves the submission by self-complying producers of declaration forms on quantities placed on the market and quantities recycled to an independent accounting firm (Wilkinson and Duffy, 2003). The use of such a system in Ireland will again depend on the overall measures taken in Ireland to implement the WEEE Directive; however, if confidentiality and a certain degree of autonomy can be maintained by operating this way, such a concept may provide an incentive to producers who are considering individual compliance to participate in a collective scheme which, from the Government's perspective would generally be easier to administer and regulate.

2.5.3 Consideration of waste operators

A study of WEEE arisings in Scotland (Entec UK Ltd., 2001) suggests that the option of developing fewer large, centralised material recycling facilities for WEEE is preferable to several small to medium size facilities. This is presented in the context of observations regarding the number of facilities that had closed due to lack of material, but also carries with it the implication that fewer facilities would ultimately result in more robust data i.e., fewer,

potentially conflicting data sets would result and they would be easier to crosscheck. How one might incorporate this principle into an Irish reporting system – without necessarily and perhaps artificially limiting the number of facilities, deserves further attention. For example, perhaps treatment facilities in a particular region, working under a “lead” facility or otherwise working in cooperation, such as in association with a collective scheme could devise a system to consolidate information and report collectively. Similarly, a group of, or perhaps all treatment operators could report to a single, third party organisation tasked specifically with the reporting function.

2.5.4 Conceptual models: waste and material flows

As reflected in previous examinations of waste and material flows associated with packaging and ELVs (discussed in Section 2.4.1), modelling serves as a useful means of further evaluating a potential WEEE reporting system. Material flow diagrams and process trees relating to various aspects of WEEE management enable a comprehensive evaluation of different scenarios and they assist in identifying potential sources of information and specific areas where reporting/monitoring for the purpose of compliance control will be required.

It is important to note that in the case of packaging, the waste is relatively homogenous; process trees for WEEE will undoubtedly be significantly more complicated due to the variety of EEE products, the materials and components they comprise and the treatment options/technologies available, including reuse. The latter is a particular poignant example of the differences with packaging; reuse is not typically an option for packaging by the time it enters the treatment system. As such, the ELV material flow diagrams are a more useful model for WEEE.

Analysis carried out as part of a study to examine potentials for projecting future WEEE arisings (Crowe *et al*, 2003) provides interesting insight regarding the various material streams and information arising in the context of WEEE management systems. WEEE quantities are analysed using a four-phased model, based on the inputs and outputs associated with all unit processes and flows within a defined boundary. The model is designed with clear mathematical rules and features and the flow of different material streams in each of the unit processes (phases) are expressed as formulae. Material flows associated with each of the four phases can be summarised as follows:

Table 2.11
Four-phased material flow model for EEE/WEEE (Source: Crowe *et al*, 2003)

Phase		Material streams
I	Production/sales	Input = production + import + re-use of collected WEEE – treatment/disposal of non-saleable EEE Output = consumption + export
II	Consumption (use)	Input = output sales – export Output = WEEE generated
III	Collection	Input = WEEE generated after consumption + import of end of life EEE Output = end of life goods transferred to disposal/treatment/re-use + export
IV	Treatment/disposal	Material streams are influenced heavily by the composition of WEEE and will ultimately depend on the processes/technologies used

In terms of the treatment/disposal phase (Phase IV), a description of the substance flow method used in the study identifies the following four steps, which are required to compile necessary data on material streams:

1. Define system boundaries: the system starts with the treatment of WEEE and ends when treatment has concluded.
2. Define unit operations within the system boundaries: unit operations are technical processes such as dismantling, shredding or metallurgical treatment. In the case of recycling, the system can be complex and different; specific treatment schemes (series' of technical processes) can be used for different product types/categories or even different products.
3. Describe the transfer of materials in the various unit operations: this is to account for inputs into treatment operations other than the WEEE being treated, such as process materials required to run the process and all outputs, including losses to the environment.¹⁶
4. Carry out calculations e.g. ratio of recovered or recycled material per total quantity treated.

¹⁶ Based on the information presented in the study, losses to the environment are not anticipated to be significant in terms of calculating recycling and recovery rates. Nonetheless, these are very significant in terms of overall environmental impacts and conformance with relevant regulatory controls e.g. waste and/or IPPC licenses.

Many of the considerations highlighted in the above steps need to be examined further in the context of the management of Irish WEEE.

2.6 Conclusions of the literature review

Many of the WEEE Directive's provisions are likely to have a downstream impact on parties or individuals other than "producers," as defined in the Directive. Despite the far-reaching implications, awareness would appear to be lacking.

Lack of awareness could lead to the provision of incomplete, incorrect and/or incompatible data by waste treatment operators. This is particularly true with respect to the ten categories of WEEE specified in the Directive, which can at times be confusing or unclear. In addition, retailer awareness requires specific attention.

While the simplest reporting system possible is desirable, any reporting associated with producer responsibility legislation and/or involving specified recycling and recovery targets is likely to be somewhat complex as a matter of course. However, the nature of detailed or specific measurements of EEE use and WEEE recovery and recycling, and the associated inaccuracies and non-comparability, raises questions regarding their value as monitoring tools. Trend analysis, qualitative assessment and other forms of monitoring may present a better assessment of the effectiveness of the measures taken to implement the WEEE Directive than extremely detailed and perhaps costly regulatory regimes. What appears to be more important is that those evaluating the data possess a degree of familiarity with the information and, critically, that the necessary crosschecks and auditing procedures are in place.

The EPA waste questionnaires raise several questions and there appears to be no consistent, direct link between these, other EPA reporting requirements and local authority reporting requirements. Returns on questionnaires and annual environmental reports and waste-related questionnaires have been reported to be poor and/or inconsistent, both in quantitative and qualitative terms and the potential for duplication, errors and omissions again appears to be high. Some of these issues have received further consideration through data validation exercises by the EPA; however, with the exception of packaging waste, these are generally undertaken in a broader context and specific focus on WEEE does appear to be warranted. In turn, development of a comprehensive WEEE reporting system could contribute to improving waste statistics reporting in Ireland, generally.

A centralised system for reporting is desirable. Consideration of the extent to which data points can be consolidated or otherwise minimised will reduce the potential for errors, omissions or overlaps. Similarly, the division of responsibility for monitoring and control amongst authorities should be minimised. In this context, web-based reporting would appear to be an option worth exploring; however, links and/or conflicts with existing regulatory regimes, such as waste authorisations needs to be examined closely to ensure it captures all relevant stakeholders and that it is compatible with, if not directly linked to other reporting systems.

Increased awareness of and information sharing between industry and regulators will enable greater and collective consideration of issues such as those outlined above. Reporting through a collective scheme or other third party acting on behalf of the relevant operator(s) would appear to be a potential option for consolidating information; however, this will ultimately depend on how the WEEE Directive is implemented in Ireland, and anyone wishing to comply on an individual basis will also need to be considered. In light of this as well as concerns over confidentiality, operation of a “black box” or similar means of establishing an independent data/reporting function or body should be explored. Based on the potential role of and impacts upon a collective WEEE scheme(s), and the critical role of the EPA, a clear understanding by all parties of their respective plans, requirements and concerns would greatly facilitate the formulation of an acceptable, workable reporting system for WEEE.

3.0 METHODS

A combination of interviews and surveys were used to further explore the options considered and to test some of the conclusions drawn based on the information presented in the literature review. In addition, new information and plans or proposals for methods and systems for managing WEEE within Ireland, as well as in other EU Member States, have been considered as they have emerged.

In light of the still pending implementation of the WEEE Directive in Ireland and the rest of the EU, and in lieu of any concrete and/or comprehensive plans or proposals for WEEE implementation in Ireland, modelling is also used to demonstrate various scenarios for waste, materials and information flows and to extrapolate potential systems for record-keeping and reporting.

3.1 Interviews

3.1.1 Aim of interviews

Interviews were considered as the most practical first step towards confirming and/or gaining a better understanding of the key issues associated with the record-keeping and reporting on WEEE management, current levels of awareness with the WEEE Directive and plans, proposals and/or perceptions regarding WEEE management practices and implementation of the Directive in Ireland, generally.

3.1.2 Parties interviewed

Representatives from both the public and private sectors were interviewed. Parties interviewed were selected by the author based on their involvement in the implementation of the WEEE Directive or management of waste including WEEE. Public sector representatives included Irish as well as other Member State authorities and WEEE recyclers based in Ireland as well as in other EU Member States were interviewed. No WEEE producers or representative bodies were interviewed; although ultimately responsible for ensuring many of the obligations set out in the Directive are met, public authorities and waste managers were viewed as the parties more likely to be involved in the compilation, reporting and/or verification of data

3.1.3 Structure

The structure of the interviews was left open. This was due to the varied nature of the individuals interviewed and the organisations they represent. However, key issues addressed in all interviews included:

- Current method(s) of record-keeping and reporting and reasons or drivers behind these e.g., customer demand, regulatory requirements, company policy, etc.;
- Discussion of the ten WEEE categories in the context of current practice, most notably collection and management of mixed WEEE;
- Current regulatory requirements, including record-keeping and reporting and what might be considered reasonable or feasible in the future in this regard;
- Relationships with suppliers and sub-contractors, including the possibility of requiring additional information and reporting from these with respect to the management of WEEE.

In addition, information obtained in interviews assisted in refining the questions included in questionnaires sent to waste treatment operators and waste collectors in Ireland, discussed below.

3.2 Questionnaires

Questionnaires were developed with a view to gaining a better understanding of the current practices and capabilities of Irish companies involved in WEEE management.

3.2.1 Aim of the questionnaires

As noted in the Literature Review (Section 2.0), a telephone survey of companies involved in recycling WEEE was conducted as part of the recent collection trials project in Ireland (Wilkinson and Duffy, 2003). The collection trials survey focused on the processing routes for WEEE in Ireland i.e., what happens to the WEEE and how much of this takes place in Ireland versus sending it abroad.

The questionnaires sent out as part of this study aimed to ask companies specifically about their willingness or ability to monitor, quantify and report on the ten categories specified in the WEEE Directive regardless of how, where or whether treatment is carried out. Questions regarding processing routes for WEEE were also included; however, this was in order to give context to, qualify and/or to better understand the responses to subsequent questions. Companies were also

asked how they are or, if required, would be able to distinguish between the ten WEEE categories, and they were asked to comment on any limiting factors to doing this.

3.2.2 Target audience

Two questionnaires were sent out; one to holders of Waste Collectors Permits under the Waste Management (Collection Permit) Regulations, 2001 and one to holders of Waste Permits under the Waste Management (Permit) Regulations, 1998. Most of the questions were the same in both questionnaires; however, some were tailored to the specific audience for which they were intended. Copies of both questionnaires are included in Appendix V.

Both audiences are viewed as important potential sources of information, particularly in light of the Directive's targets pertaining to both collection and recycling. However, it is at present unclear whether and to what extent each of the two audiences will have a role in the system ultimately devised to fulfil the various reporting requirements under the Directive. For example, one must consider whether collectors of waste would be an appropriate source of collection data, versus obtaining this information from actual collection points e.g., CA sites, retail outlets, etc. Responses to the questionnaire by waste collectors might help to answer this and other questions raised as the system is developed.

It was also hoped the questionnaire might serve to raise awareness. For example, not only would questions force respondents to think about the issue (or so it was hoped), a list of examples of products falling under each of the ten WEEE categories specified in the Directive was included with the questionnaires; for some this might have been the first time they had been made aware of the categories and/or the types of products included within each of them.

The covering letter to the questionnaire stressed the importance of receiving sufficient responses and respondents were encouraged to reply in lieu of not responding at all, if even anonymously, in confidence or partially. Contact details were requested in the questionnaire but this was again specified as voluntary information.

3.2.3 Mailing list selection criteria

Registers available on the EPA's website (www.epa.ie) were used as the basis for the final mailing lists for the surveys. These consist of all Waste and Waste Collection Permits issued by local/nominated authorities; the authorities are required to notify the EPA of the permits they issue on a regular basis. It is important to note that holders of EPA Waste Licenses were generally not included in the questionnaire; however, any of the 35 recycling organisations

identified in the survey undertaken as part of the WEEE collection trials project (Wilkinson and Duffy, 2003) that were not included in the Waste Permit Register were added. A number of these are identified by the EPA (www.epa.ie) as being Waste License holders.

The Waste Permits Register had last been updated in December 2004 and the Waste Collection Permits Register had last been updated in February 2005. The former included 950 entries, while the latter included nearly twice this number. As such, both lists had to be narrowed down for practical reasons i.e., printing and postage, time to analyse returns, etc. and also with a view to eliminating as many of permittees as possible who clearly have no involvement in the collection or management of WEEE. The primary means for doing this was to examine the types of waste handled, as reported in the Registers. The processes undertaken to do this for both Registers are described below.

3.2.3.1 Waste Permits

The first step in reducing the Waste Permit list was to limit it only to those where the types of waste handled included metal, electronics, mixed municipal waste and bulky waste. In addition, permits where the types of waste handled were not indicated (e.g., reference instead to a condition or an Annex to the relevant Permit) were maintained. From the resulting list, the following were eliminated:

- Facilities where composting was listed as the sole activity;
- Facilities where conditions are clearly indicated and/or the activities specified make it clear that WEEE would not be accepted or managed there e.g., recovery of waste with agricultural benefit;
- Facilities managing a specific type of metal waste that is clearly not WEEE e.g., metal packaging; and
- Facilities managing only waste with an EWC code beginning in 17, of which there were several, as refers only to *construction and demolition waste (including excavated soil from contaminated sites)*.

As regards facilities managing specific, non-WEEE metal wastes, those managing ELVs were maintained. This was because the types of wastes handled at some of the facilities permitted for management of ELVs included references to “other metals” or “small amounts of appliances,” which lead the author to conclude that management of metal rich items and WEEE in particular at such facilities may be common practice.

The resulting list included 217 companies or individuals or companies who hold Waste Permits and questionnaires were mailed out to these.

3.2.3.2 Waste Collection Permits

Due to the number of entries and the quality of information contained in the Waste Collection Permit Register, reducing this list to a manageable number was much more subjective. In general, the following were removed from the list:

- Permits where the waste collected clearly does not/would not include WEEE e.g., construction and demolition waste, soil and stones, etc.;
- Most permits where the types of waste collected were not indicated and a condition or an Annex to the relevant Permit was referenced instead, with the exception of those whose trading name would imply a potential to be involved in the collection of WEEE e.g., XYZ Metal Recyclers;
- Most companies/individuals collecting only industrial waste, again with the exception of those whose trading name implies a potential to be involved in the collection of WEEE.

In addition, any clear duplicates were eliminated. These included companies or individuals holding permits from more than one collection authority as well as companies/individuals who also hold Waste Permits (the latter received the questionnaire addressed to Waste Permit holders).

The resulting list included 245 companies or individuals or companies who hold Waste Collection Permits and questionnaires were mailed out to all of these.

3.3 New and emerging information

Information referred to or obtained through the literature review, interviews and questionnaires conducted in association with this research often included reference to other, potentially relevant information. Where necessary, further research on certain information or issues highlighted in the course of other work was subsequently carried out.

Progress on implementation of the WEEE Directive in each of the Member States is ongoing. Although the Directive was supposed to be transposed into National legislation by 13 August 2004, only three Member States (Greece, The Netherlands and Finland) notified the European Commission of transposition on time and only one of these (Greece) was officially acknowledged by the Commission. As of 16 March, 13 of the 26 Member States had notified the Commission of its legislation (pers. comm., M. Klingbeil, 2004).

Measures to implement the WEEE Directive throughout Europe and in Ireland in particular, both by regulatory authorities as well as the private sector, were monitored up until May 2005. Relevant information including draft Irish legislation transposing the Directive was reviewed as it became available and in some cases stakeholders were contacted. Various issues associated with implementation of the Directive were also discussed with representatives of other Member States. In addition, the author participated in meetings of the TAC on waste and the Irish WEEE taskforce, workshops and seminars on the WEEE Directive and meetings between the Department of Environment, Heritage and Local Government and various stakeholders e.g., industry representatives, retailer associations, etc.

4.0 RESULTS

4.1 Interviews

4.1.1 Private waste operators

4.1.1.1 European Electronics Recycling Association (EERA)

The author met with Mr. Norbert Zonneveld, EERA Executive Secretary on 30 December 2004 (pers. comm., N. Zonneveld, 2004b).

Background

EERA is a non-profit organisation based in the Netherlands. The organisation promotes the interest of recycling companies who are treating WEEE in Europe and currently includes ten members who treat more than 400,000 tonnes of WEEE annually (www.eera-recyclers.com). Mr. Zonneveld had written to the European Commission's TAC on waste, in light of that committee's discussion of a working document on compliance rules and data formats associated with the WEEE Directive. The letter encouraged the Commission, in cooperation with the TAC, to address a number of outstanding issues associated with the document, such as: to whom, by whom and how often information should be reported; the means of characterising waste and materials streams, including methods and frequencies of conducting sampling or other characterisation studies; provision of necessary evidence of recycling, including ensuring treatment is environmentally sound; and calculation of recycling and recovery percentages (Zonneveld, 2004a).

Requirements for WEEE treatment operators

With regard to the register of producers (Art. 12(1) of the WEEE Directive), Mr. Zonneveld suggested that in many cases "treatment organisations" (collective schemes) would register on behalf of their member producers. He suggested that details regarding the plans or proposals for the treatment of WEEE should be made available as a condition of producer registration, regardless of how or by whom registration is undertaken. He also suggested that tenders between treatment operators and producers (including collective schemes working on their behalves) for services associated with WEEE management should also be made available as a condition of registration and should include certain minimum requirements. ISO certification was suggested as one minimum requirement and he also noted that for EERA members/membership, primary

treatment operators must be located within the European Union. In addition, export of whole, untreated WEEE outside the EU is not allowed.

Conditions of contracts

Mr. Zonneveld made a clear distinction between conditions of tenders (i.e., the specifications and/or selection criteria provided to all prospective treatment operators in advance of entering into a formal contract) and conditions of the actual contracts themselves, noting that the latter often contains commercially sensitive information. The position of EERA is that the provision of copies or disclosure of details in contracts should not be required as a condition of registration and that it could instead be assumed that minimum requirements or conditions set out in tender documents are incorporated into contracts.

Following on from this, Mr. Zonneveld suggested that enforcement authorities and/or policing bodies should review the conditions of tender documents for the necessary provisions to ensure, *inter alia*, environmentally sound treatment, accurate and auditable record-keeping and consistent, reliable reporting systems. Selected tenderers should be audited to ensure the conditions are, indeed, being met. Mr. Zonneveld noted that current practice in Europe is for accountants or Government officials, as distinct from producers or the collective scheme to which they belong, to audit tenderers, the latter often in association with a waste and/or operating permit.

Legal clarifications and consistency

The importance of clear and consistent use of terminology such as “recovery,” “recycling” and “disposal” was highlighted both in Mr. Zonneveld’s letter and during the interview. For example, Mr. Zonneveld noted that technologies for recycling plastics, as distinct from the more common current practice of energy recovery are increasingly available and are improving and that this distinction must be acknowledged in the calculation of rates of recycling and recovery i.e., energy recovery should not automatically be considered recycling. It was also suggested that examples of how recycling (recovery) rates are to be calculated be provided, particularly for difficult situations such as where a number of product categories are being treated together and/or with other, non-WEEE waste streams. This latter point will be addressed if and when the European Commission finalises and publishes its reporting protocol, discussed in Section 2.1.2.

Suggested approach

Taking into consideration many of the points made above and the experience in the Netherlands in establishing a national system for WEEE collection and recycling, Mr. Zonneveld suggested that as a first step, authorities should set minimal information requirements and focus instead on fundamental issues such as ensuring operators are appropriately permitted and are otherwise operating in compliance with relevant legislation, with a view to trouble-shooting and identifying key issues and problems as a reporting system(s) is put in place.

Discussion

The suggestion that only tender documents, as opposed to actual contracts should be required by authorities may be reasonable in principle; however, adequate checks would be required to ensure this is not being exploited. In addition, minimum requirements set out in tender specifications must somehow be proven in the actual operations/activities undertaken as part of the agreed contract and a certain degree of accuracy and the ability to rely on data that is reported is going to be required.

4.1.1.2 Fingal Recycling

The author met with Mr. Cathal Delaney, Managing Director on 10 January 2005 (pers. comm., C. Delaney, 2005).

Background

Fingal Recycling is a waste management and recycling company based in Ireland. The company processes electronic waste including the recovery of integrated circuits from printed circuit boards, recovering precious metals and brokerage of component materials and used equipment. The company aims to recover, re-manufacture and recycle in excess of 90% of materials processed (www.fingalrecycling.ie).

Current practice

The current system employed for tracking and reporting waste and material flows uses serial numbers for company's and client's purposes and EWC codes for the purposes of regulatory reporting. In the future the company plans to implement a standardised, on-line system for all reporting, whereby information is updated continuously and clients can gain secure access to track progress of orders/service based on serial number(s) of equipment. This will involve the use of specially developed software for tracking and traceability.

The company logs all waste volumes on a waste register and provides certification of “correct” destruction & recycling of all waste streams, although this is not thoroughly documented or substantiated. For example, while the company audits its subcontractors (so-called downstream operators), it does not confirm recycling rates or other quantifiable performance criteria, if provided in the first place, so long as the purported treatment method can be qualitatively confirmed in the audit. Similarly, all materials sent to a shredder are counted as (assumed) recycled, and shredder residue or other waste, which is not recovered and is typically landfilled, is not discounted from the figures.

Requirements for treatment operators

Mr. Delaney acknowledged the importance of being able to confirm the performance of contracted or subcontracted treatment operators; however, this was in the context of information security i.e., ensuring IT equipment is properly destroyed, and not in the context of meeting and reporting on recycling targets. To do this, Fingal Recycling audits all of the treatment operators they use to ensure complete destruction of equipment. All of the treatment operators the company uses must hold the appropriate regulatory approvals and Mr. Delaney indicated that based on this the integrity or accuracy of any data relating to actual levels or rates of recycling, should they be required in future, would likely be assumed. Mr. Delaney also noted that all of the treatment operators the company uses are ISO certified.

Information security

The information and level of detail maintained is driven largely by clients’ requirements, which in the case of IT equipment are predominantly related to data security; private-sector clients i.e., EEE manufacturers often require an end-of-life agreement, whereby hard drive and data destruction are guaranteed and the treatment type/method is specified e.g., recycling, shred for disposal, etc. Other clients, such as local authorities, do, however, require more specific data, for example the weight of the WEEE Fingal Recycling manages for them based on specified categories.

Conditions of contracts

Contrary to Mr. Zonneveld’s (EERA) reference to the provision of tenders, as distinct from contracts, Mr. Delaney indicated that it is reasonable to require that details of ‘primary’ recycling contracts i.e., direct contracts with producers, collective schemes and other suppliers of WEEE be provided as a condition of regulatory permits or authorisations. He also indicated it would be

reasonable to require that permit holders have access to details of any subcontracts held by their contractors, subcontractors or other associated operators located in other countries, although he suggested it would not be reasonable to require that such information be submitted directly to regulatory authorities.

Other possible approaches

If required or requested, the company could count individual items of WEEE. Weighing individual items is, however, not seen as reasonable or in many cases feasible and the company has concluded through its own research and practical experience that the use of average/standard weights for certain items is not a reliable or representative means of estimating quantities of WEEE. If use of average/standard weights were to be allowed, these would have to be standardised at a national level to ensure consistency and to avoid anti-competitive practices.

Discussion

Under the “primary contracts” system suggested by Mr. Delaney, whereby only certain details would be provided to regulatory authorities, Irish operators would have to satisfy themselves that the service and information they obtain from third-party operators, including those in other countries, meets all relevant regulatory requirements and is accurate. As such, data provided to primary contract holders by their subcontractors or partners, including actual levels or rates of recycling would have to be accepted as accurate by the authorities in good faith, based on the primary contractor’s submission. Without some additional assurance, for example, a comprehensive programme for auditing subcontractors and requirements for ISO or EMAS certification, it is difficult to see how regulatory authorities would accept such a “good faith” approach.

4.1.1.3 Electronic Recycling

The author met with Mr. Brendan Palmer, Managing Director and Ms. Linda Palmer, who is responsible for much of the company’s record-keeping and regulatory reporting on 10 January 2005 (pers. comm., B. Palmer and L. Palmer, 2005).

