Mapping health and safety standards in the UK waste industry

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Mapping health and safety standards in the UK waste industry

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This report describes a study on the nature of the UK waste industry and its health and safety standards.

It is estimated that around 160,000 workers are employed in the waste industry. The industry is driven by legislation and regulation, much originating from European Directives. Recent research estimates that if the 30% national recycling target is to be met in 2010, then around 45,000 extra jobs could potentially be created.

The waste industry reports around 4,000 accidents each year. Private companies report around 45% of these and local authorities around 50%. The overall accident rate for the waste industry is around 2,500 per 100,000 workers (nearly five times the national rate). Over 3-day injury handling accidents are the most common. Being struck by a refuse collection vehicle or a car are the most common workplace transport accidents.

Influence Network workshops were held with a range of delegates for waste collection and landfill/treatment. Analyses indicate there is a need to influence company culture, ownership and control, organisational structure, and health and safety management in relation to companies' head offices. These head offices then need to influence training and management/supervision to influence workforce competence, team working (where appropriate), communications and compliance.

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INTRODUCTION AND OBJECTIVES

This report has been prepared by BOMEL Limited for the Health and Safety Executive and describes a study on the nature of the UK waste industry and its health and safety standards.

The overall objectives of the study are to:

1. Scope the waste industry form source to sink in terms of process, size and employment.

2. Identify the health and safety performance of the industry.

3. Analyse the workplace transport accidents in the waste industry.

4. Foresee trends in the industry that may affect its health and safety performance.

5. Provide information that will enable HSE to intervene effectively and influence the waste industry.

THE UK WASTE INDUSTRY

The UK generates around 430 million tonnes of waste each year from agriculture, mining and quarrying, construction and demolition, industry, commerce and households. Agriculture, mining and quarrying, and construction and demolition wastes are integral parts of those industry sectors. Activities involving the collection, disposal and recycling of industrial, commercial and municipal (household) waste form the focus of this report in relation to the UK waste industry.

Around 50 million tonnes of commercial waste are generated each year along with 30 million tonnes of industrial waste, and around 30 million tonnes of municipal waste. Municipal waste is increasing by around 3% per year. Almost 60% of waste in the UK ends up in landfill sites. Landfill has been considered a profitable part of the waste business, but demand is now reducing as a result of the landfill directive. Materials Recovery Facilities (MRFs) produce low margins from a high capital outlay. However, they are a growth area.

Estimates made in this report suggest that there are around 160,000 workers employed in the UK waste industry, of which around 120,000 are employed in the private sector. The sewage / refuse disposal standard industry classification (SIC 90) includes around 135,000 workers involved in waste management activities, whilst recycling includes around 15,000 workers and wholesale waste around 10,000 workers.

Data for workers employed in waste management activities in the public sector are not available. Employment surveys are required to rectify this. However, extrapolation of accident data indicates that there may be 40,000 to 45,000 waste workers in the public sector.

Whilst the largest employers in the waste industry are a small number of large integrated waste management companies, the waste industry is composed primarily of SMEs. There are around 2,000 skip hire companies in the UK. These are likely to employ at least 4,000 workers.

The availability of workers is likely to be a localised issue. For instance, there is relatively full employment in the Southeast where agency workers are more likely to be required.

HEALTH AND SAFETY PERFORMANCE OF THE WASTE INDUSTRY

The UK waste industry typically reports around 4,100 to 4,300 accidents per year, although the figure did reduce to around 3,800 in 2001/02. Private companies typically report around 1,700 to 2,000 accidents per year, with the majority of the residual being reported by local authorities. The number of accidents reported by local authorities has been decreasing over the six-year period, whilst the number of accidents reported by the private sector has been increasing (but to a smaller extent). This may be as a result of waste operations and workers transferring from the public to the private sector following compulsory competitive tendering.

In terms of accident rates:

- The overall accident rate for the waste industry in 2001/02 is estimated to be around 2,500 per 100,000 workers. This is around four times the national rate (559 per 100,000 workers as reported by HSE).

- The fatal injury accident rate for the waste industry in 2001/02 is estimated to be around 10 per 100,000 workers. This is ten times the national rate (0.9 per 100,000 workers).

- The major injury accident rate for the waste industry in 2001/02 is estimated to be around 330 per 100,000 workers. This is more than three times the national rate (101 per 100,000 workers).

The RIDDOR coding system does not give the level of information required to gain sufficient understanding of what accidents are occurring where. The codings are too generic, and combine several industries (both within and outside the waste industry) such that the majority of the accidents are concentrated in only a few categories. This causes problems in identifying in sufficient detail the areas to be targeted for intervention.

Within the limitations of the RIDDOR coding system, the following conclusions can be drawn about the safety performance of the waste industry:

- The accidents predominantly occur during refuse collection, with significant numbers also occurring during loading / unloading and on-site transfer activities.

- Over 3-day injury accidents account for around 85% of the total number of accidents. Handling and sprain injuries resulting from refuse workers handling refuse during collection account for the largest proportion of these over 3-day accidents.

- The age profile of those involved in the accidents peaks in the 30 to 39 age group. Overall, the age profile of the accidents reported in the UK waste industry is similar to that for UK industry. The main differences being that the proportion of accidents reported involving younger (under 30 years old) workers is slightly lower for the waste industry, whilst the proportion involving older (over 30 years old) workers is slightly higher than that for UK industry.

- Considering all injury severities, handling / sprain injuries are the most significant, with heavy weights being the most frequently involved in handling injuries followed by sharp objects and awkward loads.

- When considering those accidents that result in fatal or major injuries, being struck by refuse collection vehicles, being struck by falling objects, trips and low falls are particularly significant.

Two Influence Network workshops were held with a wide range of delegates representing the key stakeholders. These workshops generated significant input and discussion, which have been analysed to gain an insight into the underlying influences on health and safety in the waste industry and potential risk control measures.

Analysis of the delegates' views presented at the workshops on the underlying causes of accidents and ill health in **waste collection** indicated that:

- Of the factors that have a *Direct* influence on health and safety in **waste collection**, *competence*, *team working*, *communications* and *compliance* are the most significant factors. This reflects the workshop discussions where the importance of *team working* was stressed, and even provided a means of compensating for low *competence* among some of the team members provided there were some team members with sufficient *competence*.

- Of the *Organisational* level factors influencing health and safety in **waste collection**, *training*, *management / supervision* and *communications* are judged to be the most significant, followed by *procedures*, *planning* and *health and safety culture*. These factors are significant as they influence the key factors at the *Direct* level, with *management / supervision* being essential to motivate workers to go out and undertake relatively unpleasant jobs.

- Of the *Policy* level factors, *company culture* and *organisational structures* have the most significant impact, followed by *health and safety management*.

- Of the *Environmental* level factors, the *regulatory* influence is the most significant followed by the *market* influence.

- The critical paths through the Influence Network indicate that the *regulator* needs to influence *company culture*, *organisational structure* and *health and safety*

management in relation to organisations' head offices. These head offices then need to influence *training* and *management / supervision* in order to influence *competence*, *team working*, *communications* and *compliance* within the workforce.

Analysis of the delegates' views presented at the workshops on the underlying causes of accidents and ill health in **waste landfill and treatment** indicated that:

- Of the factors that have a *Direct* influence on health and safety in **waste landfill and treatment**, *competence*, *communications* and *compliance* are considered to be the most significant, followed by *situational awareness*, *equipment operability* and *safety equipment*. The primary difference with waste collection is the lesser significance of *team working*. This reflects the working patterns in landfill sites, where workers are typically operating on their own. The other three key factors at the *Direct* level are the same as for waste collection. Reflecting the significant use of plant and mechanical equipment in landfill sites and MRFs, *equipment operability* and *safety equipment* have reasonably significant influences. *Situational awareness* is considered a reasonably significant influence for two reasons; there is high awareness of the risks on landfill sites, whilst there needs to be high awareness of the risks on MRF picking lines.