Background

Electronic Recycling is a waste management and recycling company based in Ireland. The company specialises in the disposal of obsolete computer, telecommunications and other electronic office equipment e.g. IT equipment, photocopiers, etc. The company’s customers are primarily businesses; however, in anticipation of the forthcoming implementation of the WEEE

Directive the company is planning to expand its services to include domestic electrical and electronic waste.

Current practice

Record keeping and reporting is driven primarily by pricing and costs. Customers are charged per item for computer equipment and generally by total weight of an order (e.g., a container, load or pallet) for all other equipment. The company records the product type (e.g., fax, server, photocopier) and the total quantity and weight of each type of equipment managed for each customer. Brands or weights of individual items are not recorded.

Individual items are weighed on occasion to get a general idea of unit costs. The types or categories of WEEE currently recorded by the company include the following:

- IT equipment, further broken down as desktop printers, large printers, monitors, hard drives/central processing units (CPUs), keyboards and mice;
- Cables and partial equipment such as CPUs with missing motherboards;
- White goods;
- Brown goods, including a specific sub-category for televisions;
- Refrigerators.

Quantities managed of the latter three types of WEEE are presently minimal; however, as noted above, the company intends to step up its operations to include all domestic WEEE.

At least one of the facilities to whom Electronics Recycling sends WEEE (IT equipment) provides a material analysis to the company, whereby the quantity, weight and, for the purposes of payment, value of different materials and components from the WEEE are itemised e.g. motherboards, adaptor cards, cables and steel.

Issues with current regulatory reporting systems

Ms. Palmer indicated that the EPA questionnaire used to compile statistics for the National Waste Database is problematic, particularly with respect to reporting for the WEEE Directive. She noted that the questionnaire is too generic, in that waste streams/types are specified only by EWC codes, of which there are only four that apply or are appropriate to use in describing most WEEE¹⁷ and two that apply to the WEEE the company is permitted to accept.¹⁸ In addition, the

¹⁷ These include: 20 01 21, *fluorescent tubes and other mercury-containing waste*; 20 01 23, *discarded equipment containing chlorofluorocarbons*; 20 01 35, *discarded electrical and electronic equipment other than those*

questionnaire does not include any provision to report reuse or refurbishment of equipment; this is significant, as the company uses parts and components from several pieces of IT equipment that arrive at the facility to repair or rebuild a single item.

Similar limitations exist for regulatory reporting to Fingal County Council, from whom the company has a Waste Permit. Mr. Palmer provided a copy of the permit for the company's facility in Finglas. The following information, *inter alia*, for each load of waste arriving at and departing the facility must be recorded, and a summary of this information must be provided to Fingal County Council annually:

- Description of the waste, including the relevant EWC code;
- Total quantity of waste, recorded in tonnes;
- Facility or site from which the load originated.

In addition, the company must report all locations and waste facilities including, where applicable, waste permit or license number to which waste from the Electronic Recycling facility is delivered. This and the requirement to report the origin of waste would be the type of information required at all stages of waste treatment and transfer in order to facilitate reporting through the entire treatment chain.

As with the EPA questionnaire, use of EWC codes in reporting to Fingal County Council limits the extent to which WEEE can be characterised. In addition, while all relevant EWC codes must be reported, the only weight that is reported is that of the entire load. Therefore, the quantity of each individual type of waste is not reported to the authorities, although, as noted above, Fingal Recycling does record this type of information.

Other possible approaches

Mr. Palmer was asked whether and to what extent the current system for record-keeping and reporting – namely, counting everything arriving at the facility and measuring the total weight of each type/category of equipment would be possible if/when the facility began accepting higher volumes of mixed WEEE, such as that coming from households. He indicated the company could, if required, conduct waste stream analyses, whereby a select number of loads arriving at the facility are analysed to determine the quantity of each of the ten categories specified in the WEEE Directive. It was acknowledged that seasonal variations might require this to be done at

mentioned in 20 01 21 and 20 01 23 containing hazardous components; and 20 01 36, discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35

various times throughout the year e.g., semi-annually or quarterly. Mr. Palmer also suggested that collection facilities would be the most logical place to count and classify items but that an average weight of each product would in many cases be required, because it is not likely that the WEEE would be kept segregated into the ten WEEE categories during subsequent transport. He suggested the critical issue is the cost associated with counting and classification of WEEE and suggested that this alone is an argument for establishing a standard protocol for compositional surveys to be used by all WEEE treatment facilities.

Legal clarifications and consistency

Another issue highlighted was the definition of waste. Electronic Recycling often receives equipment that is in working order and, as referenced above, they will repair and refurbish some equipment or will pass it on to someone else for this purpose. The company sought to have such equipment excluded from any waste-related requirements, namely, the need for a collection permit and/or hazardous waste movement notification to transport it; however, the permitting authorities disagreed with this. In addition, some of this activity creates a gap in the company's mass balance, as the total weight of WEEE entering the facility can be greater than the weight of waste that leaves the facility if components from WEEE are used to make a saleable product.

Discussion

In principle, the materials analysis information provided by one of Electronics Recycling's subcontractors is the type of information that will be required for reporting under the WEEE Directive. However, the facility in question only accepts IT equipment. This not only limits the variation in the waste stream and the associated options/outlets for processing, this type of equipment and the associated components and materials tend to have a higher recovery value, making thorough documentation a more cost-effective operation. It is unclear how or whether the facility could provide this type of information if mixed categories of WEEE were supplied or, conversely, whether a total quantity of materials specified on a materials analysis form could somehow be apportioned between various categories of WEEE supplied in a mixed load.

¹⁸ According to the company's waste permit, these are 20 01 35 and 20 01 36.

4.1.1.4 KMK Metal Recycling

The author met with Mr. Kurt Kyck, Managing Director and Ms. Charlotte Walker, Environmental Manager on 10 January 2005 (pers. comm., K. Kyck and C. Walker, 2005).

Background

KMK Metal Recycling is a metal recycling company based in Ireland. The company collects and processes metal-containing waste, including WEEE from nine of Ireland's eleven waste management regions. In addition, the company holds the contract to collect, store and arrange shipment of waste refrigerators and freezers from nearly all of the country's local authorities. These are shipped to M. Baker Recycling in the United Kingdom, which operates the contract for an all-Ireland refrigerator recycling scheme established by the Irish and Northern Irish governments. A representative of this company was also interviewed and a summary of that discussion is included below under the relevant sub-heading.

Current practice

Customer pricing and cost considerations contribute to the type and detail of information that is maintained by KMK. Customer pricing is based on the total weight of equipment collected and the value of components/materials or, conversely, the cost to dispose of these. In this context, Mr. Kyck indicated that the key driver for most electronics recycling activity is materials, noting that equipment is not seen as a toy or a toaster, but as a quantity of metal, plastic, etc.

Total collection weights are provided to KMK by its collection contractors. These may include a breakdown of the type(s) of equipment included in that weight; however, this is not done on a consistent basis. Examples of types or categories which may be reported include computer equipment, monitors and televisions, small household appliances and large household appliances, the latter of which is generally considered anything that requires two people to lift.

KMK segregates and quantifies incoming equipment according to source or supplier and records this on an Incoming Materials Inspection Form for the purposes of invoicing. The information documented includes either equipment type (e.g., copiers, monitors, fluorescent tubes) or, where the equipment has been partly disassembled or broken down, materials and components (e.g., steel, plastic, printed circuit boards). The gross weight and EWC code of each of these is also recorded. Mr. Kyck acknowledged that at present the majority of WEEE the company handles is office equipment and/or comes from businesses and is therefore relatively easy – and financially possible to document in such a detail.

Most tenders for the collection and management of televisions, monitors and computers require costing on a per item basis and the company therefore uses an average weight of these items, which it obtained from various sources including internal records and other treatment operators, to determine approximately how many are in a given load. For most other equipment the company charges by total weight of the order (e.g., a container, load or pallet).

Other possible approaches

Mr. Kyck suggested that for the purposes of reporting for the WEEE Directive, in his experience customers i.e., sources/suppliers of WEEE could possibly be required to provide a breakdown of the equipment based on the ten WEEE categories in the future. He noted this would be particularly plausible for local authorities, whereby WEEE could be itemised as it is brought to collection sites by the public and/or placed into collection containers. This would be consistent with a recommendation arising from the WEEE collection trials project (Wilkinson and Duffy, 2003) discussed in the literature review (Section 2.0).

At present mixed WEEE such as small household appliances and consumer electronics, of which the company currently receives relatively little, is classified simply as electronic scrap and is not segregated further. In future it is envisaged that segregation will be undertaken along a picking line and will be driven not by the ten categories specified in the WEEE Directive but by options for management and/or associated processing costs or material values. Notably, this was the reasoning behind the six categories suggested by the Irish WEEE taskforce. In this context Mr. Kyck suggested that, for the purposes of reporting in accordance with the WEEE Directive, a particular treatment method or recycling process might need to be accepted or assumed as achieving a certain rate of recovery or recycling. He also suggested that producers are likely to undertake sophisticated “mass balance” exercises, with a view to establishing typical or potential rates of recycling and recovery from their products, and that this might be used as a way of verifying or crosschecking treatment results.

Issues with current regulatory reporting systems

As noted above, the company records the EWC codes of all equipment or materials. This is due to regulatory reporting requirements, including an EPA license conditions requiring the company to keep records of throughput, reporting in association with the company’s nine waste collection permits and the company’s annual in completion of the EPA waste recycler questionnaire. Consistent with comments made during the interview with representatives of Electronics Recycling, Ms. Walker noted that there are a limited number of EWC codes that pertain to

WEEE, and that these are neither consistent nor compatible with the ten categories specified in the Directive. Significantly, Ms. Walker indicated three of the four codes the company uses and has always used for WEEE fall under EWC chapter 16, *wastes not otherwise specified*, as opposed to chapter 20, *municipal wastes including separately collected fractions*. As such, presuming at least some of the WEEE the company handles comes from households, they would appear to be reporting in error; chapter 16 codes are only to be used when the waste, as defined by its origin, cannot be described using any of the other nineteen general chapters contained in the EWC. The company does, however, report fluorescent tubes under chapter 20 (20 01 21, *fluorescent tubes and other mercury-containing waste*).

Also consistent with comments from Electronic Recycling, Ms. Walker noted problems with the EPA questionnaire. Issues she highlighted included the requirement to classify waste as either commercial or industrial, the distinction of which is often unclear, and more recently the requirement to distinguish between recyclable waste and mixed waste within each of these classifications, as much recyclable waste is collected as a mixed waste stream. Furthermore, Mr. Kyck noted the latest (2004) waste questionnaire gives four options for reporting the source of recyclables: 1) civic amenity site; 2) bring bank; 3) household i.e., kerbside collection; or 4) transfer station, noting the latter can double as a collection site. He also referred to the WEEE Directive's distinction of "B2B" WEEE and questioned whether, in the context of EPA reporting this would be synonymous with industrial and/or commercial waste.

Environmental Management System

The company is required to provide information regarding the destination of all waste leaving the premises, including recovery, disposal and transfer facilities, and details of any associated permit or licenses. It also must report details of any exports of waste. Mr. Kyck indicated that KMK has an Environmental Management System (EMS) in place as a requirement of their EPA waste license. As part of their EMS, the company audits the facility in Germany, to which it sends the majority of materials and components from WEEE. He indicated this was an effective means of ensuring a degree of quality, performance and regulatory compliance and suggested that an EMS should be a fundamental requirement of any company or facility undertaking WEEE management. In addition, the aforementioned German facility intends to work with KMK to develop protocols for WEEE disassembly and subsequent materials management, with a view to enabling calculations of recovery and recycling rates.

Discussion

The issue of whether B2B WEEE would be considered industrial or commercial waste for the purposes of EPA reporting does, indeed, require consideration, as does reporting B2B WEEE, generally. In light of KMK's current practice, in which most WEEE is reported under EWC chapter 16 and which the EPA and local authorities appear to accept, perhaps in future use of the chapter 16 codes that pertain to whole WEEE should be restricted for use in reporting B2B WEEE, while use of the chapter 20 codes would be restricted to reporting household WEEE. This would require further evaluation to ensure it is consistent with broader European practice and also that it would not create (further) potential for double counting or other errors.

4.1.1.5 Indaver Ireland

The author met with Mr. Anthony O'Dea, Environmental Manager on 31 January 2005 (pers. comm., A. O'Dea, 2005).

Background

Indaver Ireland is waste management and recycling company based in Ireland and is one of the country's largest managers of hazardous waste. In cooperation with Gandon Enterprises, a social employment company working under the Rehab Partnership, the company recently opened a WEEE treatment facility in Dublin, the first of three planned in Ireland.

Current practice

Indaver Ireland uses a "tracker system" to monitor and record the types and quantities of WEEE managed. The system was designed by the Indaver parent company in light of the company's involvement in hazardous waste management, which carries with it stringent requirements for record-keeping and reporting. The main WEEE streams recorded are cathode ray tubes (CRTs), lamps/lightbulbs, equipment containing chlorinated fluorocarbons (CFCs), and non-CRT/CFC equipment, which would represent everything else. The company also maintains separate information on batteries; however, at present this is only with reference to separately collected streams, as opposed to batteries that are contained within WEEE.

Mr. O'Dea indicated the breakdown above is the extent to which they are required to maintain information for the purposes of regulatory reporting, which relies on the use of EWCs. However, some customers for whom the company manages IT equipment require that not only CRTs be separately reported but also CPUs, leaving everything else associated with the equipment e.g., keyboards and mice for a third, "miscellaneous" category.

Customers are charged per item for televisions and lamps/lightbulbs and generally by total weight of an order or load for all other equipment. The company is charged by the waste operators and processors to whom it subsequently sends waste based on weight.

Mr. O'Dea noted that one of treatment facilities where Indaver sends the WEEE it collects was involved in a project aimed at examining record-keeping and reporting for the WEEE Directive in great detail. Apparec N.V., an Indaver affiliate, is located in Belgium and is part of a network of WEEE recyclers that is working in conjunction with an association of a number of the existing National WEEE schemes, the WEEE Forum, to develop a detailed reporting system. A representative of Apparec was also interviewed and details from that interview are provided below under the relevant sub-heading.

Indaver currently uses Apparec primarily to process televisions and IT equipment. Mr. O'Dea provided examples of the information the company receives back from them. Details reported include:

- The weight and proportion of each individual material or component contained within each type of equipment Apparec receives from Indaver (e.g. CRT glass, cable, plastics and other materials contained in TVs);
- The percentages of each material or component that are recycled, incinerated with energy recovery, incinerated without energy recovery or landfilled (e.g., a recent report indicates 100% of Indaver's PCB-suspected capacitors were incinerated with energy recovery) as well as a percentage of the total waste reported by Apparec in that particular example that this represents (e.g., Indaver's capacitors represent 0.3% of the total amount of waste included in that particular report from Apparec).

With the exception of refrigeration equipment, most large household equipment is currently sent to a metal shredder in Ireland. Mr. O'Dea indicated that for the purposes of pricing, an assumption is made regarding the quantity of metal within the equipment (generally 90% of total weight) and that it might equally be assumed that this is the quantity recovered or recycled. He also noted that the shredder is able to determine the amount of metal, concrete and "fluff" (shredder residue) it produces from a given quantity of input. Input would, however, include other, non-WEEE items such as vehicles and general scrap metal.

Conditions of contracts

At present Indaver does not require specific confirmation/documentation from the waste operators and processors it uses regarding the level of treatment, recycling and/or disposal of the

WEEE it sends to them. However, the company is certified according to ISO standards 14001 and 9001:2000 and Occupational Health and Safety (OHAS) standard 18001 and, in conjunction with its overall environmental and health and safety management systems has formal procedures in place for the approval and monitoring of their suppliers and subcontractors. The procedures include confirming compliance with all relevant legislation, including appropriate permitting/licensure, and compliance with requirements regarding effluent and emission control. In many cases the approval process involves an on-site inspection of the facility/operator in question.

Legal clarifications and consistency

Mr. O'Dea acknowledged the issue highlighted in the interview with Electronic Recycling regarding the definition of waste, noting that some products the company receives may be sent to another facility to be repaired or refurbished. However, based on the company's experience with handling hazardous waste and the risks associated with misclassification, Indaver's policy is to consider these to be waste and, where required to ship them as hazardous waste.

Discussion

The level of detail afforded by Indaver's use of their "tracker system" and the system used by Apparec are fairly resource-intensive, both in terms of the time/personnel commitment and the IT and wider information management requirements. Indaver and Apparec, both of which are relatively large companies, have these resources available; small- to medium-sized companies, such as many of those operating in Ireland, may not have similar capabilities.

The company's use of a metal shredder for processing any of the WEEE it collects can only continue after 13 August 2005 if the shredder is able to report performance specifically with respect to WEEE. To this end, the European Commission's draft reporting protocol (European Commission, 2004b), discussed in Section 2.1.2, lays out general procedures for instances of mixed WEEE and/or mixed waste treatment, such as shredding with other scrap metal. The protocol suggests regular performance trials involving treatment of pure i.e., WEEE-only streams. As noted in Section 2.1.2, if more than one category of WEEE was to be treated together, the waste stream would also have to be sampled so that material fractions could be apportioned accordingly. As previously indicated, the protocol has yet to be finalised.

4.1.1.6 Apparec N.V.

The author met with Mr. Mark Adriensens, Manager on 10 February 2005 (pers. comm., M. Adriensens, 2005).

Background

Apparec is a social enterprise initiative of two companies: van Gansewinkel (50%) and Indaver (50%). The initiative was set up in 1998 for the purpose of the recovery and recycling of household appliances and brown goods (www.apparec.be).

Current practice

The foundation of much of Apparec's record keeping and reporting is accountability to its main supplier, Recupel. Recupel is the collective body for the collection, transport and treatment of WEEE in Belgium on foot of WEEE take-back obligations being put in place in Belgium. The organisation manages the collection, grouping together and treatment of WEEE on behalf of its members, the EEE industry in Belgium, and is responsible for ensuring a system is in place for monitoring EEE equipment from the time of its production through to end-of-life treatment (www.recupel.be).

Mr. Adriensens provided the following examples of practices that are in place or other requirements of Apparec as part its agreement with Recupel:

- At the request of Recupel, the company must arrange to undertake an extensive audit to test the effectiveness and efficiency of CFC recovery from the waste refrigeration equipment it treats. This involves a complete shutdown of the facility, typically lasting four days, whereby all equipment and processes are tested and measured.
- Every three months, one hundred monitors and one hundred televisions are weighed. The data is compiled and is used as the basis for assuming average product weights. In addition, the company undertakes an annual "batch trial," whereby a known quantity of a "clean" stream i.e., identical or similar types of televisions is run through the treatment process and the resultant material streams are carefully measured. Mr. Adriensens indicated that while directed by Recupel, the impetus for the latter measures is the regulatory requirements placed upon Recupel and not Apparec itself. Recupel must submit annual lists of data relating to the flow of goods treated, their origin, their destination and their treatment to the regional authorities (www.recupel.be).

- Consistent with practice observed at both Fingal Recycling and Electronic Recycling, Recupel have requirements in relation to ensuring information security, including that Apparec cannot reuse or re-sell any WEEE supplied to them. In other words, by the time WEEE reaches the Apparec facility, the question of whether or not it is a waste is removed by default. In addition, Apparec conduct four-monthly random audits/inspections of its employees to ensure that no equipment, components or materials are being removed from the treatment chain.

Conditions of contracts

The conditions of Apparec's contract with Recupel are passed on by the company to all of its sub-contractors and suppliers. Suppliers located outside the EU must be audited by a body that is accredited in accordance with European Standard EN 45004/ISO 17020 'General criteria for the operation of various types of bodies performing inspection.' This enables consistency and accountability back to the original supplier (Recupel) throughout the treatment chain.

Unified reporting system for the WEEE Forum

Mr. Adriansens demonstrated the reporting system referred to by Mr. O'Dea (Indaver), currently being tested by various WEEE recyclers in Europe in conjunction with the WEEE Forum. The system is web-based and can therefore provide real-time data regarding various performance indicators, including rates of recycling and recovery. Mr. Adriansens indicated that the system was initially very difficult and time-consuming to implement but that its value as a means of assessing the performance and efficiency of Apparec's operations is clearly becoming evident. He demonstrated various detailed data sets, reports and trend analyses that could be produced using the system to provide an indication of the company's performance.

Similar to many of the other systems observed during the interviews, classification and characterisation of all waste and materials flows reported in the system is based on EWC codes. Additional numbers ("suffixes") are added to EWC codes for the purposes of enabling more specified characterisation of waste and material streams, including the ten categories specified in the WEEE Directive. In total, there are 32 'input' streams i.e., codes applicable to whole WEEE, prior to any disassembly or treatment and close to 200 output streams, which include 'interim' streams i.e., those which will be subject to further treatment, hence resulting in two or more streams.

While it is an on-line system, treatment companies and facilities accessing the system are only able to view and modify information pertaining to their own operations; only the primary

contracting body i.e., acting representatives of the national WEEE collective schemes comprising the WEEE Forum have access to more than this. For example, only Recupel can access information (including the identity) pertaining to companies used by Apparec's sub-contractors. Furthermore, Recupel is obliged not to disclose any of this information, including the identity of companies as well as their operations and performance.

Mr. Adriansens indicated that the Forum's ultimate objective is to require all treatment operators that hold contracts with any of the Forum's members (the eight major existing WEEE recycling schemes currently operating in Europe) to use the system. It has yet to be decided how and to what extent the system might be used. For example, while it enables actual performance to be monitored and reported, it is possible that the data amassed in the system would in some cases serve as the basis for making assumptions on performance in the future, whereby results proven and/or consistently documented in the system now might be applied "by default" to certain operators, operations and/or technologies.

Discussion

The configuration of the reporting system currently being tested by the WEEE Forum would differ from the suggestion by Mr. Delaney (Fingal Recycling), which was that all contract holders and not just the main contracting party should have access to the information supplied by other contract holders. However, setting up the system the way it has by the WEEE Forum project helps to ensure not only that company- or facility-specific data and other, potentially proprietary information regarding operational performance is kept confidential, but also to preserve existing business relationships; Apparec is not able to by-pass any of their sub-contractors in an attempt to undercut prices.

4.1.1.7 M. Baker Recycling/Environmental Intelligence, Ltd.

The author interviewed Ms. Julie-Ann Adams on 7 March 2005. Ms. Adams recently took a lead role in establishing Environmental Intelligence, Ltd. (En-I) as a subsidiary company to M. Baker (pers. Comm., J. Adams, 2005).

Background on M. Baker

M. Baker Recycling Limited was established at the end of 2001, specifically to develop services for the collection, transport and recycling of end of life refrigerators and freezers. This was on

foot of new EU legislation on ozone depleting substances (ODS),¹⁹ which, *inter alia*, requires the controlled removal of ODS from refrigeration equipment before such appliances are scrapped or recycled. As previously noted, M. Baker Recycling holds the all-Ireland contract for the collection and recycling of waste refrigerators and freezers on behalf of local authorities in Ireland and Northern Ireland.

Current practice

The all-Ireland refrigerator scheme contract requires a comprehensive and robust audit trail from each collection point in Ireland through to the point of disposal, including manufacturer information where this can be identified. To accomplish this, M. Baker developed a tracking programme called the 'Smart Tag System,' a hybrid of the standard bar coding system that uses unique tags and some manual data collection to identify and track every refrigeration unit collected. Radio frequency (RFID) tags were the first option considered by the company for its tracking programme; however, these were ruled out for various reasons; contributing factors included cost, vulnerability to grit/dirt, potential for damage to tags during transport and interference with the radio signal due to their placement on metal objects or within metallic environments i.e., a recycling facility.

Use of the Smart Tags has generally been successful, although experience with the system has highlighted issues, some of which may be relevant to gathering data in the more general context of the WEEE Directive. For example, manual collection of data such as manufacturer and product serial number has proved problematic. Reasons cited include:

- Conditions at CA sites i.e., no space and/or protection from the elements to collect data;
- Missing or illegible information, including doors (where most manufacturers marks can be found) missing altogether;
- Confusion over serial numbers, as more than one serial number was often observed (e.g., one on the compressor, one on the main body) and in any case these tended not to be unique to individual units but rather to batch;
- Time.

The Smart Tag system has been modified to address certain issues. Units were assigned new, unique serial numbers associated with the tamper proof tag attached to each unit. In addition, M.

¹⁹ Council Regulation 2037/2000 on substances that deplete the ozone layer (OJ L 244, 29.09.2000, p. 1)

Baker compiled a list of all known makes or brands of refrigerators and created unique Smart Tag for each of these. All manufacturer Smart Tags are located on a “Manufacturer Board” at M. Baker’s plant; when units arrive at the plant their unique Smart Tags are scanned followed by the relevant manufacturer tag, eliminating the need to record this information manually. Collection sites were also issued with their own “Smart Tags,” whereby this information could be scanned upon arrival at the site, hence linking units to a particular collection point.