- Of the *Organisational* level factors influencing health and safety in **waste landfill and treatment**, *training*, *procedures* and *management / supervision* are considered the most significant. These are followed by *planning*, *communications* and *health and safety culture*. The six key factors are the same as for waste collection.

- Of the *Policy* level factors, *company culture* and *health and safety management* are considered the most significant (in common with waste collection). However, *organisational structure* is seen to be less important than in waste collection, whilst *ownership and control* is considered to be more significant, perhaps reflecting greater board level interest in health and safety.

- Of the *Environmental* level factors, the *market influence* is considered to be greater than that of the *regulator*. This reflects the reductions in the profitability of landfill sites, as they are not seen as a long-term proposition due to the landfill directive. Whilst there is a growing demand for MRFs, they require extensive capital expenditure and return relatively low margins.

- The critical paths through the Influence Network indicate that the *regulator* needs to influence *ownership and control*, *company culture* and *health and safety management* in relation to organisations' head offices. These head offices then need to influence *training*, *procedures* and *management / supervision* in order to influence *competence*, *communications* and *compliance* within the workforce.

WORKPLACE TRANSPORT ACCIDENTS IN THE UK WASTE INDUSTRY

Around 60% of the waste industry accidents are associated with workplace transport. This is particularly so in refuse collection, where many of the accidents occur in the vicinity of refuse collection vehicles. The conclusions from the global analyses of the waste industry accident data are thus equally appropriate to the workplace transport accidents.

Similar limitations in the data were found to those for the global analysis of the waste industry accident data. However, the new coding system for agents introduced in 2001/02 does provide greater detail on the type of vehicle involved. Within the limitations of the RIDDOR / FOCUS coding system, the following conclusions can be drawn about the safety performance of the waste industry in terms of workplace transport issues:

- More workplace transport accidents occur in the general public services sector than the sewage / refuse sector, perhaps reflecting the amount of refuse collection undertaken in the public sector.

- Analysis of the workplace transport subset for accidents involving workers being struck by moving vehicles indicates that the majority of these occur in refuse collection in both the private and the public sectors, typically involving either refuse collection vehicles or private cars.

- More accidents involve vehicles moving forwards than in reverse. However, less time is likely to be spent in reverse, thus making the accident rate per unit time higher than that for moving forward.

- There are essentially five broad issues surrounding accidents where workers are struck by moving vehicles:

  - Workers having their ankles and feet run over by forward-moving vehicles either due to standing too close or due to slipping / tripping from kerbs whilst the vehicle is moving past.

  - Workers being injured whilst trying to get onto or off moving vehicles.

  - Reversing vehicles being guided by two ‘banksmen’ and striking one whilst the driver was watching the other for instructions.

  - Banksmen failing to stop reversing vehicles with either verbal or hand signals and either themselves or others being struck.

  - Workers not expecting vehicles to move, and being struck (i.e. the driver was not aware of the worker behind).

The view of the workshop delegates was that there was felt to be a high *awareness* of the risk associated with hazards such as transport and sharp objects. (This is in contrast to the

perception of risks associated with manual handling, which is much lower). On landfill sites, operators with heavy plant have high *perceptions of risk*.

Inspection and maintenance tend to go beyond the regulatory requirements. Operational needs are paramount, as the costs are considerable if a vehicle breaks down. Health and safety benefits accordingly. This is not the case for skip trucks.

Operational issues predominate in *design* of refuse collection vehicles, with the vehicle industry being reactive rather than proactive. The situation has improved in recent years, with bins being interchangeable between different vehicles. However, the design of vehicles and facilities are rarely co-ordinated.

Workers are often provided with communication radios on landfill sites, as companies do not want plant drivers stopping to receive verbal instructions. Special signalling codes have been developed for *communications* on landfill sites.

FUTURE TRENDS

The UK waste industry is driven by legislation and regulation. Much of the legislation originates from European Directives that are implemented in the UK. Views expressed by the workshop delegates indicate that the government was felt to be interested in recycling targets, but meeting these targets required the rest of the country to deliver.

Recent research indicates that the implementation of the UK waste strategy is likely to have an impact on employment numbers and patterns within the waste industry. This research indicates that if targets to decrease the amount of waste generated and increase the amount of waste recycled are met, there may be a transfer of jobs within the waste industry. In particular, jobs may be transferred from the traditional collection and landfill sectors to materials recovery facilities (MRFs) and material reprocessing. Recent research estimates that if the 30% national recycling target is to be met in 2010 then around 45,000 extra jobs could potentially be created in the UK. This estimate consists of around 9,000 extra jobs in collection, 26,000 in sorting and 9,000 in reprocessing.

Potential future changes in the waste industry may result in more exposure to manual handling hazards due to the number of jobs required in collecting and sorting waste. Potential future changes in the waste industry may also result in more exposure to workplace transport due to the number of jobs required in collecting waste. With the UK waste strategy requiring the public to sort more waste and take some bulky and recyclable waste to civic amenity sites, there may be a potential to transfer risk from the waste industry to the public in some cases.

Finding workers may be difficult in some circumstances as landfill is declining due to the legislative approach requiring more recycling and less landfill and, as such, landfill is not a popular career choice within the waste industry. There is a driver shortage affecting UK industry as a whole. This is exacerbated in the waste industry, as other driving jobs will appear more attractive. Recruitment and retention may become an issue in the waste industry over the next in 10 years time due to changes in demography and increased demand.

The waste industry offers the creation of new economies and jobs. Unfortunately, recycled products are viewed as inferior to new ones. Whilst shareholders have a desire for more

socially responsible companies, views expressed in the workshops indicated that environmental issues might attract investors more than health and safety.

ENABLING HSE TO INTERVENE WITH THE WASTE INDUSTRY EFFECTIVELY

In addition to the summary information contained in this report, the following suite of data analysis tools has been developed for use by HSE:

- **Waste RIDDOR Data Tool** – For detailed graphical analysis of the RIDDOR accident data by any of the fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for industry as a whole or individual organisations.

- **Waste RIDDOR Report Tool** – For detailed analysis of the RIDDOR accident data by any of the fields reported under the RIDDOR regulations plus the notifier comments and investigation reports for industry as a whole or individual organisations.

- **Waste Company Profile Tool** – For analysis of the processes and locations of the major waste companies (based on the ESA membership).

- **Waste Sector and Employment Tool** – For analysis of the location of the number and size of organisations and number of workers by region in the waste and recycling industries (based on Annual Business Inquiry data).

- **Waste Tonnage and Employment Tool** – For analysis of the number of tonnes of municipal, industrial and commercial waste by region plus estimates of the associated number of workers (based on Environment Agency data).

- **Licensed Waste Site Tool** – For analysis of the location, ownership and type of licensed waste sites (based on Environment Agency and Scottish Environmental Protection Agency data).

- **Waste Skip Hire Profile Tool** – For analysis of the location of skip hire operators (based on directory listing data).

This suite of tools provides HSE with rapid and convenient means to: identify accident ‘hot spots’, benchmark the performance of individual organisations within the waste industry, and identify specific groups for targeted intervention. Access to such intelligence can enable HSE to optimise its resources and target the most appropriate areas for intervention.