Upon arrival at the M. Baker plant, each delivery is weighed. Units are batched and processed according to size and refrigerant type along with units collected from other authorities and customers. Therefore, while the company is able to say how many of each brand/producer’s refrigerators enter their facility, they are unable to provide individual recycling statistics relating to one producer’s or one supplier’s/customer’s units. They are, however, able to provide statistics to determine the average weight of materials recycled, as all recyclable materials are weighed upon despatch from the premises.

Background on Environmental Intelligence, Ltd.

En-I was recently established as a subsidiary of M. Baker. Similar to the work being undertaken by and on behalf of the WEEE Forum, the company aims to develop a web-based service for tracking and reporting data necessary to meet the requirements of the WEEE Directive.

Reporting system for WEEE treatment operators

The reporting system envisaged by En-I is intended to collate and provide information on behalf of “lead contractors” i.e. companies taking in whole WEEE and undertaking the first step/stage in treatment. Examples of lead contractors would be authorised treatment facilities or refurbishers. In the context of the WEEE Directive, this might be whomever a producer or compliance scheme awards a contract.

The En-I system is consistent in principal with the European Commission’s draft reporting protocol, which provides that “first treatment operators” i.e., lead contractors must indicate which activities the treatment operator undertakes itself and which it has done by third parties and must record all treatment operations data (European Commission, 2004*b*). However, in the En-I system, subsequent contractors i.e., those further down the treatment chain would also report directly into the system and not, as is envisaged in the draft reporting protocol, to lead contractors. This is consistent with the approach of the WEEE Forum system; similar to that system, Ms. Adams indicated this was for the purpose of protecting commercial contracts further down the treatment chain and would enable information to be rectified and performance to be

tracked independently throughout the treatment process. The system will work on the basis of mass balance i.e., everyone reporting into the system provides information including quantities of 'goods in' and 'goods out;' the En-I system/software will then be able to rectify this to come up with client-specific data.

Ms. Adams indicated information that could be reported to clients or lead contractors includes the following:

- Category Report – this will provide confirmation, generally (i.e., to the authorities) that the treatment has been carried out;
- European Waste Catalogue reference Report – quantity of waste treated based on EWC codes, so that the data can be fed into wider waste data systems used throughout Europe, for example, national waste statistics reports;
- Collection Report – quantities of WEEE collected from or supplied by specified locations, for example, based on a local authority area or on a set of collection points such as retail outlets;
- Lead Contractor Report – a mass balance of WEEE by category and percentages of recycling and recovery achieved, provided to individual producers and/or collective compliance schemes;
- Audit Reports – summary reports provided to subsequent contractors (the ones down the treatment chain) regarding their individual performance.

Other issues and considerations

Ms. Adams noted that the UK Government intends to rely on periodic surveys/samples of WEEE collected at CA sites for the purposes of characterising all household WEEE arisings in the UK. Pilot studies are currently being undertaken in the UK to gain a better understanding as to how and how often surveys and sampling would be required. These were discussed further during an interview with officials from the Department of Environment, Northern Ireland, which is summarised in Section 4.1.2 below.

Based on M. Baker's experience, sampling such as that proposed in the UK will be required at least every six months and possibly as frequently as every three months in order to be at all representative of actual arisings. Furthermore, she indicated that while sampling would be a pragmatic approach to characterising the WEEE waste stream in the early days of implementing the Directive, actual figures will be available in a relatively short time and real-time data is likely

to be used in the longer term. This was noted in light of the producer (financial) responsibility and reporting requirements associated with the Directive and the systems being developed to manage this (such as that proposed by En-I). However, regardless of the method used to characterise the waste stream and track and measure performance, Ms. Adams acknowledged that figures will never be exact and 'inputs' will never weigh up exactly with 'outputs,' particularly on a mass balance basis as is proposed by En-I. As such, appropriate margins of error must be set by treatment operators and tolerated by authorities.

Ms. Adams suggested that any protocols or assumptions, including those used to determine and/or report performance, should be specific to the population to which they are applied. In this context, she noted M. Baker's experience when the company purchased German processing equipment: the performance results obtained with the plant were not consistent with the specifications and this turned out to be due to the variations in the waste stream (refrigerators) being processed; UK refrigerators tend to be larger than those used in Germany and also tend to contain larger quantities of plastic and ferrous metals, hence resulting in different quantities and in some cases different types of material fractions.

Exporting WEEE and/or components and materials arising there from presents a unique set of problems. Ms. Adams noted the value of certain items such as computer hard drives and the existence of a black market for these items creates the potential for items to be removed from a shipment or consignment along the way. This is consistent with what was noted in the Irish collection trials project as "cherry picking" valuable components and materials from collected WEEE. Ms. Adams suggested that containers should be weighed and/or sampled as close to the point of export as possible, for example at the port of export, and at that point should be sealed until they reach their final destination i.e., the treatment facility. Furthermore, in addition to the existing, general requirement in the WEEE Directive that all exported WEEE must still meet the recycling and recovery targets, Ms. Adams feels that the same treatment standards should be required. In other words, requirements for e.g. appropriate regulatory licensing or approvals, certification such as ISO14001 or EMAS, undertaking process audits or regular performance trials should be universally applied to all contractors associated with the treatment of WEEE, regardless of where this is undertaken and whether or not it is within the EU.

Discussion

The system M. Baker uses would not necessarily conflict with the reporting requirements for the WEEE Directive, as it is a single category of WEEE (Category 1, large household appliances) that is being treated. However, individual producers and/or suppliers of WEEE may have a

problem with this, particularly if the results produced by the company suggest lower rates of recovery and recycling than what a particular producer believes is possible with their product. Whether and to what extent individual producers in Ireland will require information regarding the quantities of their products turning up in the waste stream, and/or the specific levels of recycling and recovery they achieve, is at present unclear; they may be willing to accept any system involving averages, as long as the recycling targets in the WEEE Directive are met. This will ultimately be a matter for producers to decide and hence demand of their treatment contractors; however, the principle of the system, and its use of automation in particular is worth considering.

The reporting system envisaged by En-I is intended to collate and provide information on behalf of 'lead contractors;' however, as noted in the literature review (Table 2.10), a number of WEEE recycling companies in Ireland transfer whole WEEE within the country and/or export whole WEEE, without actually undertaking any treatment. These operators may not be considered 'lead contractors' per se and/or they may not have any sort of contractual arrangement with the operators to whom they transfer WEEE. For WEEE transferred within Ireland, this presents the potential for double counting. The En-I system would account for these by working on the basis of 'mass balance.' For exporters of whole WEEE, the only means of ensuring accountability appears to be by placing a mandatory requirement upon them to take on the role as 'lead contractor' and, furthermore, for them to oblige any operator to whom they export WEEE to report into the system or otherwise provide the required information as a condition of contract.

En-I is planning to provide information in its Lead Contractor Report based on product category. As is the case generally, the Lead Contractor Report can only provide this information if the quantities or proportions of individual category(ies) of WEEE are known or are somehow estimated at the start of the treatment process, and if the sources of components and materials resulting from treatment processes can be attributed to a particular category of WEEE. As such, compositional surveys and periodic single-stream analyses e.g., shredder trials will still be necessary.

4.1.2 Public authorities

4.1.2.1 Irish Environmental Protection Agency (EPA)

The author met with Mr. Brian Meaney, Office of Licensing and Guidance on 30 November 2004 (pers. comm., B. Meaney, 2004).

Background

The EPA is the National body charged with, *inter alia*, waste licensing, permitting, and oversight thereof by local authorities; waste monitoring and reporting; and enforcement of relevant legislation. As discussed in the sections above, the EPA plays a key role in the gathering and reporting of waste statistics, including the NWD.

The National Waste Database

As previously noted, the primary source of information for the NWD is local authority and waste recycler questionnaires. Mr. Meaney acknowledged that there are shortcomings with the questionnaires; in addition to those previously noted in the interviews with private sector operators, he also indicated that local authorities often do not receive AERs or, when they do, they are often incomplete, inaccurate and/or incorrectly filled out. Mr. Meaney indicated the questionnaires have been adapted on an ongoing basis and that ultimately the EPA aims to develop a web-based waste reporting system in the future, which might also serve as a daily data/information management tool for those using it.

The EPA has contracted a private consultant to undertake data validation for the 2003 waste statistics. This has involved detailed analysis and scrutiny of responses to local authority and waste recycler questionnaires, with a view to making further modifications. The scrutiny applied included following up with respondents by telephone and conducting site visits to determine whether reported waste was collected or received from other sources, who might also have responded to the questionnaire(s); further details regarding the type and level of processing on-site; and, if waste was being exported abroad, where it was going.

The modified 2003 questionnaires request information based on the six categories identified by the Irish WEEE taskforce, which, as indicated in Section 2.3.1, were suggested as the most likely and/or practical in light of options for collection and treatment. Based upon their review of the 2003 questionnaires, the consultants noted the level of detail provided was often dependent on the organisation and their diligence to reporting. This was observed generally, as well as

specifically in the context of WEEE. In addition, the consultants noted that in some cases correct assignment to the appropriate WEEE category could only be assumed, as not all companies/facilities were contacted or visited. In general:

- Fridges and freezers and TVs and monitors were often well subscribed;
- White goods were often included as ferrous non-packaging material;
- Batteries and light fittings were often specified (presumably, as opposed to not being separately reported);
- Toner and printer cartridges were also specified, although this appeared to be largely by companies who deal only or mainly with this waste stream;
- A number of organisations only described WEEE as 'other WEEE' or, even more generally, 'electrical.'

Quality control and cross-checking; packaging statistics

Mr. Meaney indicated that to a certain extent the questionnaires enable the EPA to rectify information regarding waste treatment with statistics on waste generation. For instance, using the example of the current reporting system use for the packaging Directive, Mr. Meaney indicated that the EPA audited data compiled by Repak and, to the extent possible, used waste recycler questionnaires to rectify the information. He acknowledged this was an imprecise and, importantly, resource-intensive practice; however it does allow a degree of crosschecking and oversight, and will highlight any major reporting discrepancies. He also noted that the system is evolving in tandem with the implementation of the packaging Directive; as shortfalls are highlighted and data gaps are identified, alternatives are explored and put in place. For example, the EPA is currently exploring whether and to what extent they might implement a system of data management auditing, whereby in addition to the actual activities or operations, a facility's or operator's record keeping and reporting system might be audited.

As noted in other interviews, issues associated with confidentiality and information regarding contractual relationships have been highlighted by recyclers and other stakeholders with legislative reporting requirements in Ireland. Mr. Meaney noted this is the case for some with interest in or obligations associated with the Packaging Directive. This is particularly the case with respect to market share and quantities of product produced and/or placed on the market. In light of this, Repak, the EPA and other stakeholders in Ireland's implementation of the Packaging Directive are undertaking a trial on a reporting methodology that involves reporting

information directly to the Irish Central Statistics Office (CSO). Mr. Meaney noted that unlike the EPA, the CSO is not covered by legislation pertaining to freedom of information and that the CSO has a mandate to explore, as well as a strong interest in, waste statistics reporting. Trial results have not been reported to date and Mr. Meaney noted this as a disincentive for using the CSO; the typical lag time in obtaining final information from the CSO can be up to two years from the time the information is reported into the office.

Possible approaches for WEEE reporting

Applying the packaging model to WEEE, Mr. Meaney suggested the primary sources for information regarding WEEE collection would be local authorities and transfer stations; the former providing information regarding WEEE collected at civic amenity sites and the latter providing information regarding WEEE coming from both local authority civic amenity sites and private sources e.g., B2B WEEE. Information from the two would need to be rectified to ensure WEEE collected at civic amenity sites was not double-counted. Information regarding WEEE collected by/at retailers would not be required, as this would be reported by one of the two aforementioned; however, Mr. Meaney indicated the information would be useful in a general sense.

As regards treatment, the recycler questionnaire would be the primary source of information, again acknowledging both the imprecision and the resource intensity of undertaking an exercise to rectify all of this information. Mr. Meaney also suggested local authority civic amenity sites might not necessarily be an information point at all, and that the WEEE reporting system could rely entirely on the current systems for waste authorisations, including waste permits, waste licenses and transfrontier shipments, and the associated reporting requirements. In this instance, he suggested, treatment operators responding to the recycler questionnaire would be required to report additional details regarding the source of the WEEE they manage, e.g., civic amenity sites, retailers or private businesses.

Mr. Meaney acknowledged that, while the greatest degree of segregation possible should be promoted to maximise reuse and improve rates of recycling and recovery, it is likely that information will not be available based on the ten categories specified in the WEEE Directive, and that assumptions and/or protocols may be required in at least some cases. When asked how assumptions or protocols might be applied in practice, he suggested legislation might be left somewhat open, for example provisions requiring all WEEE processors to carry out the 'necessary steps' to report on ten categories, and that subsequent guidance might suggest options including, *inter alia*, waste characterisation studies or, similar to a practice used by Repak,

application of standard recycling and recovery rates based on the treatment technology(ies) applied. He suggested that by leaving these provisions open regulators and treatment operators alike could learn by experience.

Similar to the suggestion by Mr. Kyck (KMK Metals) regarding producers' maintenance of information on the 'mass balance' of their products, Mr. Meaney referred to Article 11 of the WEEE Directive, which provides that member States take the necessary measures to ensure that producers provide information regarding reuse and treatment for each type of new EEE they place on the market. The information must identify the different components and materials as well as the location of dangerous substances and preparations to the extent needed by reuse centres and treatment operators in order the facility reuse and environmentally sound management of WEEE. Mr Meaney suggested this information might contribute to or be used as a basis for assumptions regarding the rates of recycling and recovery achieved for a particular product or category of WEEE.

Discussion

Findings noted in the recent independent review of 2003 waste statistics reported to the EPA confirm some of the issues and concerns highlighted in the literature review and/or interviews with private sector operators. In particular, the 2003 returns revealed recyclers are misclassifying or misreporting WEEE as ferrous non-packaging material. In addition, a number of returns used more general or generic descriptions such as 'other WEEE,' instead of specifying the particular types/categories of WEEE. Both of these examples further highlight what now appear to be likely barriers to obtaining reliable statistics in a format that will be conducive to compiling national figures based on the ten categories specified in the WEEE Directive.

Mr. Meaney suggested that, in lieu of requiring local authority civic amenity sites to characterise or otherwise monitor the specific types of WEEE collected at their facilities, treatment operators responding to the recycler questionnaire would be required to report additional details regarding the source of the WEEE they manage. In light of the previous acknowledgment of shortcomings with the waste questionnaires, this would seem to be a less than ideal solution. However, as noted in the Literature review, at present the questionnaire requests only the country of origin of wastes i.e., from within Ireland or another country; expanding the questionnaire to include greater details on the source of waste and materials would, indeed, facilitate crosschecking.

The approach taken to the packaging statistics would appear to be an approach similar to that suggested by Mr. Zonneveld (EERA) for WEEE; start initially with a relatively basic reporting

system and make changes as and when any shortcomings are identified. While some would argue whether the reporting requirements for packaging waste were ever basic, the EPA does appear to accept that gaps or difficulties are to be expected with any sort of statistical reporting system and that requisite changes will have to be made as issues arise.

4.1.2.2 Department of Environment, Northern Ireland (DOE NI)

The author met with Mr. Sandy Truesdale, Principal Officer, Environmental Policy Division on 18 January 2005 (pers. comm., S. Truesdale, 2005).

Background

The DOE NI is the body charged with the implementation of the WEEE Directive in Northern Ireland. As part of their measures to implement the Directive, the UK Government are planning to put in place an accreditation system for authorised WEEE treatment facilities in order to demonstrate that they can meet specified requirements. Accreditation will be run by the Industry Council for Electronic Equipment Recycling (ICER), a membership association involving material suppliers, manufacturers, retailers and distributors, the waste management industry, recyclers and local authorities (www.icer.org.uk).

Source or on-site segregation

In light of the intent to use protocols to characterise WEEE arising at CA sites, neither DOE NI nor any of the other UK Agencies with responsibilities for implementing the WEEE Directive intend to undertake any on-site segregation of WEEE. Should segregation be required or desired, for instance to facilitate recovery and/or recycling, this would need to be done at another location, such as a waste transfer facility or treatment facility.

Pilot protocol study on WEEE arisings and characterisation

In cooperation with ICER, the UK Department of Environment, Food and Rural Affairs (DEFRA) are working to develop a protocol to estimate the contribution of different categories of WEEE to a typical load of mixed waste equipment collected at a CA site. To do this, DEFRA and ICER are conducting trials involving sorting mixed WEEE from a number of CA sites throughout the UK including two in Northern Ireland; one in Bainbridge and one in Belfast.

The choice of the two CA sites for the protocol study was intended to provide representatives of both an urban and a rural site. Avenue Recycling, the contractor responsible for collecting the WEEE from both sites noticed a difference in the quantities, types and qualities of WEEE

collected at the two sites and this was confirmed when WEEE was sorted and counted. This would imply that at least two different protocols (one for urban sites and one for rural) might be required. In addition, DOE NI is undertaking a temporal analysis of arisings and has already noticed potentially significant variations (arisings in September and particularly those of white goods were substantially higher than in previous months). This would again imply the need to tailor protocols further to account for seasonal variations or, alternatively, to undertake representative sampling on a more frequent i.e., monthly basis.

Another observation made by DOE NI was in relation to the potential for the affluence of a catchment area to effect arisings. Mr. Truesdale noted anecdotally, based on factors such as car ownership and (apparent) willingness of residents to travel, that the Bainbridge site and rural sites in general tend to cater to a more affluent population. Further analysis of the catchment areas of the two CA sites is being undertaken to determine whether and to what extent this might be a factor in terms of the quantities and/or types of WEEE arising.

Performance reporting on treatment and recovery

Mr. Truesdale acknowledged that the proposed system employing protocols is likely to be adapted as alternative, more accurate means of quantifying WEEE arisings and measuring performance are identified. In particular, he noted that despite the work of an all-Agency working group established to examine any/all methods for WEEE monitoring, to date no methods for providing accurate figures or even estimates for recovery and recycling on a consistent basis have been identified, implying that the protocol system will be a short-term solution. In addition, he noted the use of technologies such as “smart chips” (microchips installed within equipment) will enable information such as the producer, production date and material composition of EEE to be stored, as well as ‘cradle to grave’ tracking of the EEE, all of which will facilitate closer monitoring when equipment becomes WEEE.

4.1.2.3 OVAM – Public Waste Agency of Flanders

The author met with Ms. Annemie Andries, the individual with oversight responsibilities for WEEE management by the EEE industry in the Flanders region of Belgium, on 10 February 2005 (pers. comm., A. Andries, 2005).

Background

OVAM is the Belgian Flemish Regional authority with responsibility for the implementation and oversight of policy and legislation relating to waste and contaminated land. A take-back

obligation for WEEE has been in place in Flanders since 1 July 1999. The obligation applied to all discarded electrical and electronic equipment and the associated “VLAREA” implementing decree made the importers/manufacturers, intermediaries and end-users collectively responsible for collecting, dismantling and treating discarded electrical and electronic equipment. Following on from this, at the beginning of 2001, all three Belgian regional governments and industry, through the organisation Recupel, concluded a number of “Environmental Policy Agreements on the take-back obligation for waste from electrical and electronic equipment,” with a view to introducing a uniform take-back system for waste appliances throughout Belgium (www.recupel.be).

Environmental Policy Agreements and reporting requirements

Ms. Andries indicated that the Environmental Policy Agreement currently in place in the Flanders Region is relatively simple, laying down the general principles, expectations requirements for fulfilling the take-back obligations. Despite this, the information and reporting requirements are quite extensive; the following information must be reported to OVAM annually under the current agreement:

- Total WEEE collected by weight as well as the number of the four individual types of WEEE;
- Total WEEE collected by retailers;
- Total WEEE reused and associated destination;
- Total EEE placed on the market;
- Estimates of the composition of EEE placed on the market;
- Participating members of the system;
- Collectors used;
- Communities served;
- Reuse centers cooperating with the system;
- Participating retailers, as submitted by Recupel.

The reference to participating retailers is associated with a requirement for retailers to register with Recupel. The list of participating retailers Recupel submits to OVAM facilitates enforcement; the list of participating retailers, when crosschecked with a comprehensive list of all EEE retailers, provides OVAM with an indication of who to audit.

Recupel must also provide a qualitative description of the recycling methods used by contracted treatment facilities and they must provide verification that all contracted facilities hold the

appropriate permit(s) to treat waste. Furthermore, before Recupel can enter into any new contracts with a treatment facility(ies), they must first get approval to do so from OVAM.

Separate and in addition to the above requirements, Recupel must submit a comprehensive report relating to the flow of goods treated, their origin, their destination and their treatment results to OVAM on an annual basis. Ms. Andries indicated that until January 2005, only one such comprehensive report had been submitted; however, no proceedings were taken, as the organisation is generally achieving the desired objectives of the Environmental Policy Agreement and they are fulfilling other statutory requirements related to reporting, such as those mentioned in preceding paragraphs.

Ms. Andries highlighted positively the measures Recupel takes to ensure the system is effective, including many of those highlighted by Mr. Adriansens of Apparec (facility audits, regular performance trials, use of external consultants to certify results, etc.). She also noted that OVAM will audit facilities contracted by Recupel, but that these involve an audit of the operational, record-keeping and reporting systems, as opposed to actually undertaking to confirm performance or what has otherwise been reported.

Implementation of the WEEE Directive

The 2001 Environmental Policy Agreement for the Flanders Region was for a period of five years, expiring in July 2006. The agreement specifies four categories of WEEE: 1) cooling appliances; 2) large household goods; 3) televisions and CRTs; and 4) all other WEEE. In light of the forthcoming implementation of the WEEE Directive, OVAM is currently negotiating with industry regarding the terms and conditions of a new agreement to fulfil the requirements of the Directive, including provisions for reuse of WEEE, greater transparency with respect to financing and the destination(s) of WEEE, and the distinction of the ten categories of WEEE specified in the Directive. With regard to the latter, there is general agreement that some sort of sampling will be allowed/used to characterise the waste stream(s); however, details of how this will be done have yet to be worked out.

Ms. Andries noted that while OVAM is negotiating what will ultimately be a much more detailed agreement, the original agreement was relatively simple, allowing industry (Recupel) to devise acceptable means of fulfilling the general obligations it set out. She suggested that for Member States who, like Ireland, do not currently have any programmes or legislation related to producer take-back of WEEE, they should also start out with a relatively simple system, with a

view to enabling stakeholders to devise the most workable system given “local” conditions, and addressing problems or deficiencies as they arise during the early stages of implementation.

Negotiations on foot of formulating a new agreement with industry have included the discussion of increasing the more comprehensive reporting requirement referred to above to three times per year. This is due in large part to the more prescriptive and stringent requirements set out in the WEEE Directive. In addition, Ms. Andries noted that it was only in the past year that Recupel could track materials and components arising from WEEE to the final treatment step. It is interesting to note, however, that Recupel has publicised its performance, including achievement of material-specific recycling targets in the past without much question or challenge from the authorities.

Ms. Andries highlighted other elements of the current system that act as drivers for performance. In particular, Recupel is subject to recycling targets, both by product type and material fraction (ferrous and non-ferrous metal and plastic). Significantly, Ms. Andries also noted that, a visible fee is placed on all new EEE and any consumer in Belgium is able to dispose of WEEE by taking it back to a sales shop when buying new equipment. This creates an element of public accountability; the public wants to know where the fee is going and expects recycling targets to be met.

Unified reporting system for the WEEE Forum

OVAM has been provided with information regarding the reporting system currently being tested in conjunction with the WEEE Forum (discussed with Mr. Adriansens of Apparec) and Ms. Andries indicated the Agency is enthusiastic about it. She noted in particular that the system would enable more comparisons of results from different treatment operators and that because it is an on-line system the destination of WEEE, components and materials, as well as overall performance, can be more closely tracked. She also highlighted the way the system facilitates confidentiality, noting this is a frequent and widely expressed concern amongst many of the stakeholders in the Belgian system.

Discussion

Despite Ms. Andries’ reference to the Environmental Policy Agreement being relatively simple, the information and reporting requirements are quite extensive. In light of the information and reporting requirements set out in the current agreement, Ms. Andries’ reference to ‘simple’ appears to relate more to the actual enforcement and oversight of how the obligations are met by industry. It would appear as though the authorities have taken a somewhat “hands off” approach

in this regard; Recupel have largely been left to determine and implement the measures they feel are necessary to fulfill the requirements/expectations set out in the Environmental Policy Agreement. The implication given in the interview was that unless a major problem is identified and as long as Recupel continues to organise the effective collection and treatment of WEEE, the Government will not pursue matters such as failures to submit annual reports.

One could argue that Recupel takes advantage of its position as the sole operator in Belgium for the purposes of fulfilling the requirements of the Environmental Policy Agreement on behalf of the affected industry players. The scheme has a significant influence over their contractor's operations, including environmental and operational performance, record-keeping and reporting practices, and cost controls. Furthermore, Recupel contractors have little choice but to pass any and all requirements placed upon them as part of the Recupel contract to their suppliers, as there is only one scheme in Belgium which would have control over a large proportion of the WEEE arising in the country. As such, failure to follow Recupel's terms would cut off access to a significant market. While this appears to create an unfair market advantage, one must assume the appropriate measures have been taken to ensure compliance with Belgian and EU competition rules.

Under the WEEE Directive, visible fees may be used for a transitional period of eight years (ten for Category 1, large household appliances), as long as they reflect only the costs to producers for recycling historic WEEE, i.e., WEEE placed on the market from 13 August 2005. In light of the accountability element highlighted by Ms. Andries, as well as the benefits afforded to producers, use of visible fees in Ireland may provide further incentives for thorough and verifiable record-keeping and reporting.

4.1.3 Discussion of interviews, preliminary conclusions

The Irish companies interviewed indicated they currently manage most if not all types of WEEE or have plans to do so in the near future; however, none of the operators interviewed appeared to have considered how they might monitor or report on the ten categories specified in the WEEE Directive. The bulk of what they are currently treating – as opposed to simply collecting, bulking up and/or exporting consists largely of large appliances and office equipment (primarily computers and other IT). Large appliances are relatively easy to track/monitor; in general these are large, metal-rich items, their size makes them easier to count, and the number contained in a load or batch is easier to assume based either on an average weight of an appliance or the total volume of the load. Similarly, their relatively homogenous makeup i.e., primarily metal with smaller amounts of plastic, glass and rubber is also conducive to making assumptions regarding the amount of material recovered from them. In the case of IT equipment, as noted in some of the interviews, there is a stronger incentive for material-specific segregation and quantification in managing this type of equipment due to the material recoverability, value and customer requirements for information security. Furthermore, average or standard weights for computer monitors are widely available and are being used; the fact that these have specific handling and treatment requirements (due to the lead content and consequent designation as hazardous waste of cathode ray tube glass) and the associated cost and the associated cost of doing so is clearly a driver for segregating these items from other WEEE and for more accurate monitoring of treatment.

More than one of the individuals who were interviewed highlighted the ongoing legal uncertainty associated with terminology such as ‘recovery,’ ‘recycling’ and ‘disposal,’ as well as the definition of waste (as distinct from a product or material that may be reused). These remarks are consistent with the findings of previous research referred to in the literature review (Wilkinson and Duffy, 2003 and Ansems and van Leeuwen, 2003), which highlighted the issue as a potential limit to the reliability of information submitted by various sources.

EWC codes are a fundamental element of waste reporting systems in Europe. At least one of the Irish treatment operators interviewed appears to be using the wrong EWC codes for the majority of household WEEE it accepts, and broad discrepancies in the use of EWC codes have been noted in National waste statistics reported to and compiled by the EPA.

Reporting of B2B WEEE requires further consideration. In particular, whether this would be considered industrial or commercial waste for the purposes of EPA reporting and which EWC codes should be used.

Companies employing an environmental management system and/or that are ISO certified were able to demonstrate how these systems are being used, and most attributed their ability to provide thorough documentation of their activities and throughput to these systems. In addition, many companies require their subcontractors to employ an EMS and/or to be ISO certified, citing this as a means of providing a level of assurance that certain minimum standards are being met. Based on the practices observed and information provided during the interviews, there does appear to be a link between the availability of data and overall quality of record-keeping with the implementation of a wider environmental and/or quality management system.

Centralised, web-based reporting systems are currently being developed specifically for the purposes of the WEEE Directive. Notably, this is being done largely by private sector operators, with the support, but little direct involvement, of regulatory authorities. Important features include involvement of an independent, third party and limiting access to information reported into the system.

Any reporting system will need to be able distinguish between operators who actually undertake treatment and those who is simply acting as a bulking up, sorting and/or transfer facilities. This is required in order to avoid double counting and will also facilitate greater oversight of operators who export whole WEEE for treatment outside Ireland.

Irish authorities (the EPA) appear to be willing to accept assumptions, protocols and even a certain degree of uncertainty in a waste reporting system, with a view to making necessary changes and improvements as the system is put in place and applied. What appears to be more important is consistency, i.e., setting average or standard weights to be used by any/all operators, developing standard protocols for conducting compositional surveys and ensuring these are, indeed, reflective of the waste stream. Furthermore, operators need to have a clear understanding of reporting systems and/or requirements. Attention should therefore be focused on making and continuing improvements to existing systems, namely, increasing the rate of return of AERs and facilitating education and awareness with respect to waste classification and the use of EWCs in particular.

There appears to be merit in requiring details of plans or proposals for WEEE management from contracting bodies (producers or compliance schemes acting on their behalf). This includes

tender documents. For example, authorities might review the conditions of tender for the necessary provisions to ensure, *inter alia*, environmentally sound treatment, accurate and auditable record-keeping, and consistent, reliable reporting systems. This could be done cooperatively i.e., involving authorities in the actual development of the call for tenders and may also involve a process of prior approval of the call for tenders and/or the winning tender before new contracts are let.

Visible fees have the potential to bring a greater degree of accountability and transparency to any take-back scheme for WEEE. This, as well as the benefits afforded to the affected stakeholders may in turn provide an incentive for more thorough and verifiable record keeping and reporting associated with the scheme.

4.2 Questionnaires

4.2.1 Response rate

As previously indicated, 217 questionnaires were sent to holders of Waste Permits and 245 were sent to holders of Collection Permits. Seventeen of the questionnaires for Waste Permit holders and six of those for Collection Permit holders were returned unopened. As such, analysis of the response rates and responses are based on a total of 200 questionnaires sent to Waste Permit holders and 239 questionnaires sent to Waste Collection Permit holders. Based on these revised figures, a total of 25 questionnaires were received back from Waste Permit holders and 25 from Collection Permit holders, representing return rates of 12.5% and just over 10%, respectively.

4.2.2 Nil responses/no relevance to operations

Of the 25 responses from Waste Permit holders, over half (14) indicated the questionnaire was not relevant to their operations. These consisted primarily of companies involved in the dismantling of ELVs. In addition, one respondent indicated they do export whole WEEE; however, they subsequently indicated “we do not generate such wastes in any quantity” and the remainder of the questionnaire was left blank. This response did not receive further consideration. As such, only eleven responses from Waste Permit holders, representing a net response rate of 5.5%, received further consideration.

Of the 25 responses from Collection Permit holders, nearly three quarters (19) indicated the questionnaire was not relevant to their operations. Many of the respondents provided information regarding the type(s) of waste they do collect and this varied e.g., slurry, construction waste, timber, sanitary waste, etc. In addition, one company responded with a letter indicating “we work on behalf and under the supervision of the Waste Management Companies, who determine the classification, types of waste and the destination of such loads to licensed recycling or licensed disposal sites and they notify the various permitting authorities. We do not give commercial information...” As such, only six responses from Waste Collection Permit holders, representing a net response rate of 2.5%, received further consideration.

Table 4.1
Response rates and relevance of questionnaires sent to holders of
Waste Permits and Waste Collection Permits

	Waste Permit Holders	Waste Collection Permit Holders
Total number sent	217	245
Number returned unopened	17	6
Balance	200	239
Number returned	25	25
Return rate (number returned/ balance)	12.5%	10%
Number indicating questionnaire not relevant to their operations	14	19
Final number considered	11	6
Return rate (number considered/balance)	5.5%	2.5%

The low response rate was not entirely surprising. As noted in the discussion of the mailing lists (Section 3.2.3), the selection of recipients for the questionnaires was somewhat subjective. The number of questionnaires returned unopened is, however, worth noting, as this may be an indication of the quality of information contained in the EPA's registers. As highlighted in discussion of the mailing lists, it was often difficult to ascertain certain information from these and poor or incomplete address information in the registers might have contributed to the relatively high number of returned questionnaires. Significantly, a return address was not indicated on the envelopes. Postage was paid via meter and this enabled the postal service to identify the origin of the correspondence; however, the number of questionnaires returned unopened would likely have been even higher had a return address been provided.

The numbers indicating the questionnaires were not relevant to their activities or operations were also unsurprising. As highlighted in the Literature Review (Section 2.4.2), only between 20 and 34 companies were involved in the management of WEEE in Ireland in 2003. As such, it was inevitable that the questionnaire was sent to companies or individuals who are not involved whatsoever in the management of WEEE. Despite this, nearly all respondents provided contact details and many specifically indicated they could be contacted for further information or clarifications. A few, however, did limit their responses or did not complete certain sections of the questionnaire, citing reasons of confidentiality.

4.2.3 Responses from Waste Permit Holders

As previously indicated, 217 questionnaires were sent out to Waste Permit holders, 25 were returned and eleven contained relevant information and were assessed further. It is also important to recall that, based on responses to the EPA recycler questionnaire and the WEEE collection trials project (Wilkinson and Duffy, 2003), only between 20 and 34 WEEE recyclers were believed to be operating in Ireland in 2003. As such, the responses could potentially represent between one third and one half of all WEEE recyclers in the country.

4.2.3.1 Number of employees

Companies who responded range in size from fewer than five employees to greater than 40. No one response/company size was particularly prevalent amongst the respondents.

4.2.3.2 Reporting

Recipients were asked whether they completed EPA waste questionnaires for 2003 and/or 2004. The majority (nine) did for at least one of the two years and some indicated they were in process of preparing a response to the 2004 questionnaire.

4.2.3.3 Disassembly

The questionnaire asked whether any disassembly of WEEE was undertaken and, if so, whether resulting materials were sent on to a company in Ireland or abroad. The questionnaire also asked whether whole equipment was passed on, again to another company in Ireland or abroad.

Many of the respondents answered yes to more than one question, indicating that a combination of treatment methods and outlets are used. Seven (64%) of the respondents indicated they do not undertake any disassembly. Ten (91%), including some of the aforementioned seven, pass whole WEEE on to another company in Ireland. Only four (36%) respondents, again including some of the aforementioned seven, indicated they export whole equipment. This differs somewhat from the findings of the Irish WEEE collection trials project (Wilkinson and Duffy, 2003) where, of the 35 Irish and Northern Irish companies surveyed, more were exporting whole equipment abroad than were transferring equipment within Ireland; the respective figures were 20 (57%) and 13 (37%).

The responses received would imply that the companies are simply accepting WEEE, perhaps as part of a wider waste management service, and then passing it on to a specialist waste handler or other company with capabilities for actually managing the WEEE. These companies would not be considered WEEE recyclers per se and, with the exception of those who export whole

equipment, they would not likely be considered a “lead” or “primary” contractor for the purposes of reporting on treatment targets. Two issues arise: 1) ensuring whole equipment transferred to another operator in Ireland is, indeed, accounted for, but that it is not counted more than once/by more than one contractor (an issue highlighted during the interviews, as discussed in Section 4.1); and 2) ensuring those who export whole equipment are aware that from 13 August 2005 they will need to be able to provide documentary evidence that this WEEE is managed in accordance with the terms of the WEEE Directive.

4.2.3.4 Current capabilities

Recipients were asked whether they could provide information based on the ten categories of WEEE specified in the WEEE Directive and, if so, whether this could be provided based on the number of items and/or the weight of items in the particular category. They were also asked whether this type of information could be provided based on the six WEEE categories identified by the Irish WEEE taskforce, as referred in the Literature Review (Section 4.1.2). Responses are summarised in Tables 4.2 and 4.3 below.

Table 4.2
Capability of Waste Permit holders to provide information on ten WEEE categories
Out of 11 responses received

WEEE category	Can provide information based on the number of items or products in this category	Can provide information based on the weight of items or products in this category	Cannot provide this information
1. Large household appliances	6	4	2
2. Small household appliances	5	4	2
3. IT/telecommunications equipment	6	4	3
4. Consumer equipment	4	3	3
5. Lighting equipment	5	5	5
6. Electrical/electronic tools	4	1	6
7. Toys, leisure, sports equipment	3	1	6
8. Medical Devices	2	2	5
9. Monitoring & control instruments	2	2	5
10. Automatic dispensers	2	2	5

Notes:

One of the respondents who indicated they could provided the number of items falling under categories 2, 4, 6 and 7 indicated this would be based on estimates.

One respondent provided an actual tonnage, but also answered “no” in their responses regarding IT/telecommunications equipment and lighting equipment.

One respondent indicated electrical/electronic tools and toys, leisure and sports equipment would be included with either small household or consumer WEEE; another indicated these items would be included with “mixed WEEE.”

One respondent indicated medical devises and automatic dispensers would also be included with “mixed WEEE.”

Table 4.3
Capability of Waste Permit holders to provide information on six WEEE categories
Out of 11 responses received

Irish WEEE taskforce category	Can provide information based on the number of items or products in this category	Can provide information based on the weight of items or products in this category	Cannot provide this information
1. Fridges and freezers	8	4	1
2. All other white goods	5	7	0
3. Televisions and monitors	9	4	1
4. IT and telecommunications equipment	6	4	3
5. Lighting equipment	6	4	4
6. All others (<i>i.e.</i> , <i>excluding</i> any of the others listed above)	3	4	3

As regards the ten WEEE Directive categories, some respondents provided more information than was requested; namely, a number of items or tonnage of a particular category they handle in a given time period e.g., per week. Conversely, some indicated “N/A,” “undefined” or did not answer at all, instead leaving responses for certain categories blank; this would generally imply they do not handle that type/category of WEEE at all, as opposed to a “no” answer, which would imply they handle it but are not able to provide specified information on weights or quantities.

The number of companies willing or able to provide information based on the number (as opposed to weight) of items is somewhat surprising, particularly for items such as WEEE Directive Categories 2, *small household appliances*; 4, *consumer equipment*; and 6, *electrical and electronic tools*. Based on observations and discussions in interviews, one reason for this may be that relatively few of these items are currently being collected and managed; perhaps if substantial volumes were coming in the companies would reconsider their willingness to count equipment item by item.

Although the sample size is small and may not be considered a definitive representation of current practice in Ireland, narrowing the categories to the six identified by the WEEE taskforce would generally appear to accommodate more operators in Ireland. It is somewhat surprising that more are not able to provide information on what essentially represents a mixed WEEE stream

(WEEE taskforce Category 6, *all others*), as it is difficult to see how most of the equipment contained in other categories would not be removed: white goods are generally large, metal-rich items; fridges and freezers (cat. 1), televisions and monitors (cat. 3) and lighting equipment (cat. 5) are generally hazardous and require special treatment; and, as previously referenced, IT and telecommunications equipment generally have higher material value and greater options/outlets for recyclates.

4.2.3.5 Methods for classifying WEEE

Recipients were then asked about the method by which they do or, if required, could determine the classification/categorisation of WEEE. Options provided included:

- Itemised list accompanying WEEE;
- Estimation/visual inspection;
- Weighing (batches, single streams and/or individual items);
- Count/classify WEEE as it comes in;
- Waste composition surveys;
- Other.

At present, none of the companies undertake random sampling or waste composition surveys and none indicated this would be something they could do in future.

Three of the respondents estimate WEEE composition using a visual inspection and only two indicated this is a technique they would use in the future. This is not likely to be accepted as a reliable method for the purposes of monitoring and compliance control; however, if more specific monitoring is undertaken periodically e.g., waste composition surveys or periodic counting exercises, visual inspection may be a means of monitoring WEEE for the purpose of identifying any significant changes or discrepancies in the normal waste stream, whereby further surveys or counting could be undertaken.

Three of the respondents weigh batches of single streams or types of WEEE and, with the exception of large household appliances, four (including the aforementioned three) indicated this is something they could do in the future. Three respondents indicated this is something they could or would be willing to do for large household appliances. Based on current practice, the likely reliance on “primary” or “lead” contractors and some of the systems being devised to facilitate this (e.g., the reporting system being explored by the WEEE Forum and the system envisaged by En-I), this is more likely to be an acceptable method of monitoring. However, weighing individual streams will require the WEEE to remain segregated or, if not already, to be

segregated, at least until it can be weighed. Furthermore, facilities must have a weighing scale on-site. These requirements may be contributing factors to why others did not respond positively to this method.

Only one treatment operator weighs individual items. This was one of the companies interviewed; the company deals primarily with larger business clients who provide a relatively homogenous waste stream (primarily IT and office equipment) and who have quite specific requirements regarding how their equipment is managed. These factors may contribute to the company's willingness or ability to undertake item-by-item weighing.

Six of the respondents currently count and classify each item from at least one of the WEEE Directive categories as they come in; again, this is somewhat surprising given the implicit time and effort. However, the categories for which companies are or would be willing to count or weigh equipment item by item in the future provide further insight, as depicted in Table 4.4.

Table 4.4
Capability to count or weigh WEEE items individually
Out of 11 responses received

WEEE category	Companies willing/able to count or weigh items individually
1. Large household appliances	6
2. Small household appliances	4
3. IT & telecommunications equipment	5
4. Consumer equipment	3
5. Lighting equipment	5
6. Electrical and electronic tools	4
7. Toys, leisure and sports equipment	2
8. Medical Devices	3
9. Monitoring and control instruments	3
10. Automatic dispensers	3

As can be seen, larger and/or more valuable equipment (large household appliances and IT equipment) and that which has more specialised handling requirements (lighting equipment) drew more positive responses.

Low positive responses might be construed one of two ways:

- 1) the company is not or does not anticipate managing this type of WEEE – this is suspected to be the case for medical devices (cat. 8), monitoring and control instruments (cat. 9) and automatic dispensers (cat. 10), and perhaps also for electric/electronic tools (cat. 6) and/or toys, leisure and sports equipment (cat. 7); or
- 2) the company is, indeed, not willing or not in a position to itemise – this is suspected to be the case for small household appliances (cat. 2) and consumer equipment (cat. 4) and again, perhaps electric/electronic tools and/or toys, leisure and sports equipment.

It should be noted that one recipient, who would be regarded as a fairly significant player in the Irish WEEE recycling industry, specifically indicated that tools, toys and leisure equipment is very rarely received unless it is mixed with other household waste.

It is not surprising that more companies are willing to itemise large appliances; this would appear to be a relatively easy thing to do. Similarly, it is understandable that companies would be willing to monitor and document IT equipment more closely; as previously noted, drivers for recycling IT equipment include information security and the inherent value in many of the components and materials. It is slightly less clear how or why companies would be willing to itemise other telecommunications equipment, such as calculators and mobile phones; perhaps it is because they may have relatively greater value than other types of WEEE due to the presence of a printed circuit board or perhaps, despite a list of example products falling under each of the categories being provided with the questionnaires, these items were not given thorough consideration. Higher positive responses for lighting equipment might again be due to the fact that this a fairly specialised waste stream; items such as fluorescent lamps are considered hazardous waste and most lighting equipment requires special handling and treatment.

Seven of the respondents weigh batches e.g., pallets or containers of mixed WEEE. This is not surprising given current practice, which, based on the interviews, relies heavily upon load weights and tonnage as a basis for costing. This removes the requirement to segregate or to keep WEEE segregated until it enters the treatment chain, but reintroduces the issue of determining performance towards meeting the targets set out in the WEEE Directive. It is interesting to note that the responses to this question appear to contradict those presented in Table 4.3 pertaining to the WEEE taskforce categories, where only four respondents indicated they are able to report information based on the weight of products in a generally mixed WEEE stream. The only explanation for this seems to be that in the case of the WEEE taskforce categories, a degree of

segregation/product removal is still involved; the other five categories would be removed from the mixed stream, whereas a pallet or container of “mixed WEEE” could include anything. This explanation would again be consistent with the current practice of costing/pricing based on total tonnage e.g., the weight of an entire container.

Four companies indicated the WEEE they receive is accompanied by an itemised list; however, in none of these four responses was this the only means by which WEEE is classified/categorised. This would imply that lists are provided only for certain items, by certain clients and/or as one of a number of means for determining the composition of a given WEEE stream. In fact, only two methods are being used in isolation: 1) counting and classifying each item as they come in (two of the respondents rely solely upon this method) and 2) weighing batches of mixed WEEE (three of the respondents rely solely upon this method).

4.2.3.6 Limiting factors

In a follow up question, companies were asked to comment regarding factors that might prevent them from providing details based on specific WEEE categories. Results are presented below. It should be noted that five of the respondents did not answer this question.

Table 4.5 Factors preventing the provision of information based on specified categories of WEEE <i>Based on a total of 6 responses</i>	
Limiting factor	Recipients who consider this an issue
Cost	4
Time	5
Space constraints	1
No weighbridge/scales at facility	0
Disruption to operations	3
Lack of available staff	1

The fact that none of the recipients indicated the lack of weighing facilities as a limiting factor would seem to negate the previous suggestion that this might be a factor preventing operators from being able to weigh batches of single or mixed streams of WEEE. This in combination with the relatively low response on space constraints would suggest that, while answers to a previous

question indicated that treatment operators are reluctant to undertake waste composition surveys, they would at least be physically possible. Composition surveys would, however, require time to do and would likely disrupt operations, two limiting factors that scored relatively high. The higher response on cost considerations is again not a surprise and other factors such as time and disruption to operations likely played into the response on costs.

4.2.4 Responses from Waste Collection Permit Holders

As previously indicated, 245 questionnaires were sent out to permitted waste collectors, 25 were returned and six contained relevant information and were assessed further.

4.2.4.1 Number of employees

Three of the companies who responded have between six and ten employees, one has 11-20 and two have greater than 40.

4.2.4.2 Reporting

All respondents indicated they submit an AER to the permitting authority(ies).

4.2.4.3 Sources/collection points

WEEE is collected from a variety of sources/locations. Responses are summarised below.

Local authority collection facilities	3
Privately operated collection facilities	3
Private households	2
Private businesses	5

In addition, one waste collector indicated they collect WEEE from schools and charities.

The prevalence of collection from private businesses would be consistent with what was learned and/or observed in the interviews; much of the current WEEE management in Ireland is undertaken on behalf of private companies and involves largely IT and other office equipment.

4.2.4.4 Export

Three of the respondents export whole WEEE. Notably, all of these were the smaller companies (6-10 employees). Presumably these collectors are acting on behalf of the waste generator, either as the person who arranges the shipment or strictly as the waste carrier. If not, as previously noted in the case of Waste Permit holders, these collectors will need to be aware that from 13 August 2005 they will need to be able to provide documentary evidence that this WEEE is managed in accordance with the terms of the WEEE Directive.

4.2.4.5 Current capabilities and methods of classifying WEEE

Three respondents indicated they are not able to provide any information based on the ten categories specified in the WEEE Directive. Reporting limitations noted by two of these companies included cost, disruption to operations, lack of staff to undertake this and time. The other of these respondents noted that the information could, technically, be provided, but that the company is not willing to do so for commercial reasons; however, this conflicted with the respondent's subsequent answers regarding the six WEEE taskforce categories, upon which they indicated information could be provided based both on the number of items per category and the weight of items per category. Furthermore, this company indicated it uses a number of different methods for classifying/categorising WEEE, including itemised lists provided upon collection, weighing batches of mixed and single streams, counting and classifying each item collected and "reverse logistics software." In addition, this company referred to "TFS" (transfrontier shipment) documentation as a means or driver for classifying/categorising WEEE. Not surprisingly, the other two respondents who export whole WEEE also indicated they are able to report on various categories, primarily by weight.

One respondent who collects only lighting equipment indicated the amounts collected can be reported based on the weight of items/products and that this is determined by counting and classifying each item collected.

The remaining two responses differed somewhat. One indicated information pertaining to two WEEE categories, *large household appliances* (Category 1) and *IT and telecommunications equipment* (Category 3) as well as all six of the WEEE taskforce categories could be reported based on the weight of items in each of these categories. This company noted explicitly, however, that waste management companies and not the transport company determine classification.