RECOMMENDATIONS

It is recommended that the following areas should be addressed in order to improve health and safety in the UK waste industry:

- **Both the Standard Industry Classifications (SIC) and RIDDOR reporting systems need to be amended** in order to provide improved intelligence for targeting risk controls. In terms of industry classification systems, the waste industry needs to be treated as a separate industry rather than being combined with the water industry. In terms of the RIDDOR accident recording systems, specific codes are required to reflect waste management activities other than refuse collection (e.g. the various recycling and sorting activities). In addition, the agents involved in waste management activities need to be expanded to capture those that relate to recycling and sorting. These amendments are important now, but as the industry changes and moves towards greater recycling, their significance in delivering relevant data is likely to increase.

- **A strategy needs to be developed for intervening with local authorities**, with the intention of reducing the number of waste-related accidents in the public sector. Given the number of accidents in the public sector, and the lack of readily available information on public sector waste services, further work is required to survey local authorities in the UK in order to gain a better understanding of how many workers they employ in the waste sector, what these workers do, and why such a large number of accidents are occurring. Local authority employment data could be sought as part of the yearly Municipal waste survey (undertaken by DEFRA to obtain estimates of the amount of municipal waste generated). Such information would allow HSE and local authority EHOs to better target its interventions in the public sector.

- **A survey should be undertaken of the number of agency workers employed in waste organisations** in both the public and private sectors. This information could be provided anonymously, and would give an indication of the extent to which agency workers are used in the waste industry and in which processes and regions.

- **Strategies need to be developed to reduce the number of accidents due to being struck by vehicles, being struck by objects, trips and falls from vehicles** in order to meet the Re*vital*ising targets for reducing the number of fatal and major injury accidents.

- **Strategies need to be developed for reducing the number of handling-induced injuries** in order to meet the Re*vital*ising targets for reducing the number of lost working days. This requires input from clients as well as waste organisations, such that unsuitable containers are not imposed on waste companies.

- In tackling these two previous issues for the waste industries, the *regulator* needs to influence *company culture*, *ownership and control*, *organisational structure* and *health*

and safety management in relation to companies' head offices. These head offices then need to influence *training* and *management / supervision* in order to influence *competence*, *team working* (where appropriate), *communications* and *compliance*.

1. INTRODUCTION

1.1 INTRODUCTION

This report has been prepared by BOMEL Limited for the Health and Safety Executive as research contract D5001, and describes a study on the nature of the UK waste industry and its health and safety standards.

In 2003 HSE reorganised its resources such that the waste industry from 'source to sink' was the responsibility of one unit of its Manufacturing Sector. This report and the accompanying IT tools are intended to provide HSE with information such that it can intervene with the waste industry efficiently and effectively.

1.2 CONTEXT OF THE STUDY

In June 2000 the Deputy Prime Minister and the Health and Safety Commission (HSC) launched the Re*vital*ising Health and Safety (RHS) Strategy Statement[1]. Underpinning this were the new targets for health and safety in the UK given in Table 1. HSE has identified the waste industry as potentially having a high accident rate. The waste industry thus has the potential to make a significant contribution to meeting the Re*vital*ising targets.

Table 1 Revitalising health and safety (RHS) targets for health and safety

Target	*By 2004/5*	*By 2009/10*
Reduction in incidence rate of fatalities and major injury accidents	-5%	-10%
Reduction in incidence rate of cases of work-related ill-health	-10%	-20%
Reduction in number of working days lost per 100,000 workers from work related injury and ill-health	-15%	-30%

1.3 AIMS AND OBJECTIVES

The overall aims of the study are to:

1. Scope the waste industry form source to sink in terms of process, size and employment.

2. Identify the health and safety performance of the industry.

3. Analyse the workplace transport accidents in the waste industry.

4. Foresee trends in the industry that may affect its health and safety performance.

5. Provide information that will enable HSE to intervene effectively and influence the waste industry.

1.4 SCOPE OF WORK AND APPROACH

The principal focus within this study is on:

- Areas of the waste industry for which the Manufacturing Sector within HSE has responsibility
- Workers within the industry rather than Members of the Public

The approach taken in this report is to provide detail in these required areas, but to present this within the context of the UK waste industry as a whole in order that the degree to which the profile of the subject group is typical or otherwise can be determined.