The other respondent indicated weight- and/or number-based information could be provided for seven of the WEEE Directive Categories and five of the WEEE taskforce categories. Methods used by this company to classify WEEE include itemised lists accompanying WEEE, estimation/visual inspection and weighing batches of mixed WEEE. No information can currently be provided on toys, leisure and sports equipment (WEEE Category 7) or automatic dispensers (WEEE Category 10); however, this company indicated monthly waste composition surveys could be carried out to determine quantities of WEEE contained in these categories. This company did not indicate whether any information could be provided on consumer equipment (WEEE Category 2).

4.2.5 Discussion of questionnaires, preliminary conclusions

Limiting the number of categories of WEEE for which detailed monitoring is required appears to present a stronger potential for information to be available from treatment operators. Quantifying or otherwise distinguishing between the ten categories specified in the WEEE Directive will still be required and composition surveys appear to be a necessary component of any system using less than the ten WEEE Directive categories. In particular, if the six WEEE taskforce categories are used, although television and monitors are likely to be treated together, these fall under two different WEEE Directive categories (Category 4, *consumer equipment* and Category 3, *IT and telecommunications equipment*, respectively); not only do they have different recovery and recycling targets, they would generally be the responsibility of a different set of producers. Furthermore, the composition of the sixth taskforce category, a catch-all of 'other WEEE,' would still need to be determined. Removing the other five WEEE taskforce categories would, however, restrict the number of items falling under this sixth category.

In light of some of the limitations cited by Irish operators, composition surveys may require a cooperative effort and/or other forms of assistance. In light of the requirements and obligations the WEEE Directive places upon private sector operators, industry leadership also appears to be warranted; producers are, after all, responsible for meeting the recovery and recycling targets. Furthermore, not only must the specified recovery and recycling targets be met, producers must pay for the management of WEEE and costs will be directly linked with the quantities of particular types i.e., categories of products arising in the waste stream. As such, it is in the producer's best interest to ensure the compliance schemes and/or waste managers working on their behalf are efficient, accountable and are indeed achieving the specified targets, and that the associated record-keeping and reporting is accurate and equitable. Options for an industry-led approach might include a collective of recyclers, a group of producers (e.g., a collective scheme) or, as in the case with the WEEE Forum, a group of collective compliance schemes mandating, organising, funding and/or otherwise facilitating composition surveys. If responses to the questionnaires are taken in their most literal sense, facility staff are available to assist in composition surveys, this would just need to be outside normal working hours so as not to disrupt operations or otherwise cut into time spent on other duties.

While permitted waste collectors will be an important source of information regarding the quantities of WEEE collected, they will be of limited value in terms of providing qualitative information regarding the types/categories this comprises. Such information will need to be

provided by the generator or collection point of the waste and/or determined by treatment facilities.

The current system of waste collector permitting, whereby up to ten collection permits (one from each nominated collection authority) can be held by one waste collector increases the potential for waste to be double-counted in the compilation of National figures. It would seem logical to centralise the system and have only one authority responsible for permitting all waste collectors in Ireland.

As highlighted in the interviews, instances where whole WEEE is transferred to another operator, without any actual treatment, represents a potential for double counting. If collection data were to come strictly from permitted waste collectors, these would need to be aware of the distinction between what might be considered a first collection (for example, from an authorised collection facility or the point from which the waste is actually generated) and what might strictly be considered a transfer.

4.3 New and emerging information

4.3.1 Implementation in the Member States

As noted in Section 2.3.2, the systems and measures proposed by individual Member States to implement the WEEE Directive in their respective countries vary, often considerably. They are generally tailored to the individual Member States' current systems for managing waste, particularly as some already had/have legislation and schemes in place specifically for the collection and recycling of WEEE. In addition, planned or proposed measures take into account the general regulatory and commercial environments of the particular Member State, which can be influenced by what might be considered cultural factors i.e., whether it is a generally "compliant" culture or one that requires a more "command and control" approach. Furthermore, a number of Decisions under the Directive were only recently or have yet to be made and several issues and clarifications remain outstanding, including on such fundamental matters as the scope of the Directive (pers. comm., TAC on waste, 2005). This is having an affect on the implementation measures and/or options available to Member States and the affected stakeholders.

4.3.2 Additional information on Recupel

Following on from the discussion in Section 4.1.3 of Recupel, the Belgian WEEE management scheme, further information was obtained from the scheme's website (www.recupel.be). Although this would not be considered new and emerging, some of the information provides further insight into factors that might facilitate reporting as well as the overall effective and efficient operation of a national WEEE take-back scheme.

Measures taken by Recupel to ensure a degree of financial and operational accountability, both to regulatory authorities and those participating in the scheme include the following:

- "In collaboration with the regional authorities, the 5 product organisations of Recupel appoint an independent firm to audit their accounts and ensure the correct use of financial flows."
- "The operational partners and their services to the Recupel system (collection operators, inter-communal unions, transfer centres, firms with social aims and recyclers) are subject to checks aimed at examining whether the systems are optimal as regards the environmental techniques and whether they are economically justified."

- “Recupel also conducts checks at collection points on retail businesses and at waste disposal sites, to verify whether WEEE are received there under suitable conditions and whether communication is sufficient.”
- “Recupel employs up to 10 full time external auditors to provide financial and logistical checks on participating firms.”

As noted in the discussion of the interviews (Section 4.1.3) the website indicates Recupel uses a relatively simple configuration of suppliers, including one transport firm and five specialist recycling firms who operate on the basis of product and component type. In addition, Recupel is currently developing a system for the certification of quality and environmental management systems with its service providers.

The website highlights a number of ongoing challenges Recupel is facing with respect to implementing various elements of the WEEE Directive, but states that the scheme will be “mostly in compliance” by the 13 August 2005 implementation date.

A number of changes must be made to the Recupel scheme in order to fully implement the WEEE Directive in Belgium. As previously referred, by being the only WEEE scheme operating in Belgium and by limiting the number of contractors it involves, the scheme has a degree of control over its contractors that might otherwise not be afforded. Also previously noted was the apparent potential for such an arrangement to create an unfair market advantage or to otherwise be construed as anti-competitive; the website specifically states, however, that Recupel has “relied solely on market forces to ensure adequate recycling and logistics capacity is in place” and that two new commercial electronic waste recyclers have come into the market “as a direct response to market signals from Recupel.”

The overriding message that can be taken away from the Recupel information is the influence of wider factors on the effective operation of a compliance scheme and the associated system for monitoring, record keeping and reporting. These factors include service, quality and market forces. This might complement the previous suggestion that a relatively simple, albeit standardised regulatory reporting system is put in place to start, with a view to establishing trends and identifying areas requiring improvement or change in the future. Under such a scenario, regulators would not remove themselves from the process altogether, but would take a somewhat hands-off approach, maintaining a greater degree of involvement in auditing and enforcement of waste operators.

4.3.3 Unified reporting system for the WEEE Forum

A number of the individuals interviewed (Section 4.1) referred to the work being undertaken on behalf of the WEEE Forum to develop a unified reporting system for WEEE. Additional information was obtained from the individual who was requested by the WEEE Forum to conduct the work.

The system proposed is sophisticated in terms of the information it is intended to manage and the statistics it will be able to produce, including those related to recycling and recovery rates for the ten categories specified in the WEEE Directive. However, overall the system aims to simplify reporting by electronically or otherwise automatically compiling and rectifying data entered by individual treatment operators. Issues highlighted by/amongst the WEEE Forum members that they felt required consideration in devising the system included those highlighted by EERA in its letter to the TAC regarding the European Commission's proposed monitoring protocol, as referred in Section 4.1.1 (Zonneveld, 2004a), as well as the inability to compare results of any of and between the current European collective systems for WEEE management.

The proposed system is based on the use of EWC codes, with additional sub-codes corresponding to a specified waste streams or types. While individual sub-codes have been specified for each of the ten WEEE Directive categories, it is proposed to use an amalgamation of the current collection and treatment categories used by the WEEE Forum members as the basis for 'inputs' into the system. The categories identified include the following (Gabriel, 2004):

Table 4.7

Input WEEE categories – WEEE Forum system

- | |
|--|
| <ol style="list-style-type: none">1. WEEE collected as 'mixed WEEE'2. Large (household) appliances3. Cooling and freezing appliances4. CRT appliances5. (Other) small appliances6. (All kinds of) fluorescent tubes or bulbs7. Other specific WEEE collected separately e.g., only mobile phones or computer equipment, excluding CRTs |
|--|

This approach, whereby the number of categories are limited based primarily on how particular items are managed, is notably consistent with that suggested by the WEEE taskforce.

The WEEE Forum's system will only provide information based on the categories specified above, and it has been acknowledged that consideration must be given to analyses or tests to determine the yield out of individual categories or fractions of WEEE to determine the 'average yield' from these, which can then be attributed based on the 'input' quantity of the particular category or fraction. In other words, 'average' treatment results for single streams of WEEE from certain WEEE categories would be obtained, most likely by running trials treating the single streams, and would then be used as a basis for extrapolations, whereby weighting or correction factors could be applied based on the proportions of the single streams that comprise the mixed stream.

The system highlights the potential for double counting of WEEE, for example as is common in Ireland, when a treatment operator passes on whole WEEE to another operator without undertaking any actual treatment. The proposed way of dealing with this is to restrict the use of the four main EWC codes describing WEEE to the "first treatment partner;" any subsequent "partner" would avoid using these codes. In other words, when whole WEEE is passed on to another operator, this would be reported by the first operator under EWC chapter 20, *municipal wastes...etc.*, and by the second operator to whom the whole WEEE is passed under EWC heading 16, *wastes not otherwise specified*. This might be a partial solution; however, it would not be conducive to the suggestion made in Section 2.4.2, whereby whole B2B WEEE is reported using chapter 16 codes. Indeed, the proposed system does not address the distinction made in the Directive between household and B2B WEEE; as treatment operators, those reporting into the system would not be concerned with where WEEE is coming from.

Based on what is proposed by this system, it appears as though there is a general willingness by the WEEE Forum members, as well as the associated treatment partners, to accept assumptions or to use protocols for estimating certain information regarding treatment results. In addition, the system seems to imply that the composition of the mixed WEEE stream could be based on surveys or protocols adopted by the individual WEEE systems and/or Member States. Considering the membership of the WEEE Forum, the associated treatment partners and the experience these represent as regards the management of WEEE on a national or otherwise large scale, the general support for the use of assumptions, protocols and surveys suggests these are, indeed, the most reasonable way of determining and reporting certain information on performance.

4.3.4 Additional information on ICER and WEEE accreditation and protocols

As noted in the interview with Mr. Truesdale, DOE NI (Section 4.1.2), the UK Government, in cooperation with ICER, are planning to put in place an accreditation system for authorised WEEE treatment facilities and are working to develop a protocol to estimate the contribution of different categories of WEEE to a typical mixed load collected at a CA site.

The intention of the ICER accreditation system is to provide a means for authorised treatment facilities (ATFs) to demonstrate they can meet permitting requirements associated with forthcoming UK legislation (www.icer.org.uk). Under the draft UK legislation transposing the WEEE Directive, producers will need to use recyclers who can demonstrate that treatment and recycling have been carried out in accordance with the Directive and that the relevant recovery and recycling targets have been met (pers. comm., C. Tollody, 2005). In the UK, these will be ATFs; ICER accreditation will enable companies seeking to become ATFs to demonstrate best practice.

The protocol project is Phase III of a wider project being undertaken by ICER to examine various issues associated with WEEE management and implementation of the WEEE Directive in the UK. Other phases of the project include estimating total arisings of WEEE, evaluating the amount of WEEE that might be separately collected (as opposed to disposed with other domestic waste), estimating recycling costs and looking at what currently happens to WEEE, including levels of refurbishment and reuse in the UK and abroad (ICER, 2005). The final report of the project is due in summer 2005.

As part of its research, ICER has noted that most CA sites are unlikely to have space for separate containers for each of the ten WEEE categories (ICER, 2005). The organisation, however, recommends that a minimum of the following five groupings be used for practical reasons:

Table 4.8

Recommended WEEE categories - ICER

- | |
|---|
| <ul style="list-style-type: none">• Refrigeration equipment• Other large household equipment• Equipment containing CRTs• Linear and compact fluorescent lighting tubes• All other WEEE. |
|---|

As with the approach taken by the WEEE Forum, this is consistent with the approach proposed by the Irish WEEE taskforce. As concluded in Section 4.2.5, such a system will still involve distinguishing and quantifying the “other WEEE” category and, consistent with what has been suggested to address this, the ICER project aims to develop a protocol for determining the composition of the “all other WEEE” category. Notably, interest in the protocols project from ICER members is reportedly strong. The organisation’s spring newsletter (ICER, 2005) notes that “representatives from ICER companies – particularly producers whose equipment is likely to end up with ‘all other WEEE’ – have eagerly volunteered to help with the sorting process.”

The interest from the affected producers is not entirely surprising; as previously referred, producers will ultimately be responsible for paying the costs of managing WEEE. Clearly, for an individual producer to segregate or otherwise quantify the amount of his or her products in the waste stream would be an extremely complicated, costly exercise. However, while not wanting to add to costs in this way, as previously noted it is in the producer’s best interest to have the most accurate information possible regarding arisings of his or her products, if even only to the level of ‘type of product’ (versus particular brand), so that they are only paying towards their approximate share of the overall waste stream. The protocol project is facilitating a collective, cooperative approach, whereby a number of producers can be involved, hence, distributing the costs associated with undertaking waste characterisation studies.

4.3.5 European Regulation on waste statistics reporting

A new European Regulation on waste statistics reporting²⁰ will place additional requirements on Member States as regards the type of information gathered and level of detail reported on waste. The additional requirements must be put into place for the 2004 waste statistics onwards. This was a key driver behind EPA’s hiring a contractor to undertake data validation on Ireland’s 2003 waste statistics, as discussed in Section 4.1.2. The EPA wanted to evaluate the existing reporting system and to obtain recommendations for any changes necessary to ensure the provisions of the Regulation could be met (pers. comm., B. Meaney, 2004).

The objective of the Regulation, as stated in Article 1 is to establish a framework for the production of Community statistics on the generation, recovery and disposal of waste. It includes detailed specifications regarding how information is to be compiled and reported, including, *inter alia*, categories, characteristics, reporting units, the coverage and quality of the statistics provided. In addition, the Regulation provides for pilot studies on the import and export of

waste, taking into account the reporting obligations under Council Regulation 259/93 on transfrontier shipments of waste, discussed in Section 2.4.2.

The Regulation provides that Member States can acquire the data necessary to fulfil the reporting requirements based on a variety of means, including surveys, administrative or other sources (e.g., reporting obligations under existing Community legislation on waste management), statistical estimation or a combination of these. However, as noted above, Member States must also report on the coverage and quality of the statistics provided. This includes an indication of the percentage to which the compiled statistics represent the universe of waste of the respective items, the degree of precision for the collected data and a description on the estimations, aggregations or exclusions used.

It is clear from the detail and breadth of the provisions of the waste statistics Regulation that the degree to which assumptions or protocols can be used to report on WEEE management in Ireland will need to be balanced with ensuring these can be justified, in particular as regards reporting on the coverage and quality of waste statistics provided.

4.3.6 Draft Irish WEEE Regulations

Legislation transposing the WEEE Directive into Irish law was published in draft for consultation on 15 April 2005 (www.environ.ie). The legislation comprises Primary Legislation amending the Waste Management Acts and more detailed Regulations transposing the WEEE Directive as well as an associated Directive on the restriction or the use of certain hazardous substances in electrical and electronic equipment.²¹

4.3.6.1 Waste Management (Electrical and Electronic Equipment) Regulations 2005

Full transposition of the Directive required an amendment to the Waste Management Acts 1996 to 2003. This is done in the Waste Management (Electrical and Electronic Equipment) Regulations 2005, which make enabling provisions for the Minister of Environment, Heritage and Local Government, in consultation with the Minister for Enterprise, Trade and Employment to make Regulations allowing for, *inter alia*:

²⁰ Council Regulation 2150/2002 on waste statistics (OJ L 332, 09.12.2002, p. 1).

²¹ Council Directive 2002/95/EC (OJ L 37, 13.2.2003, p. 19).

- retailer responsibility for one-to-one take back;
- producer responsibility for:
 - registration,
 - financing,
 - achieving targets,
 - declarations regarding market share,
 - the provision of financial guarantees,
 - the provision of information to consumers,
 - marking of equipment, and
 - reporting on quantities recovered, recycled, etc.;
- a Registration Body; and
- the establishment of a collective scheme.

The legislation allows for the exemption from certain provisions of producers who join a collective scheme and of retailers who provide alternative means of one-to-one take back, so long as it is no more difficult for the final holder and it remains free of charge. Approval for a collective scheme will be dependant upon industry satisfying the Department of Environment, Heritage and Local Government that the scheme will have adequate financial arrangements in place, and that it will achieve the required recovery and recycling targets.

4.3.6.2 The Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005

The secondary legislation, the Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005, provide detailed rules for implementing the WEEE Directive. Part III of the Regulations pertains to management of WEEE and includes provisions relating to, *inter alia*:

- retailers' take back responsibilities;
- producers' financing responsibilities;
- collection, storage, treatment and recovery targets;
- record keeping; and
- WEEE Management Plans.

Like the packaging Regulations, the provisions made in the draft WEEE Regulations are quite general. Key provisions are summarised below.

Article 22 of the Regulations prescribes treatment and recovery targets for WEEE. These are transposed directly i.e., they are identical to the provisions in the WEEE Directive. Article 23 pertains to record keeping. From 13 August 2005, producers will be required to maintain records of WEEE entering and leaving treatment and recovery facilities. This is again a direct transposition of the WEEE Directive (Article 7). In addition, records must be retained in the State for a period of six years following the year they were drawn up, and there are general provisions such that they must be made available (if required or requested) to the EPA, the appropriate local authority or any other appropriate agency.

Article 24 of the Regulations includes provisions relating to Waste Management Plans and reports. Producers must prepare a plan for the management of WEEE when first applying for registration, which is itself required by the legislation, and every three years thereafter. They must subsequently prepare a report of the steps undertaken to comply with the WEEE Regulations when applying for renewal of Registration. All plans and reports must be submitted to the EPA for approval.

As previously noted, like the packaging Regulations, the draft WEEE Regulations have left it largely to the producers and/or collective schemes to devise systems for gathering, processing and reporting relevant information. The intention appears to be that enforcement authorities will, like the packaging statistics, conduct audits and cross check information against various other sources. How authorities intend to compile National statistics for the purposes of reporting to the European Commission remains unclear and, as has been borne out in this dissertation, there are several options for and issues associated with doing this.

4.3.7 Collective schemes for implementing the WEEE Directive in Ireland

To date, three collective schemes have been proposed for the purposes of implementing the WEEE Directive in Ireland. The first scheme, WEEE Ireland, has been established with the cooperation of IBEC. Based on its membership and how it proposes to operate (pers. comm., L. Donovan), WEEE Ireland appears to be in the position of being the predominant operator for WEEE producers in Ireland. The scheme intends to make arrangements on behalf of its members for the collection of WEEE from CA sites as well as some retailers, and for the subsequent management of collected WEEE.

In addition to WEEE Ireland, the European Recycling Platform (ERP) has indicated that they intend to operate in Ireland (pers. comm., J. Hayes). ERP comprises four electronics companies: Braun, Sony, Electrolux and Hewlett Packard and proposes a pan-European approach to

implementing the WEEE Directive based on “National clearinghouses” in each EU Member State, whereby industry, under a Government mandate, runs National registers and provides a “common logistical interface between the public collection facilities for WEEE and the industry” (www.erp-recycling.org). The scheme has appointed two companies to undertake the collection and management of WEEE on behalf of its four participating producers in the nine EU countries in which it currently proposes to operate. Notably, none of the countries where ERP proposed to operate independent from other producers currently have a collective WEEE management scheme in place. The third proposed scheme, B2B Compliance, intends to manage only B2B WEEE (pers. comm., D. Burton). The scheme will focus initially on Categories 8 (medical devices) and 9 (monitoring and control instruments) WEEE, and perhaps Category 3 (IT and telecommunications) WEEE, where this arises in a B2B situation.

WEEE Ireland had originally intended that it would be the only collective scheme in Ireland, acknowledging that a few self-compliers might make their own arrangements if and when this made commercial sense. The scheme had planned on collecting all WEEE from all CA sites and participating retailers, and had not intended differentiating WEEE based on who the producer is/was or when it was placed on the market, instead distributing costs to all members based on their current market share. However, in light of the arrival of ERP and, to a lesser extent, B2B Compliance, it is unclear how the schemes will operate side-by-side, although both ERP and B2B Compliance have indicated they will cooperate with WEEE Ireland. For B2B Compliance, the operation of more than one scheme does not appear to present a significant problem, as the collection routes and financing obligations for B2B WEEE are completely distinct from household WEEE. B2B Compliance has also indicated that they would be open to being subsumed by/operating under the “umbrella” of WEEE Ireland in the future, once the schemes have been in operation for a period of time, and WEEE Ireland has welcomed B2B Compliance onto the scene, viewing it as a complement rather than a conflict to their operations.

ERP has indicated its intentions to manage its members’ proportion of WEEE; however, as there are currently no intentions of operating a National clearinghouse in Ireland, how this will actually happen is again unclear. One suggestion has been that a single, toll-free number will be provided to all collection sites/centres and that which scheme’s collection contractor goes to collect the WEEE will depend on who’s turn it is, based on a market share distribution of the National WEEE arisings to each of the schemes. For all intents and purposes, this appears to be a clearinghouse model; however, neither WEEE Ireland nor the Irish Government appear to accept this, and both have come out strongly against the concept of a National clearinghouse. Without

some consensus on the issue, it is difficult to see how or by whom the function of allocating collections will be carried out; this is in effect the sole purpose of the “clearinghouse” ERP would like to see in every Member State.

As previously noted, the arrangements for the collection and management of WEEE will have a strong influence on the associated monitoring, record keeping and reporting. The initial WEEE Ireland proposal would have likely facilitated or at least simplified reporting, as the majority of WEEE would be collected and managed through this one, single scheme. Nonetheless, many of the issues and considerations highlighted in this dissertation will exist regardless of what arrangements are ultimately put in place; information still needs to be reported based on the ten WEEE categories and data must ultimately be compiled to represent the entire National picture.

4.4 WEEE information flows

Based on a review of the WEEE Directive's provisions, current practice in Ireland and the information required to report activities associated with the WEEE Directive, potential sources of this information and bodies/authorities to which this information could be reported were considered. This information is presented in Tables 4.9A-C below.

Table 4.9: Information requirements and potential sources

A: EEE placed on and/or removed from the market

Information		Reported by	Reported to	Purpose of information Notes
EEE put on the market	EEE manufactured/ originating in Ireland and sold in Ireland	Producers	EPA, via Register of Producers	EU reporting requirements Determining market share Compliance generally
	EEE imported into Ireland from EU Member States			
	EEE imported into Ireland from outside EU			
EEE exported	EEE manufactured/ originating in Ireland and exported	Any/all manufacturers of EEE		
EEE removed from the market	EEE imported into Ireland and subsequently exported	Any/all importers of EEE		Deduction from market share RoHS compliance checking in other MS

Table 4.9: Information requirements and potential sources

B: WEEE collected

Information		Reported by	Reported to	Purpose of information Notes
WEEE collected from households	Household WEEE collected: <ul style="list-style-type: none"> • from CA sites and other central collection facilities; • at collection events organised by local authorities or private parties; • directly from households i.e., kerbside collection; • directly from retailers. 	Permitted waste collectors or local authorities who provide waste collection service	EPA, via Annual Environmental Reports submitted by local authorities/nominated regional authorities	Collection target/EU reporting requirements Compliance generally
	Household WEEE brought directly to authorise treatment operators by other than a permitted waste collector e.g., by householders, retailers and other private parties, such as WEEE collected during organised collection events held by producers, churches, schools, etc.	Authorised treatment operators (?)	EPA, via recycler questionnaire (?)	Collection target/EU reporting requirements Compliance generally
	Collected household WEEE that is subsequently removed from the system for potential refurbishment/re-use	Local authorities, collectors or treatment operators, as appropriate	EPA	WEEE removed from the system must be reported to avoid double counting Reporting reused WEEE to the Commission is currently optional but may become mandatory in the future

Table 4.9: Information requirements and potential sources

B (cont.): WEEE collected

Information		Reported by	Reported to	Purpose of information Notes
WEEE collected from households (cont.)	Household WEEE collected by retailers, private parties e.g., organised collection events and exported directly, without the involvement of a permitted waste collector	Nominated Regional Authorities, via TFS authorisation	EPA	Collection target Ensuring environmentally sound management Compliance, generally
WEEE collected from other than households (B2B WEEE)	B2B WEEE collected by permitted waste collectors	Permitted waste collectors	EPA, via Nominated Regional Authorities	Ensuring environmentally sound management Compliance generally
	B2B WEEE brought directly to authorised treatment operators by other than a permitted waste collector	Authorised treatment operators (?)	EPA, via recycler questionnaire (?)	
	B2B WEEE removed from the system i.e., for potential refurbishment/re-use	Collectors or treatment operators, as appropriate		WEEE removed from the system must be reported to avoid double counting
	B2B WEEE exported directly, without the involvement of a permitted waste collector	Nominated Regional Authority, via TFS authorisations	EPA	Ensuring environmentally sound management Compliance generally

Table 4.9: Information requirements and potential sources

C: WEEE treated

Information		Reported by	Reported to	Purpose of information Notes	
WEEE treated	WEEE treated in Ireland	WEEE removed from the system i.e., for potential refurbishment/re-use	Treatment operators	EPA	To avoid double counting
		Recovered	Treatment operators	EPA	Treatment targets/EU reporting requirements
		Recycled			
	WEEE treated in another Member State	WEEE removed from the system i.e., for potential refurbishment/re-use	First treatment operators in the other Member State	EPA, via the first Irish treatment operator (exporter/broker) in Ireland	To avoid double counting
		Recovered	First treatment operators in the other Member State	EPA, via the first Irish treatment operator (exporter/broker) in Ireland	Treatment targets/EU reporting requirements
		Recycled			
	WEEE treated outside the EC	WEEE removed from the system i.e., for potential refurbishment/re-use	First treatment operators outside the EC	EPA, via the first Irish treatment operator (exporter/broker) in Ireland	To avoid double counting
		Recovered	First treatment operators outside the EC	EPA, via the treatment operator	Treatment targets/EU reporting requirements
		Recycled			

As can be seen in the tables above, there are several opportunities for double counting and/or data gaps. For example, in the case of collection and/or delivery to a treatment facility without the involvement of a permitted waste collector, such as by retailers or private individuals (Table 4.9B), WEEE classified as green list/Annex II waste (which, in most cases, would be an incorrect classification) may not be notified whatsoever to authorities. In particular, WEEE collected under these circumstances that is subsequently removed from the system i.e., for potential refurbishment or re-use will not be reported.

It is not currently known to what extent the type of activity described above will take place and issues such as this will require further consideration in a practical context. Taking the scenario described above, options available in order to obtain relevant information include: 1) requiring treatment operators to confirm the circumstances under which WEEE has been brought to their facility, including whether this was by a permitted collector and that it is household and not B2B WEEE, and to report this figure separately; or 2) to require treatment operators to confirm whether any/all WEEE brought to their facilities is household or B2B and to report these two figures separately, whereby the household figure can be rectified with other collection data, in which case any household WEEE reported by treatment operators in excess to that reported in other collection data is attributed 'by default' to a direct delivery to the treatment operator. Neither of these options are very simple and without practical experience it is unclear whether either is realistic or, indeed, required.

5.0 CONCLUSIONS

This dissertation has examined the information, record-keeping and reporting requirements associated with the pending implementation of the WEEE Directive in Ireland. Based on an evaluation of relevant literature and publications, the results obtained from questionnaires and through face-to-face interviews, conclusions and recommendations for further work are presented below.

A comprehensive WEEE reporting system requires data from all of a number of sources including producers, collective schemes, treatment operators and/or collection points. A summary of the types and potential sources of information that will be required is presented in Tables 4.9A-C. Critically, the entire treatment chain must somehow be linked in order to ensure information can be rectified. Furthermore, any reporting system will need to be able to distinguish between operators who actually undertake treatment and those who simply act as bulking up, sorting and/or transfer facilities. This is required in order to avoid double counting and will also facilitate greater oversight of operators who export WEEE for treatment outside Ireland.

Having one centralised, web-based reporting system would greatly facilitate the compilation of data and would be consistent with a suggestion made by the Irish WEEE taskforce. It is difficult to ascertain how the use of such a system specifically for WEEE might be required i.e., by legislation, without potentially creating an unfair advantage or disadvantage to certain stakeholders. In particular, the complexity, capital requirements and/or association with a specific scheme may make them inaccessible to some treatment operators, particularly small- to medium-sized enterprises (SMEs). This could be addressed in part if the reporting system was run by a public authority/agency and with the appropriate awareness and funding, which might be provided by the schemes or “lead contractors” who employ the system, and/or through Government grant programmes.

Limiting the number of categories of WEEE for which detailed monitoring is required appears to present a stronger potential for information to be available from treatment operators. The categories used must be easily understandable for consumers and at the same time make sense with respect to waste management practices. Quantifying or otherwise distinguishing between the ten categories specified in the WEEE Directive will still be required, and composition surveys appear to be a necessary component of any system using less than the ten WEEE Directive categories.

Sampling exercises and composition surveys require appropriate planning and resources. They must be frequent enough to account for seasonal variations and may be required at different points along the treatment chain, for example, to account for losses from the system. Market forces and commercial interests will influence the scope and frequency of surveys; producers who feel their waste is being over-reported/over-prescribed will take measures, for example funding or carrying out their own surveys to improve data or otherwise account for their own products, if this is seen to have the potential to reduce overall costs. Producers whose equipment is likely to end up with 'all other WEEE' have already expressed interest in partaking in such exercises in other countries.

Broad discrepancies in the use of EWC codes have been noted in National waste statistics reported to and compiled by the EPA. Only a limited number of codes apply to WEEE and these do not enable for the distinction between the ten categories specified in the Directive. In addition, while there are only four EWC codes that could be used for whole items of household WEEE, there are numerous other codes that could apply, particularly to the components and materials comprising and/or arising from the treatment of WEEE. This clearly presents the opportunity for incorrect and inconsistent reporting.

The value of robust, detailed data must be balanced against what is actually necessary to achieve the fundamental objectives of the WEEE Directive; a diversion of WEEE away from landfill the subsequent environmentally sound management of this waste stream. What appears to be more important is that those evaluating the data possess a degree of familiarity with the information and, critically, that the necessary crosschecks and auditing procedures are in place.

In lieu of extensive statutory obligations, a general requirement for contracts to be in place and for specific contractual obligations to be fulfilled would enable a degree of consistency and traceability across the WEEE treatment chain. An example would be instances whereby any operator involved in the management of WEEE must:

- 1) have a contract(s) in place (versus an informal agreement or working load-by-load);
- 2) include in contracts the requirement/condition that the treatment activities associated with these are reported in a specified format, either back to the contractor directly or via a centralised reporting system;
- 3) require that the aforementioned includes mass balance information and that it does, indeed, balance; and
- 4) ensure that these same conditions are passed on in subsequent contracts.

In light of some of the issues outlined above, the following training, awareness and information needs have been identified:

- Waste classification. In particular, use of EWC codes, appropriate characterisation for the purposes of waste movements including transfrontier shipments and familiarity with the ten categories specified in the WEEE Directive or any other means of categorising WEEE.
- Waste reporting. Completing EPA questionnaires and compiling and submitting Annual Environmental Reports. In addition, as has been done for packaging reporting, detailed, directed guidance should be developed in association with any future WEEE reporting system.
- Environmental Management Systems. These may be particularly difficult for smaller organisations to employ and maintain. Ways of facilitating wider use include exploring the possibility of forming EMS collectives in association with a WEEE management scheme or by providing for training/consultancy services in association with award of a contract.

Based on the conclusions outlined above, the following recommendations are made:

- A relatively simple, albeit standardised regulatory reporting system should be put in place to start, with a view to establishing trends and identifying areas requiring improvement or change in the future. To the extent possible, no changes should occur during the initial stages of implementation, as this will facilitate trend analysis and benchmarking.
- Attention should be focused on making and continuing improvements to existing waste reporting systems; namely, increasing the rate of return of AERs and facilitating education and awareness with respect to waste classification and the use of EWCs in particular.
- Appropriate human and financial resources should be afforded to the public bodies involved in data compilation and validation. Public authorities have cited the resource-intensity of carrying out audits, crosschecking information and following up on submissions as barriers to the effective and complete reporting of waste statistics in Ireland.

- Anyone involved in WEEE management in Ireland should be required to have an EMS in place, perhaps as a condition of the associated contract and/or authorisation e.g., waste permit or license. Full advantage should be taken of audits, be they in the context of an EMS or for regulatory compliance, as tools and drivers for continual improvement upon the quality of data, data management and the associated reporting system(s).
- Authorities should obtain details of plans or proposals for WEEE management, ideally through cooperative involvement in their development with other stakeholders, with a view to ensuring necessary provisions have been made for accurate and auditable record-keeping and consistent and reliable reporting systems. This may also involve a process of prior approval of calls for tenders for WEEE management services and/or of the winning tender before new contracts are let.

Following on from this, public authorities, producer compliance schemes and waste treatment operators should consider the following, collectively or otherwise in consultation, to ensure reasonable requirements for, and consistent reporting of, data and information relating to WEEE management activities:

- The use of waste characterisation surveys. In particular, the scope, frequency and most appropriate junctures in the collection and treatment chain where these should be undertaken. Ideally, a set of procedures for carrying out surveys should be developed that would apply at a National level, again with a view to ensuring a degree of consistency.
- The extent to which assumptions or averages could be applied in the context of treatment. For example, the use of standard protocols and/or regular treatment trials in lieu of continual monitoring, or the degree of uncertainty or margin of error which might be tolerated to enable mixed WEEE streams to be treated together.
- The use of averages, prorating or otherwise amalgamating information from various operators to derive single, national figures for WEEE collection and treatment for Ireland for the purposes of reporting to the EU Commission.

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Appendix I

**Data tables: draft Commission Decision on compliance monitoring
and data formats**

European Commission (2004a)

Table 1: Waste electrical and electronic equipment (WEEE) collected and exported (Article 12 and Article 5)

Column number	1	2	3	4	5	6	7
Product category	Put on the market	Collected from Private Households	Collected other than private households	Total WEEE Collected	Treated in the Member State	Treated in another Member State	Treated outside the EC
	Total Weight ¹ tonnes	Total Weight tonnes	Total Weight tonnes	Total Weight tonnes	Total Weight tonnes	Total Weight tonnes	Total Weight tonnes
1. Large household appliances							
2. Small household appliances							
3. IT & Telecommunication							
4. Consumer equipment							
5. Lighting equipment							
5a Gas discharge lamps							
6. Electrical & electronic tools							
7. Toys, leisure & sports equipment							
8. Medical devices							
9. Monitor & control instruments							
10. Automatic dispensers							

¹ If this is not possible, by numbers.

Table 2: Recovery, recycling and reuse, targets (Article 7(2)).

Column number	1	2	3	4	5
Product category	Recovery	Recovery rate	Total Re-use and recycling	Re-use and Recycling rate	WEEE reused as whole appliance
	Total Weight ² tonnes	%	Total Weight tonnes	%	Total Weight Tonnes
1. Large household appliances					
2. Small household appliances					
3. IT & Telecommunication					
4. Consumer equipment					
5. Lighting equipment					
5a Gas discharge lamps	N.A.	N.A.			
6. Electrical & electronic tools					
7. Toys, leisure & sports equipment					
8. Medical devices					
9. Monitor & control instruments					
10. Automatic dispensers					

Note: items in grey are optional

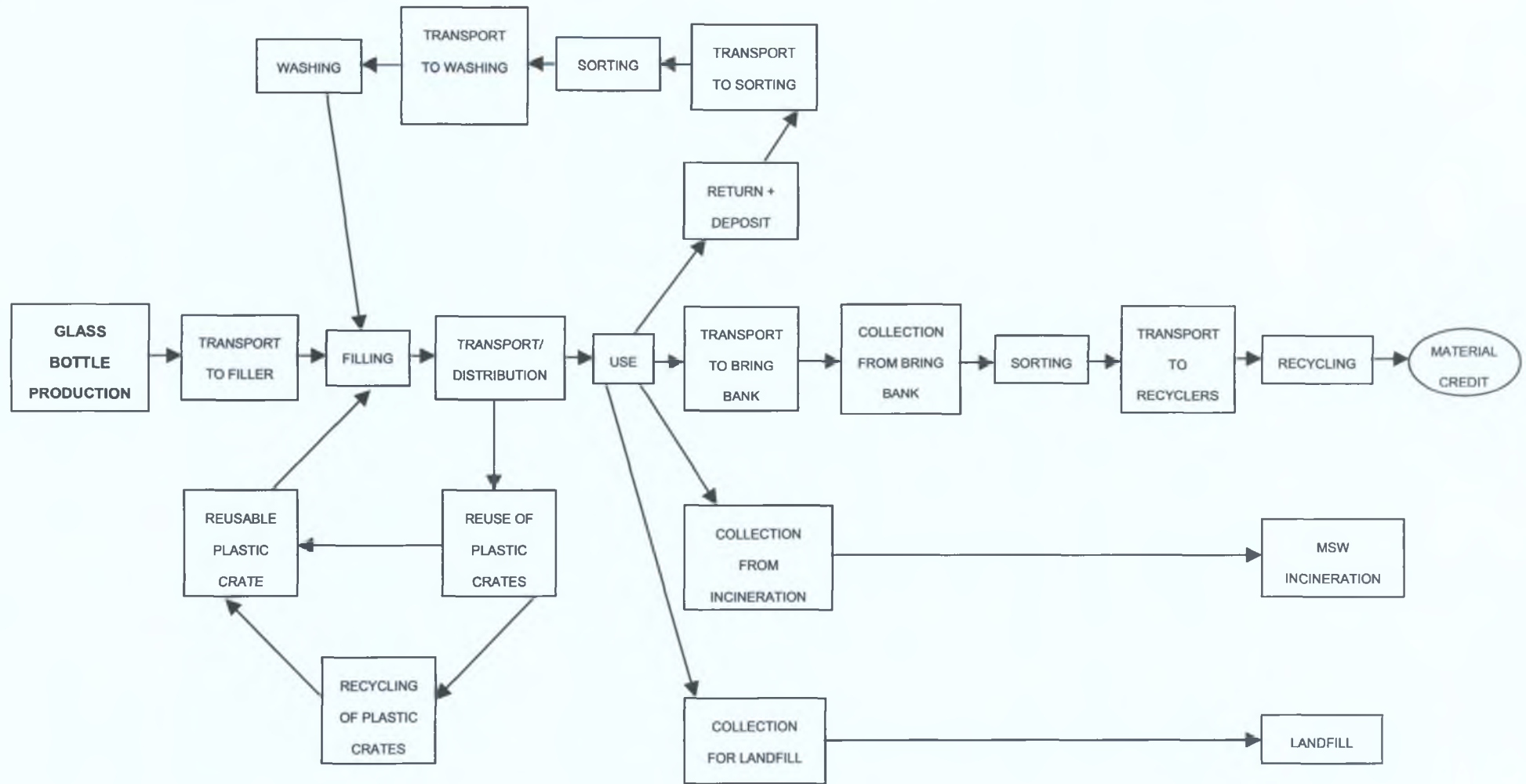
² If it is not possible, by numbers.

Appendix II

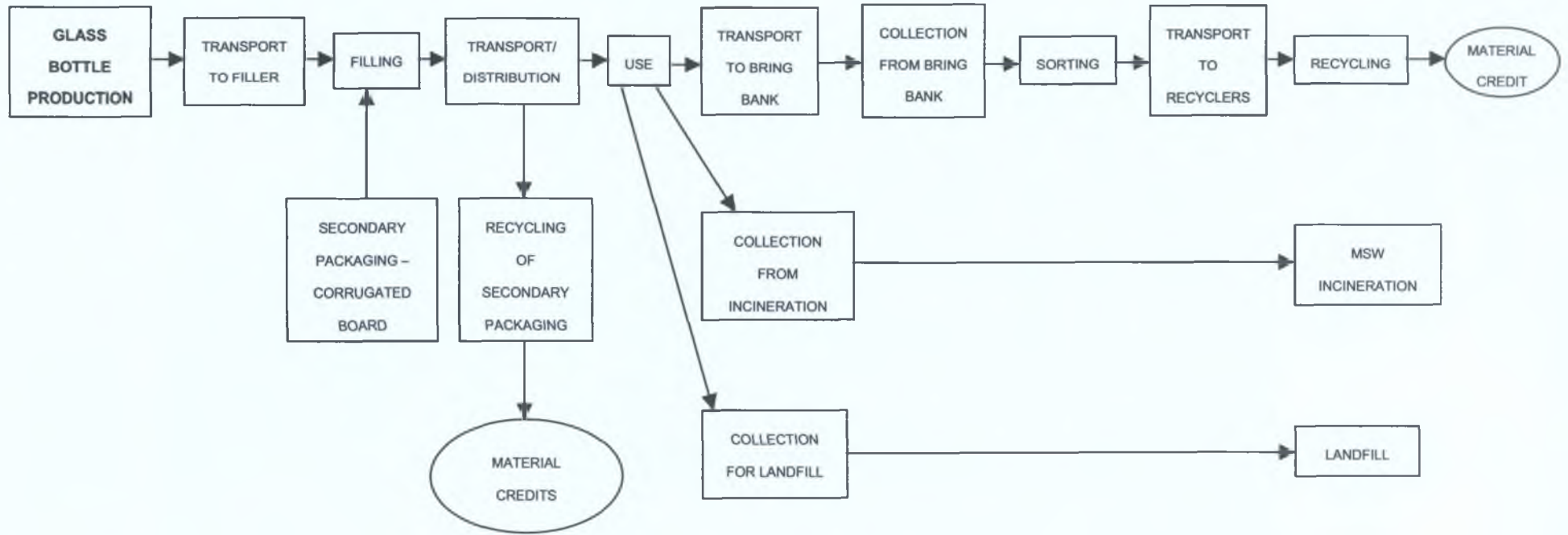
Packaging process trees

RDC and Pira (2003)

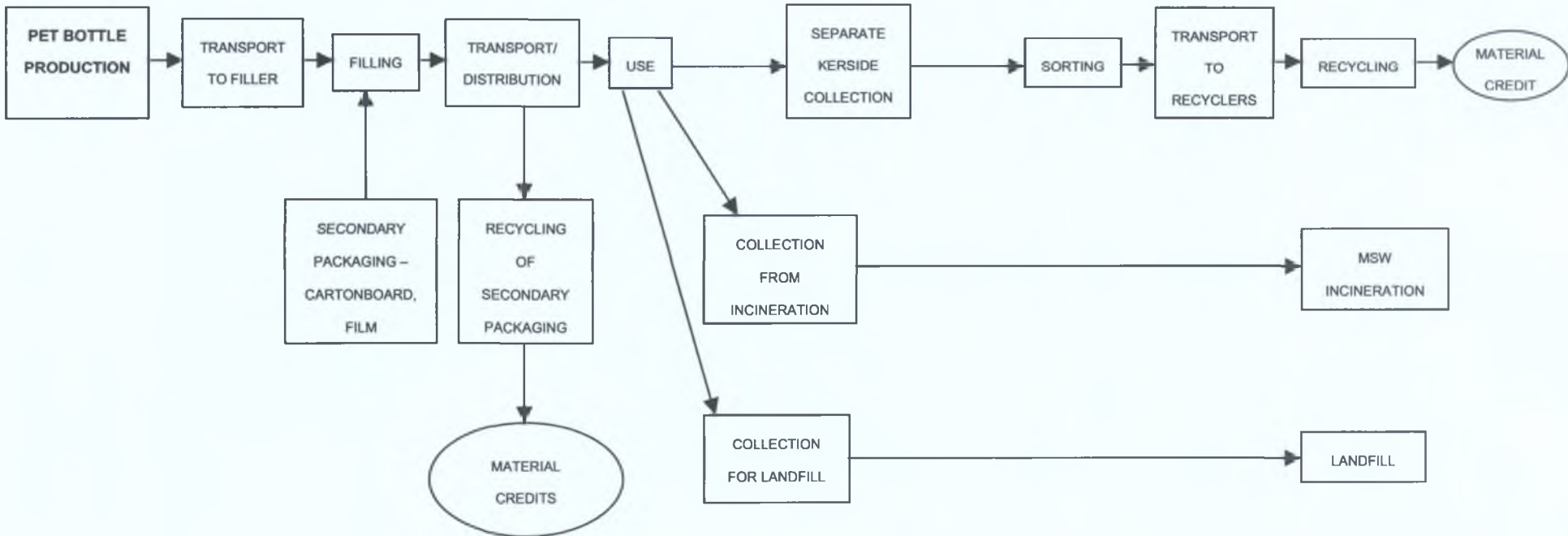
PROCESS TREE: GLASS BOTTLES RETURNABLE



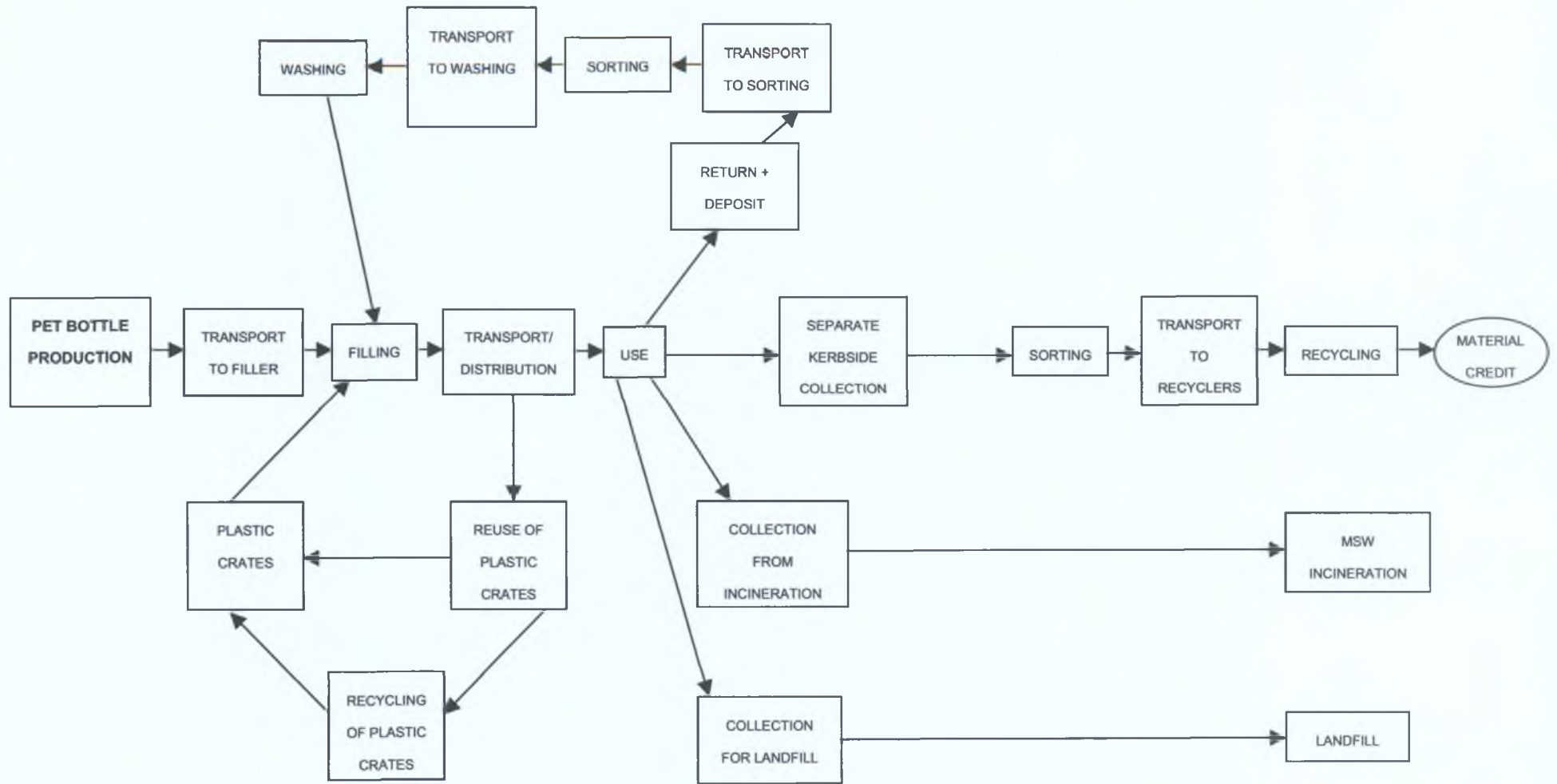
PROCESS TREE: GLASS BOTTLES SINGLE TRIP



PROCESS TREE: PET BOTTLES SINGLE TRIP



PROCESS TREE: PET BOTTLES RETURNABLE



Appendix III

ELV material flow diagrams

Kollamthodi et al, 2003*a*

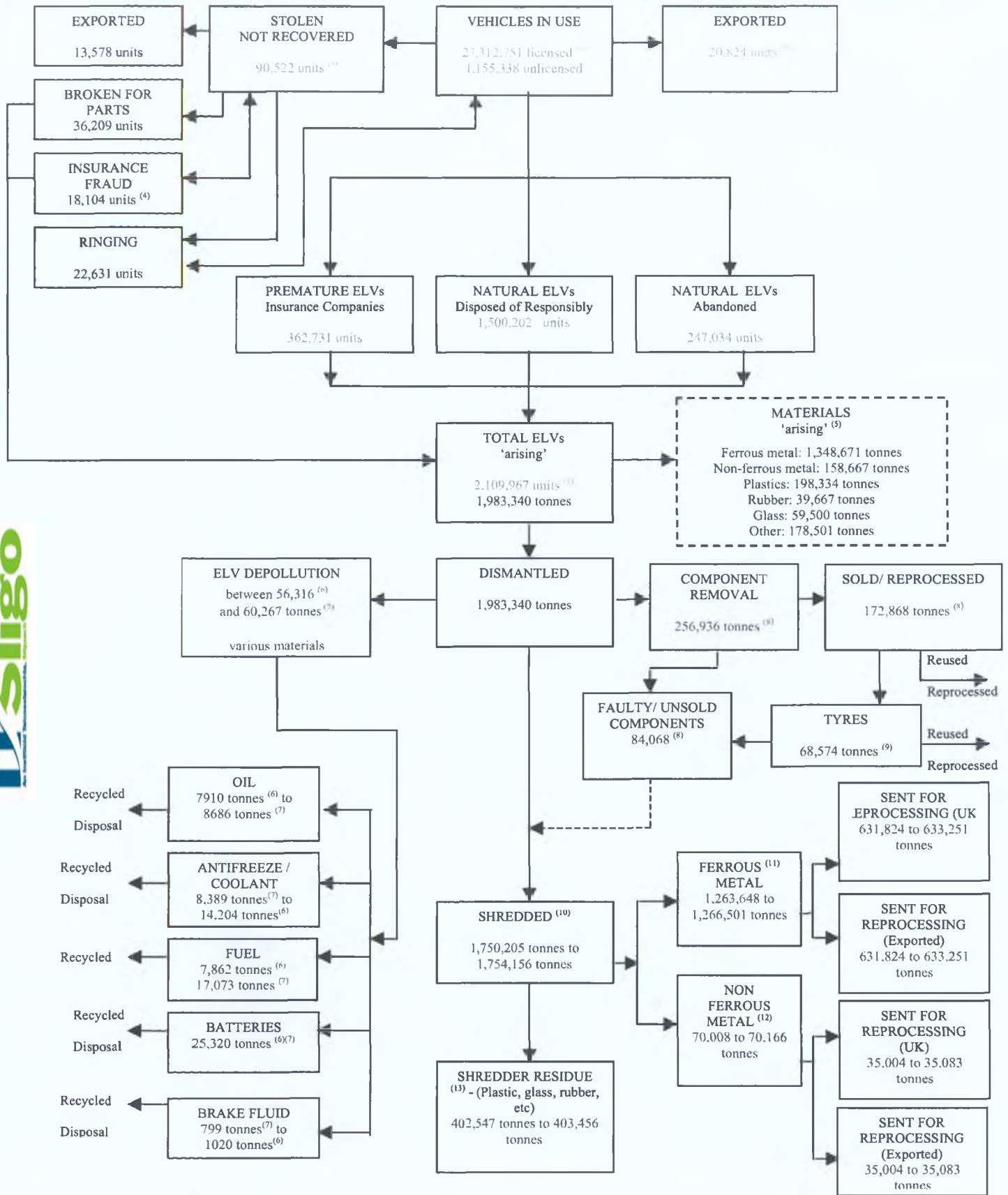
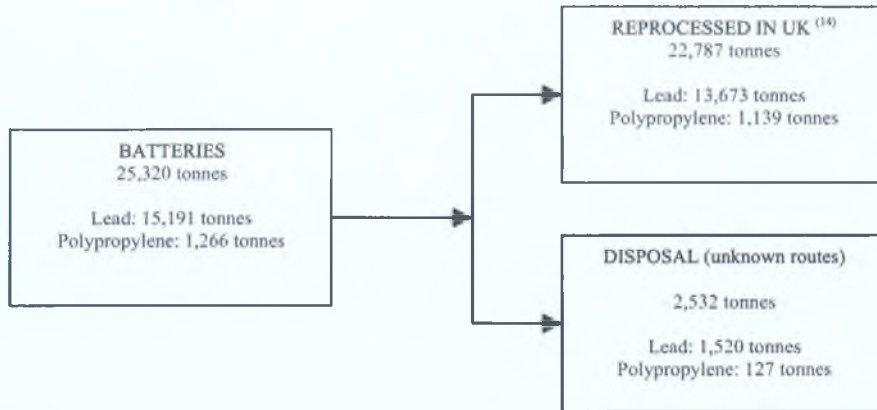


Figure 7.1(a) Summary of material flows for ELV arisings, processing and reprocessing

Batteries



Tyres

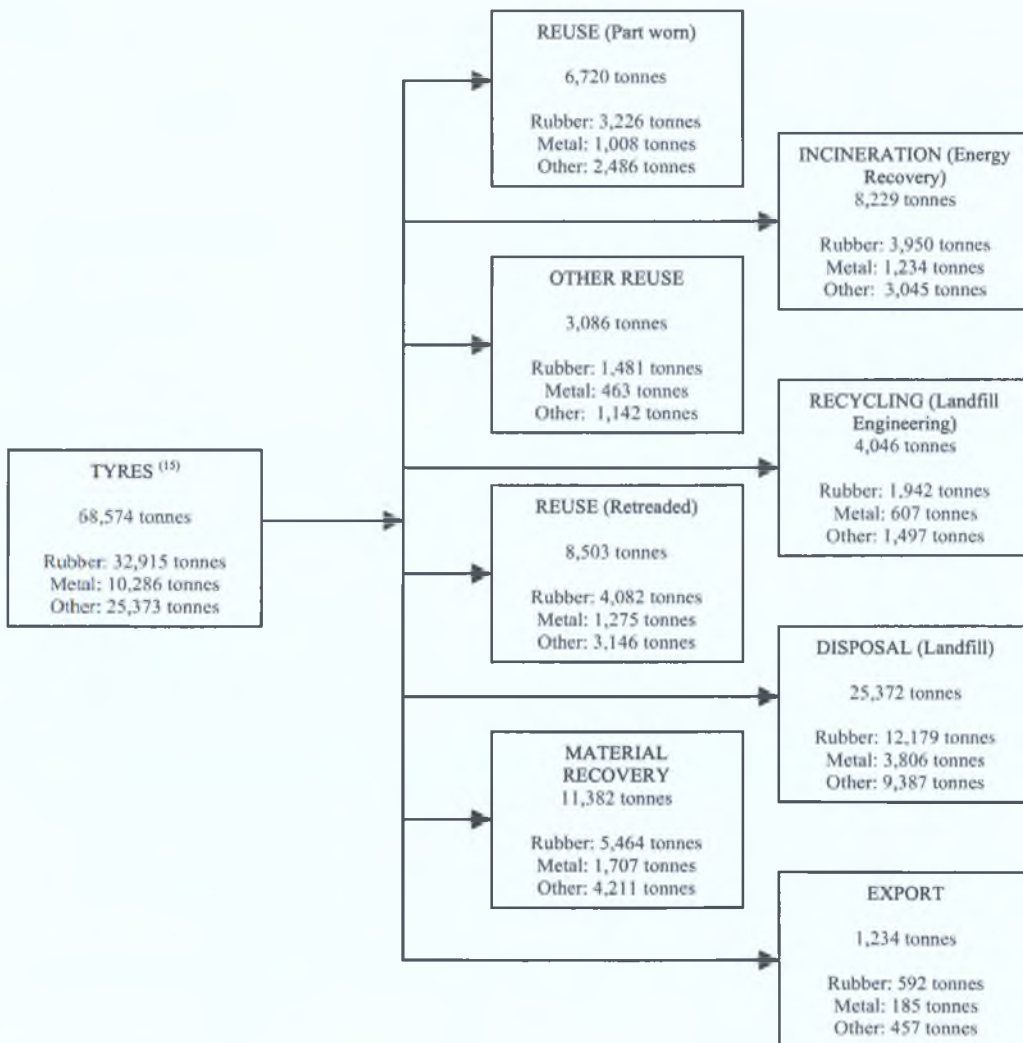


Figure 7.1(b) Summary of material flows for ELV arisings, processing and reprocessing



Oil

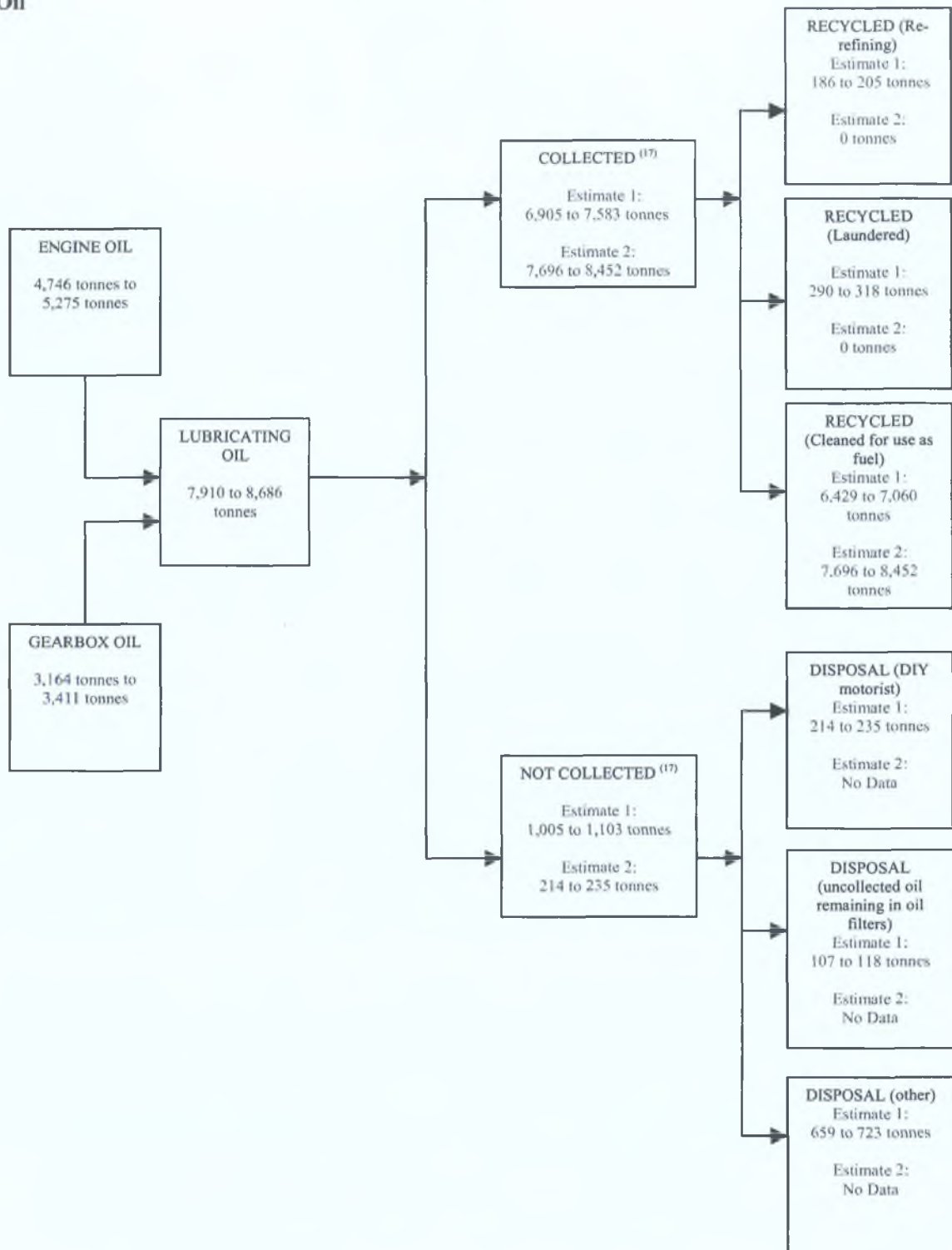


Figure 7.1(c) Summary of material flows for ELV arisings, processing and reprocessing



1. Figures for the number of vehicles in use were obtained from the DTLR publication "Vehicle Licensing Statistics". The figure presented is the sum of cars, taxis and light goods vehicles (all tax classes) licensed in each Regional Planning Area, those whose county is unknown, and vehicles classed as "under disposal". Vehicles under disposal are those where a transfer from one owner to a new owner is in progress when the statistics were collated, and consequently the Regional Planning Area to which such vehicles were assigned was unknown at that point in time.
2. Export data obtained from the Office of National Statistics (ONS) for GB and from DVLNI for Northern Ireland.
3. Estimates based on Home Office Crime Statistics, Northern Ireland Crime Statistics, data from ONS, and a study conducted by TRL for the Home Office on stolen vehicle recovery rates. The breakdown of the final destinations of unrecovered stolen vehicles was provided by the Motor Salvage Regulation Task Group (25% stolen for ringing, 40% broken for parts, 20% for insurance fraud, and 15% exported).
4. The Association of British Insurers (ABI) estimates that 90% of insurance fraud vehicles end up in the ELV stream.
5. Figures are based on ACORD estimates of the composition of a typical 1998 passenger car. It should be noted that the majority of ELV arisings will consist of vehicles manufactured long before 1998. Older vehicles will have a higher metal content and a lower plastic content than modern vehicles, but no accurate estimates of the proportions have been identified.
6. Depollution arisings estimated using average fluid capacities for fifteen popular passenger cars. Typical oil sump estimated to hold a maximum of 4.5 litres (4.1 kg), and gearboxes holds on average 3 litres (2.75 kg) of oil. 55% of capacity was assumed to be collected (AEA Technology, 1997). Coolant capacity was estimated to be 6.73 kg, and brake fluid capacity was estimated to be 0.48 kg. Each ELV was estimated to contain 5 litres (3.73 kg) of fuel to be removed. Each ELV was assumed to have a single lead acid battery weighing 12 kg.
7. Estimates of depollution arisings based on results obtained from the study of natural ELVs carried out in conjunction with Overton Garage in Aberdeen. Thirty natural ELVs were processed and the weights of all materials removed during the depollution process were recorded. Average weights per ELV were determined for each material and used to estimate the total arisings for all ELVs.
8. Estimates based on the weights of components removed from ELVs during the Overton Garage study. The mass of components sold for re-use has been estimated using stock sheets supplied by Overton Garage for components removed from the thirty premature ELVs. The same methodology has been used to estimate the mass of components scrapped.
9. Estimates for tyre arisings are based on an average weight of 6.5 kg for a used tyre, and five tyres per ELV.
10. Estimate for the amount of ELV material shredded in 2000 is based on the mass of ELV arisings, less the mass of materials removed during the depollution process, less the mass of removed components sold or reprocessed. The range of values occurs due to uncertainty in the amount of material removed during depollution. The British Metals Recycling Association (BMRA) estimated that 1.8 million tonnes of ELV material was processed by shredders in 2000, up to 50,000 tonnes greater than the estimate provided here (depending on rounding of figures).
11. BMRA estimated that 1.3 million tonnes of ferrous material was recovered from 1.8 million tonnes of ELV material processed (72.2%). This proportion has been applied to our estimate of the amount of ELV material processed to estimate the ferrous fraction. BMRA estimate that 50% of the ferrous material recovered is reprocessed in the UK with the remainder exported for reprocessing.
12. BMRA estimated that 72,000 tonnes of non-ferrous material was recovered from 1.8 million tonnes of ELV material processed (4.0%). This proportion has been applied to our estimate of the

amount of ELV material processed to estimate the non-ferrous fraction. BMRA estimate that 50% of the non-ferrous material recovered is reprocessed in the UK with the remainder exported for reprocessing. The proportion reprocessed outside the UK is likely to have increased after 2000 due to the closure of the last copper smelting facility.

13. BMRA estimated that between 408,000 and 432,000 tonnes of non metallic shredder residue was recovered from 1.8 million tonnes of ELV material processed (23 to 24%). This proportion has been applied to our estimate of the amount of ELV material processed to estimate the shredder residue fraction. It has been assumed that all of this material is landfilled.
14. Best industry estimates are that 90% of used lead acid battery arisings are recycled. Average weight of an automotove lead acid battery is 12 kg, of which 60% is lead and 5% is polypropylene.
15. Destinations of ELV tyre arisings are based on Used Tyre Working Group calculations for 1999. These figures have been modified to reflect the greater number of ELV arisings for 2000.
16. Two estimates have been provided for waste oil collection and reprocessing activities. Estimate 1 is based on data collated by AEA Technology in 1997, whilst Estimate 2 is based on data collated by Oakdene Hollins in 2000.

Appendix IV

Repak guidance documents for completing statistical return forms

www.repak.ie

Full Example of Packaging Data Statistical Return Form completion

The following is a full example of how a toilet roll manufacturer would complete the packaging data statistical return form

The company manufacture toilet rolls from Irish sourced raw material. Most of these are their own brand, but some are private label (contract packing). They also import finished products from their parent company in Europe.

The member does not have to report either the packaging waste generated (**Section 1**) or the packaging placed on the market (**Section 2**) for the private label goods, though they do keep this information on record for future reference. This falls under the definition of contract packing.

Section 1 Input Packaging

Back door products have been broken down by source between Irish sourced and imported. The packaging is removed when breaking bulk as well as from accessing raw materials. Some packaging is also removed by their *third party transport company*. This is also included here.

It is known how much product comes in per reporting period. The weights of the associated packaging removed are multiplied by unit and the respective sections are completed, depending on source (**1.1 Irish Sourced Input Packaging and 1.2 Imported Input Packaging respectively**).

Wood is reported as onward reuse, therefore the Member calculates the breakdown of how much wood is used again and how much is damaged and can not be reused. It is possible to keep a log of pallets received at the goods inward stage and subtract the weight of damaged pallets to find out how much was reused onwards.

Irish sourced steel cages are in an official reuse loop. The Member owns the cages and sends them out to his supplier to complete the order. He calculates the attrition rate at the end of 6 months and reports the balance as Reuse.

QC rejects - packaging which was purchased to apply, but was never used, can be included in section 1.3, in this case Paper. In order to prove the total, examine purchases against sales, as the balance of the two totals would be that which was not applied.

1.1 Irish Sourced Input Packaging	Paper / Cardboard	Steel	Plastic	Wood
Total Tonnes: (Including Reuse Packaging)	5.000	4.000	7.000	10.000
Reuse Packaging Suitable for Continued Reuse		3.000		

1.2 Imported Input Packaging	Paper / Cardboard	Steel	Plastic	Wood
-------------------------------------	----------------------	-------	---------	------

Total Tonnes:
(Including Reuse Packaging)

10.000		15.000	24.000

Reuse Packaging
Suitable for Continued Reuse

→ Section 1.3 top line = net 1.1 + net 1.2 less onward reuse plus QC rejects

The top line of 1.3, should be the packaging which goes to waste.

$$1.3 = 1 + 2 + 3 + 4$$

1.3 Internal Packaging Waste Management

Total Tonnes: (1 + 2 + 3 + 4)
All Packaging Waste Arising

	Paper / Cardboard	Steel	Plastic	Wood
Total Tonnes: (1 + 2 + 3 + 4)	20.000	1.000	22.000	3.756
1 RPS Scheme Recycling	19.000		22.000	3.756
2 Non-RPS Scheme Recycling		1.000		
3 Tonnes Directed to Recovery				
4 Tonnes Directed to Disposal	1.000			

This Member recycles, using both RPS Scheme and Non-RPS Scheme recyclers. The proportion he reports in sub sections 1 and 2 respectively can be proven by collection docketts, weight bridge tickets and by verifying the names against the list of approved recovery operators on www.repak.ie.

Under article 5 of the Waste Management (Packaging) Regulations 2003, a waste contractor can not accept packaging waste for Disposal unless the producer gives a written declaration of compliance. Therefore the Member will have their own back up documentation as well as collection docketts etc. The weights of packaging for disposal will appear on line 4 of 1.3 – Tonnes Directed to Disposal.

Section 2

2.1 Irish Sourced Output Packaging_Supplied in the ROI

	Paper / Cardboard	Steel	Plastic	Wood
Brandholder	95.000		200.000	50.000
Distributor	71.250		150.000	37.500
Retailer	50.000		120.000	10.000

2.1 Irish Sourced Output Packaging_Supplied in the Republic of Ireland

- ✓ The Member reports as a Brandholder as they have applied Irish sourced packaging to their product



- ✓ The proportion of packaged product they are the first to transport is reported in the Distributor section
- ✓ Only packaging removed by the direct customer is reported in the Retailer section

2.3 Imported Output Packaging_Supplied in the ROI

	Paper / Cardboard	Steel	Plastic	Wood
Brandholder/Importer	40.000		100.000	25.000
Distributor	30.000		75.000	18.750
Retailer	15.000		23.250	10.000

2.3 Imported Output Packaging_Supplied in the Republic of Ireland

- ✓ Any packaging removed from imported products, should be included in section 1.2
- ✓ The Member reports as a Brandholder/Importer for the packaging around products he imports to sell on to the ROI market
- ✓ The proportion of packaged product they are the first to transport, is reported in the Distributor section
- ✓ Only packaging removed by the direct customer is reported in the Retailer section

2.2+2.4 All Exports

	Paper / Cardboard	Steel	Plastic	Wood
Filled Packaging	3.000		7.000	10.000

2.2+2.4 All Exports

- ✓ The total weight of filled packaging exported goes in Filled Packaging in this section

2004 PACKAGING STATISTICAL RETURN FORM
REPAK LTD, Red Cow Interchange Estate, 1 Ballymount Rd, Clondalkin, Dublin 22
 Fax: +353 1 467 0197 E-mail: stats@repak.ie www.repak.ie

Member Company: Toletiries Manufacturer and Importer Repak No: 11111
 Address: Long Road, Town Land Submitted by: Joe Smyth
 Year: 2004 Half: 1 Position: QA Manager
 NACE Code: R 123 456 ROI Turnover for this period: € 1.5M
 P.O. No: 12345 Name of Packaging Waste Consultant (if any): Recycle Ltd

ALL DATA MUST BE IN METRIC TONNES (to 3 decimal places)

Section 1: INPUT Packaging Tonnage (Packaging Removed)

1.1 Irish Sourced Input Packaging

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papr/Plas Comp	Metal Comp	Other
Total Tonnes: (Including Reuse Packaging)	5.000			4.000	7.000	10.000			
Reuse Packaging (Official Loop) Suitable for Continued Reuse				3.000					

1.2 Imported Input Packaging

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papr/Plas Comp	Metal Comp	Other
Total Tonnes: (Including Reuse Packaging)	10.000				15.000	24.000			
Reuse Packaging (Official Loop) Suitable for Continued Reuse									

1.3* Internal Packaging Waste Management

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papr/Plas Comp	Metal Comp	Other
Total Tonnes: (1 + 2 + 3 + 4) All Packaging Waste Arisings	20.000			1.000	22.000	3.756			
1 RPS Scheme Recycling	19.000				22.000	3.756			
2 Non-RPS Scheme Recycling				1.000					
3 Tonnes Directed to Recovery									
4** Tonnes Directed to Disposal	1.000								

Section 2: OUTPUT Packaging Tonnage (Packaging Supplied)

2.1 Irish Sourced Output Packaging_Supplied in the Republic of Ireland

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papr/Plas Comp	Metal Comp	Other
Total Tonnes: (Including Reuse Packaging)									
Materials Manufacturer									
Converter									
Brandholder	95.000				200.000	50.000			
Distributor	71.250				150.000	37.500			
Retailer	50.000				120.000	10.000			
Reuse Packaging (Official Loop) Suitable for Continued Reuse									
Brandholder									
Distributor									
Retailer									

Year 2004

Jan to June ___ or July to Dec ___



Member Company: Toilettries Manufacturer and Importer

Repak No: 11111

Section 2 (cont'd): OUTPUT Packaging Tonnage (Packaging Supplied)

2.3 Imported Output Packaging_Supplied in the Republic of Ireland

Total Tonnes: (Including Reuse Packaging)	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papri/Plas Comp	Metal Comp	Other
Materials Manufacturer									
Converter									
Brandholder/Importer	40.000				100.000	25.000			
Distributor	30.000				75.000	18.750			
Retailer	15.000				23.250	10.000			
Reuse Packaging (Official Loop) Suitable for Continued Reuse	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papri/Plas Comp	Metal Comp	Other
Brandholder/Importer									
Distributor									
Retailer									

2.2 + 2.4 All Exports

Total Tonnes: (Including Reuse Packaging)	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papri/Plas Comp	Metal Comp	Other
Empty Packaging									
Filled Packaging	3.000				7.000	10.000			
Reuse Packaging (Official Loop) Suitable for Continued Reuse	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papri/Plas Comp	Metal Comp	Other
Filled Packaging									

Declaration

The data provided above is accurate and the systems underlying it's preparation are capable of being audited.

***Director's Signature: Mr Joe Smyth Date: 01/07/07

Notes:

Materials Manufacturer - makes or imports materials to be made into packaging.

Converter - makes or imports (empty) packaging.

Brandholder/Importer

Distributor - is the first to transport the packaged product in ROI.

Retailer - If your customer removes packaging (doesn't sell it on), you are the retailer.

Please consult guidelines on website for further definitions and examples.

If this return is to be e-mailed, please agree to declaration on cover note.

*Section 1.3: Total tonnes = Net Section 1.1 + Net Section 1.2 - Onward Reuse + QC Rejects

**Please be aware that current legislation prohibits the disposal of most packaging waste to landfill.

***This form must be signed by a Company Director before submission.

Year 2004

Jan to June __ or July to Dec __



Where to begin?

Creating a Data Capture System to Calculate Your Obligation

You're either in the process of joining Repak or you have a requirement to re-design your system in order to report the packaging you place on the market. Depending on the size and/or the complexity of your company's business model a system can be very detailed or conversely quiet simple. You must ensure that it is suitable for audit by Repak's internal auditing staff or by independent auditing firms.

You need to look at your business and see what categories you fall under.

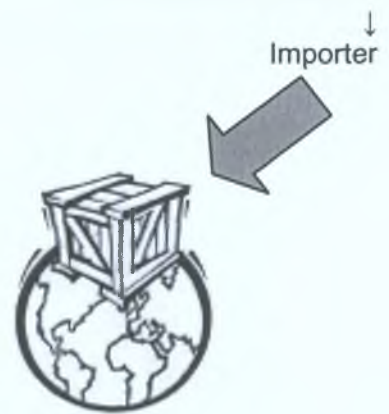
Below, is a generic supply chain, where your company may fall in to one or more categories:

Irish Manufacturer



Wholesaler
↓
Retailer
↓
End Consumer

Non Irish Manufacturer



Whether you purchase Irish sourced goods or rely on an importer, each product you handle will go through many stages within the supply chain.

You may either act under some or all of the following form headings:

- ✓ **Brandholder or Brandholder/Importer** (packaging you apply to products you own or packaging on product you import)
- ✓ **Distributor** (first to deliver your packaged good as you deliver yourself or collect from your customer) *or*
- ✓ **Retailer** (packaging removed by your customer, from your product) with regards to packaging you have applied yourself or packaging on products you import or source from other local suppliers *or*
- ✓ **Filled Packaging**(Packaging on products you export)

If you are involved in the packaging industry, you may also have an obligation to report your product under the following:

- ✓ **Materials Manufacturer** for the weight of packaging raw materials you either manufacture or import and place on the Irish market *or*

- ✓ **Converter** for the weight of packaging you either manufacture or import and place on the Irish market *or*
- ✓ **Empty Packaging** for the weight of packaging as product you export

Examine your role in the Supply Chain

When reporting to Repak, each company is responsible for the direct stages above and below as well as their own activity within the supply chain. Who are your suppliers? Who are your customers? If you purchase packaging, raw materials or finished goods, you do not need to know their country of origin, but rather the origin in the supply chain (Irish sourced – within the 26 counties, or imported). When you sell to your customers you must make a distinction between your customers in the Republic (Supplied in the Republic of Ireland) and those outside (All Exports).

You then need to relate these activities to the form.

What is Packaging?

Packaging is defined in the Waste Management Act, 1996 as:

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

Promotional goods and display units are considered packaging. The brand owner has the obligation to report.

Article 6 of Commission Decision 97/138/EC states that process waste is not packaging. Therefore, process waste should NOT be reported:

“Only waste originating from packaging placed on the market may be considered ... excluding any kind of production residues from the production of packaging or of packaging materials or from any other production process.”

Repak is only interested in packaging. Therefore you should not report weights of production residues from the manufacturing of packaging, packaging materials or any other products.

Packaging which was purchased by you but unused, can be reported as waste in section 1.3, which is your Internal Packaging Waste Management. You must disclose whether this went for Recycling, Recovery or Disposal.

Where there is uncertainty on a product's status as packaging, read through the following statements to clarify it's function:

- Does it **contain** the primary product? → Yes, then it is packaging
- Does it **group** the products together? → Yes, then it is packaging
- Did you apply it for **transportation** purposes? → Yes, then it is packaging

- Does it assist in **handling** the product? → Yes, then it is packaging
- Is it necessary for **protection**? → Yes, then it is packaging
- Is the material used to **promote** the product? → Yes, then it is packaging
- Does the packaging **market** the product? → Yes, then it is packaging
- Is the material **prescribed** for the product? → Yes, then it is packaging
- Is it a **promotional** good? → Yes, then it is packaging
- Is it a **display** unit? → Yes, then it is packaging

Where the packaging has another use, which far out weighs its packaging function, then it can be excluded from reporting, or example, as sausage skin. However examples such as this are rare and must stand up to rigorous investigation.

Section 1 – Input Packaging –Packaging Removed

In section 1, you are dealing with the packaging waste generated by your activities. This is waste arising on either your premises or that of a company contracted on your behalf e.g. (either a third party haulage company or a contract packer).

In the following, “you”, refers to either your own company, or a company contracted on your behalf...

1.1	Irish Sourced Input Packaging	Packaging removed from Irish sourced products
1.2	Imported Input Packaging	Packaging removed from imported products
1.3	Internal Packaging Waste Management	How you deal with your packaging waste

For each product arriving at your back door, can you provide it with a source tag? Do you know the weight of all associated packaging? Do you know how much packaging is removed?

If you cannot directly calculate the weights of packaging removed per product, look to your waste contractors, for the total weight of packaging recycled etc and work back. You may with reasonable estimation, apply a split between Irish sourced and imported, but this should stand up to the audit process.

Once you have calculated the packaging removed, what happens to it?

- Do you return the empty packaging to your supplier? – Any packaging returned to supplier, you should not report
- Do you remove the packaging from one product and apply it to another? Report this as **Onward Reuse** (i.e. report in 1.1 or 1.2 and do not report in section 2)
- Do you own the packaging and have it in a formalised **Reuse Loop** with your supplier? Reuse of packaging should be reported in section 1.1 or 1.2 or the form
- Do you use an **RPS Scheme** collector to have your back door packaging waste recycled? If yes, report under sub section 1 of 1.3. (please verify on www.repak.ie)
- Do you use a **Non-RPS Scheme** collector to have your back door packaging waste recycled? If yes, report under sub section 2 of 1.3. (please verify on www.repak.ie)
- Does your packaging get re-directed to a non packaging function with energy recovery? Report in section 1.3, under **Tonnes Directed to Recovery**

- Do you send the packaging waste to landfill? Report under sub section 4 of 1.3 under **Tonnes Directed to Disposal**

Example 1 – Input Packaging

You manufacture components for the electronics industry, with raw materials sourced at home and abroad.

Packaging you remove:

- Locally sourced goods are delivered in boxes, with pallet wrap and pallets
- One supplier uses **your** steel cages to deliver and you have an official reuse loop in place with him
- Plastic tote boxes are imported with air board, shrouded in plastic wrap (the boxes are returned to the supplier)
- Pallets removed are used again as packaging on another product

Irish sourced packaging removed – report in Section 1.1

- 1.003 tonnes of cardboard
- 3.000 tonnes of plastic
- 15.750 tonnes of wood
- 6 Tonnes of steel packaging from the cages. The attrition rate is calculated and a reuse value of 5 tonnes is then arrived at

Imported packaging removed – report in Section 1.2

- 6.000 tonnes tote boxes are returned to supplier – no need to report
- 2 tonnes plastic shroud removed

1.1 Irish Sourced Input Packaging

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papir/Plas Comp	Metal Comp	Other
Total Tonnes: (Including Reuse Packaging) Reuse Packaging (Official Loop) Suitable for Continued Reuse	1.003			6.000	3.000	15.750			
				5.000					

Figure rounded to three decimal places

Reuse of steel cages

Pallets - 15 Tonnes -> onward reuse. Report at the Input stage only (either 1.1 or 1.2) report what goes to waste in 1.3. Don't report in section 2

1.2 Imported Input Packaging

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papir/Plas Comp	Metal Comp	Other
Total Tonnes: (Including Reuse Packaging) Reuse Packaging (Official Loop) Suitable for Continued Reuse					2.000				

6 T Plastic drums returned to supplier don't report

1.3* Internal Packaging Waste Management

	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Papir/Plas Comp	Metal Comp	Other
Total Tonnes: (1 + 2 + 3 + 4) All Packaging Waste Arisings	1.003			1.000	5.000	0.750			
1 RPS Scheme Recycling	1.000			1.000	5.000				
2 Non-RPS Scheme Recycling						0.750			
3 Tonnes Directed to Recovery									
4** Tonnes Directed to Disposal	0.003								

Paper contaminated - Can't be recycled

www.repak.ie

Section 2 – Output Packaging – Packaging Applied/Supplied

When calculating your obligation for Section 2, remember we are interested in the source, destination and amount of packaging going from you or your supplier (be they Irish sourced or imported) to your direct customer. All packaging removed by you should be reported in section 1.

First of all, look at your sales units.

- Do you have a system capable of reporting the total units sold in six months?
- What is the total associated packaging with each unit sold?
- Can you break down the packaging levels (primary, secondary or tertiary) with each product? (See below)
- For the packaging associated with more unusual products, is each item classified as packaging? For example, does it have another function other than packaging? This may then exclude it from your reporting obligations. For example, when a medical vial is used to administer an IV drip, then it can be excluded from the return form.
- What packaging does your customer remove?
 - ➔ Per sales unit, set up the packaging ratio
 - ➔ Allocate source and destination
 - ➔ Tag your obligations to each section
 - ➔ Relate the information to the different sections of the form

Packaging levels which can be removed – 1°, 2° and 3° packaging



1° Primary Packaging: - conceived so as to constitute a sales unit to the final user or consumer at the point of purchase. E.g. bottle, label, cap...

2° Secondary Packaging: - at the point of purchase, this acts to group a certain number of sales units whether the product is sold to the final user or consumer or whether it serves only as a means to replenish the shelves at the point of sale; it can be removed from the product without affecting its characteristics. E.g. cardboard around a six pack of beer



3° Tertiary Packaging: - facilitates handling and transport of a number of sales units or grouped packaging in order to prevent physical handling, transport damage etc. E.g. pallets and pallet wrap

Each sales unit of product would have 1°, 2° and 3° packaging associated with it.

- A manufacturer will remove primary, secondary and tertiary packaging from their raw materials **Input**
- They will apply primary, secondary and tertiary packaging to newly manufactured products **Output**
- A wholesaler will remove a small amount of tertiary packaging **Input**
- They may re-apply new tertiary packaging when they sell on **Output**
- A retailer will remove secondary and tertiary packaging (**Input**) and place the primary packaging associated with the product up on the shelf **Output**. They may provide secondary/tertiary packaging in the form of carrier bags etc **Output**

The Unit Packaging Ratio

Take the example of a box of chocolates sold in a shop.

- ❖ The Box is cardboard, with a plastic tray inside and plastic film on the outside
→Therefore the associated primary packaging is the total weight of plastic and cardboard per unit
- ❖ The manufacturer packs the good in large cardboard boxes (30 to a box) which can be loaded six per pallet
→The secondary packaging is cardboard
- ❖ The goods are delivered on pallets with wrap
→The tertiary packaging is wood and plastic

Take the completed pallet as the sales unit – Allocate the weight of the associated primary, secondary and tertiary packaging:

- ✓ Pallet – 19KG
- ✓ Wrap – 0.25KG
- ✓ 6 cardboard boxes – 6 x 2KG
- ✓ 6x30 individual boxes with wrap and trays – 6x30x0.1KG (cardboard) – 6x30x0.04KG (trays) - 6x30x0.01KG (individual wrap)

Calculate the associated weight per reporting period and allocate to the specific sections on the packaging data statistical return form.

To Calculate 1 Unit

	Tertiary Wood	Tertiary Plastic	Secondary Paper Cardboard	Primary Paper Carton	Primary Plastic Trays	Primary Plastic Film
(KGs)	19	0.25	2	0.1	0.04	0.01
Packaging Type	Pallet	Wrap	Box	Carton	Trays	Film
Multiple	1	1	6	180	180	180
	19	0.25	12	18	7.2	1.8

Tonnes	
Total Paper	30
Total Plastic	9.25
Wood	19

- 10,000 units were sold
- 80% was delivered to customer
- The customer only removed the tertiary packaging

From this information you need to complete the packaging data statistical return form:

2.1 Irish Sourced Output Packaging Supplied in the Republic of Ireland

Total Tonnes: (including Reuse Packaging)	Paper / Cardboard	Glass	Alum.	Steel	Plastic	Wood	Paper/Plas Comp	Metal Comp	Other
Materials Manufacturer									
Converter									
Brandholder	300,000				92,500	190,000			
Distributor	240,000				74,000	152,000			
Retailer					2,500	190,000			





Appendix V

**Questionnaires sent to holders of Waste Collectors Permits and
Waste Permits**

Joanie Burns
113 Cowper Downs
Rathmines
Dublin 6

28 February 2005

Dear Waste Collector:

Your cooperation is requested in completing the attached questionnaire pertaining to the collection, treatment and/or management of waste electrical and electronic equipment (WEEE). The purpose of this exercise is to gain a better understanding of the current capabilities of and systems used by waste collectors to track data and information.

This work is being undertaken as part of a postgraduate research project (MSc in Environmental Protection) through IT Sligo. The success of the project is dependant in part on the receipt of sufficient responses to this questionnaire. As such, in lieu of providing no response you are welcome to reply anonymously, request confidentiality and/or withhold certain information you feel is commercially sensitive.

Thank you in advance for your participation.

Kindest Regards,

Joanie A. Burns

Recycling Organisation Questionnaire
Information requested by Joanie Burns
MSc (Environmental Protection) Programme, IT Sligo

Voluntary Information

If you are willing to provide additional details or clarifications or to discuss your responses to this questionnaire, please provide contact details.

Name: _____

Company/organisation: _____

Phone number: _____

Best time to contact: _____

Nature of Business

1. Number of employees: 1-5 6-10 11-20 21-30 31-40 > 40

2. Are **waste electronics** one of the waste streams you manage as part of your business (*for example, washing machines, refrigerators, toasters, computers, TVs, electronic games, kettles, lighting equipment, etc.*)? Yes
No

If the answer to this question is no, please answer only question 4. Other questions are not relevant to your operations.

3. If yes, do you disassemble these before sending the material on to another company or operation? Yes, to another company/operation in Ireland
Yes, these are exported
No (disassembly is not carried out)

4. Do you send **whole** waste electronics on to another company or operation (*not parts or materials after disassembly*)? Yes, to another company/operation in Ireland
Yes, these are exported
No

5. Have you completed an EPA **Waste Statistics Questionnaire for Recycling Organisations**? Yes, for the year 2004
Yes, for the year 2003
Never or not in the last 2 years



Monitoring and record-keeping

6. Can you provide information on the amount of the following **specific types** of electronics you manage (*a list of products falling under each of the categories is attached for reference*)?

	Yes, based on the number of items or products in this category	Yes, based on the weight of items or products in this category	No
1. Large household appliances			
2. Small household appliances			
3. IT & telecommunications equipment			
4. Consumer equipment			
5. Lighting equipment			
6. Electrical and electronic tools			
7. Toys, leisure and sports equipment			
8. Medical Devices			
9. Monitoring and control instruments			
10. Automatic dispensers			

7. Regardless of how you answered question 5, can you provide information on the amount of these following **specific types** of electronics?

	Yes, based on the number of items or products in this category	Yes, based on the weight of items or products in this category	No
1. Fridges and freezers			
2. All other white goods			
3. Televisions and monitors			
4. IT and telecommunications equipment			
5. Lighting equipment			
6. All others (<i>i.e., excluding any of the others listed above</i>)			

8. If you answered **yes** anywhere in questions 5 or 6, how is classification/categorisation **currently** determined (*Please mark all relevant responses*)?

Itemised list accompanying incoming WEEE

Estimation/visual inspection of contents of crates/containers

Weighing batches (e.g., pallets, crates, containers) of **mixed** WEEE

Weighing batches of **single streams**/types of WEEE

Counting and classifying each item as they come in

Weighing each item

Random sampling/waste composition surveys Frequency _____

Other _____

9. If you answered **no** anywhere in questions 5 or 6, which of the following **would be possible** in order to determine the classification/categorisation of the electronics you manage (*Please mark all relevant responses*)?

Estimation/ visual
inspection

Weighing batches
of these items

Counting or weighing
each item as they
come in

Composition Surveys
(please indicate **how**
often you could do
these (e.g., monthly,
annually, etc.)

	Estimation/ visual inspection	Weighing batches of these items	Counting or weighing each item as they come in	Composition Surveys (please indicate how often you could do these (e.g., monthly, annually, etc.)
1. Large household appliances				
2. Small household appliances				
3. IT & telecommunications equipment				
4. Consumer equipment				
5. Lighting equipment				
6. Electrical and electronic tools				
7. Toys, leisure and sports equipment				
8. Medical Devices				
9. Monitoring and control instruments				
10. Automatic dispensers				



10. If you answered **no** anywhere in questions 5 or 6, what is/are the **main limiting factors** preventing you from providing information based on the different types or categories specified (*Please mark all relevant responses*)?

Cost

Time

Space constraints

No weighbridge/scales at my facility

Disruption to my operations

Lack of staff available to do the work

Other _____

Thank you for your time and information. Please post this questionnaire back to:

**Joanie Burns
113 Cowper Downs
Rathmines
Dublin 6**

It would be appreciated if you could return the questionnaire **no later** than **Monday 14th March**.

Waste Collector Questionnaire
Information requested by Joanie Burns
MSc (Environmental Protection) Programme, IT Sligo

Voluntary Information

If you are willing to provide additional details or clarifications or to discuss your responses to this questionnaire, please provide contact details.

Name: _____

Company/organisation: _____

Phone number: _____

Best time to contact: _____

Nature of Business

1. Number of employees: 1-5 6-10 11-20 21-30 31-40 > 40

2. Are **waste electronics** one of the waste streams you collect (*for example, washing machines, refrigerators, toasters, computers, TVs, electronic games, kettles, lighting equipment, etc.*)? Yes
No

If the answer to this question is no, please answer only question 4. Other questions are not relevant to your operations.

3. If yes, where or from whom do you collect these (*please mark all relevant answers*)? Local authority collection facilities
Privately operated collection facilities
Private households
Private businesses
Other _____

4. Do you export **whole** waste electronics (*not parts or materials after disassembly*)? Yes
No

5. Do you submit an **Annual Environmental Report** to the permitting authority? Yes
No



Monitoring and record-keeping

6. Can you provide information on the amount of the following **specific types** of electronics you collect (*a list of products falling under each of the categories is attached for reference*)?

	Yes, based on the number of items or products in this category	Yes, based on the weight of items or products in this category	No
1. Large household appliances			
2. Small household appliances			
3. IT & telecommunications equipment			
4. Consumer equipment			
5. Lighting equipment			
6. Electrical and electronic tools			
7. Toys, leisure and sports equipment			
8. Medical Devices			
9. Monitoring and control instruments			
10. Automatic dispensers			

7. Regardless of how you answered question 5, can you provide information on the amount of these following **specific types** of electronics?

	Yes, based on the number of items or products in this category	Yes, based on the weight of items or products in this category	No
1. Fridges and freezers			
2. All other white goods			
3. Televisions and monitors			
4. IT and telecommunications equipment			
5. Lighting equipment			
6. All others (<i>i.e., excluding any of the others listed above</i>)			



8. If you answered **yes** anywhere in questions 5 or 6, how is classification/categorisation **currently** determined (*Please mark all relevant responses*)?

Itemised list provided upon collection of WEEE

Estimation/visual inspection of contents of crates/containers

Weighing batches (e.g., pallets, crates, containers) of **mixed** WEEE

Weighing batches of **single streams**/types of WEEE

Counting and classifying each item collected

Weighing each item

Random sampling/waste composition surveys Frequency _____

Other _____

9. If you answered **no** anywhere in questions 5 or 6, which of the following **would be possible** in order to determine the classification/categorisation of the electronics you collect (*please mark all relevant responses*)?

Estimation/ visual
inspection

Weighing batches
of these items

Counting or weighing
each item collected

Composition Surveys
(please indicate **how often** you could do these (e.g., *monthly, annually, etc.*))

	Estimation/ visual inspection	Weighing batches of these items	Counting or weighing each item collected	Composition Surveys (please indicate how often you could do these (e.g., <i>monthly, annually, etc.</i>))
1. Large household appliances				
2. Small household appliances				
3. IT & telecommunications equipment				
4. Consumer equipment				
5. Lighting equipment				
6. Electrical and electronic tools				
7. Toys, leisure and sports equipment				
8. Medical Devices				
9. Monitoring and control instruments				
10. Automatic dispensers				

10. If you answered **no** anywhere in questions 5 or 6, what is/are the **main limiting factors** preventing you from providing information based on the different types or categories specified (*please mark all relevant responses*)?

Cost

Time

Space constraints – I do not have anywhere to do this and/or my facility is too small

No weighbridge/scales at the locations I collect from and/or at my facility

Disruption to my operations

Lack of staff available to do the work

Other _____

Thank you for your time and information. Please post this questionnaire back to:

**Joanie Burns
113 Cowper Downs
Rathmines
Dublin 6**

It would be appreciated if you could return the questionnaire **no later** than **Monday 14th March**.



Examples of Products Falling Under the 10 Categories

1. Large household appliances

- Refrigerators
- Washing machines
- Dish washing machines
- Microwaves, electric stoves and hot plates
- Radiators and other electric heating appliances
- Fans and air conditioner appliances

2. Small household appliances

- Vacuum cleaners
- Irons
- Toasters and fryers
- Coffee machines
- Electric knives
- Clocks and watches
- Scales

3. IT and telecommunications equipment


- Computers (CPU, mouse, screen and keyboard included)
- Printers, faxes and copying equipment
- Electrical and electronic typewriters
- Pocket and desk calculators
- Telephones including cellular telephones and answering systems

4. Consumer equipment

- Radios
- Television sets
- Video cameras and recorders
- Musical instruments

5. Lighting equipment

- Luminaires for fluorescent lamps
- Straight and compact fluorescent lamps
- High intensity discharge lamps
- Low pressure sodium lamps

- 
- 6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)**
 - Drills, saws
 - Sewing machines
 - Saws, grinders, lathes
 - Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses
 - Tools for welding, soldering or similar use
 - Equipment for spraying, liquid or gaseous substances
 - Tools for mowing or other gardening activities

 - 7. Toys, leisure and sports equipment**
 - Electric trains or car racing sets
 - Hand-held video game consoles
 - Video games
 - Computers for biking, diving, running, rowing, etc.
 - Sports equipment with electric or electronic components
 - Coin slot machines

 - 8. Medical devices (with the exception of all implanted and infected products)**
 - Radiotherapy, cardiology and dialysis equipment
 - Pulmonary ventilators
 - Laboratory equipment for in-vitro diagnosis
 - Analysers
 - Freezers

 - 9. Monitoring and control instruments**
 - Smoke detector
 - Thermostats and other instruments used for climate control
 - Measuring, weighing or adjusting appliances
 - Other monitoring and control instruments used in industrial installations (e.g. in control panels)

 - 10. Automatic dispensers**
 - Automatic dispensers for hot drinks and hot or cold bottles or cans
 - Automatic dispensers for solid products
 - Automatic dispensers for money
 - All appliances which deliver automatically all kind of products