In order to achieve the aims detailed in Section 1.3, the following objectives were set by the HSE, and have been fulfilled in the sections indicated in parentheses:

1. To define the industry in terms of the processes covered (Section 2.2).
2. To identify the number of people employed in the industry (Section 2.3.2).
3. To identify employment figures for each sector of the industry (Section 2.3.4).
4. To identify the number and size of companies within the industry (Section 2.3.5).
5. To identify the number and type of accidents and ill health within the defined waste industry using RIDDOR statistics (Section 5).
6. To analyse the accident data to identify the main causes/types of accident by process, occupation, work process etc. (Section 6).
7. To identify the extent of peripatetic and agency working within the industry (Section 2.8).
8. To identify and profile the top organisations operating within the waste sector (Section 10).
9. To produce an accident profile from RIDDOR statistics of those top organisations broken down by type, process, cause etc (Section 10).
10. To carry out a literature review to identify health and safety research carried out in the waste industry, specifically that which addresses the Re*vital*ising topics (Section 4).

11. To identify the impact of changes in legislation and consumer demand and its implications on the waste industry (Section 3).

12. To analyse the reported workplace transport accidents to identify causes in terms of operators, site conditions and vehicles (Section 7).

1.5 SCOPE OF THIS REPORT

Section 2 presents a definition of the UK waste industry, considering the market, processes, employment, regional distribution, skip hire and agency working. Both the private and public sectors are addressed.

In recent years, a number of regulations have been introduced which have wide ranging implications for waste management. The implications of the main regulatory changes are considered in Section 3.

A review of the current literature relating to health and safety in waste management is presented in Section 4. In addition, literature relevant to the Re*vital*ising health and safety topic areas is considered in relation to the UK waste industry. Whilst aimed at the UK, little specific literature has been published in the UK, and this review calls on overseas work and guidance where available.

In Section 5, the available data on waste accidents are introduced. The methodology for building a waste industry data set from the RIDDOR accident data is explained, and analyses of the data set are carried out. Accident rates are presented, comparing the waste industry with other sectors. Detailed analyses of the waste data set including risk ranking and pattern matching can be found in Section 6. Detailed analyses of the workplace transport subset can be found in Section 7.

The analysis of these data provide:

- A baseline from which future improvements may be measured.
- A means of informing and targeting the Influence Network workshops.
- An insight into the areas where future risk control measures and interventions may best be targeted.

The Influence Network technique and analysis methodology are introduced in Section 8, setting the scene for specific applications of the technique in following chapters. Section 9 contains a summary of the discussions from the waste collection and landfill / treatment workshops along with detailed analyses of the findings.

Section 10 contains an overview of the market and health and safety performance of the most significant organisations within the UK waste industry. Where information is available for the private sector companies, it is possible to identify their relative positions in the market in terms of turnover, employees, operations and regional spread. Information is also presented on public

sector organisations. The information is considered to be commercial in confidence, and has therefore been removed from the public version of this report. The full version of this report has been issued only to the HSE Project Officer.

The conclusions drawn from this work are presented in Section 11, followed by the recommendations in Section 12.

The references used in this work are given in Section 13, and the appendices contain detailed definitions of the Influence Network factors used in the workshops.

2. DEFINITION OF THE UK WASTE INDUSTRY

2.1 UK WASTE MARKET

The profile of the UK waste market has been changing rapidly in recent years. Municipal waste was collected by local authorities in the past. However, the Local Government Act opened up the market in 1988. This led to many collection services being transferred into the private sector under compulsory competitive tendering (CCT). UNISON[(2)] indicate that the average value of local authority refuse collection contracts is around £1.4M over seven years. In 1990, the Environmental Protection Act required Waste Disposal Authorities to place their waste disposal operations in Local Authority Waste Disposal Companies (LAWDC) and invite tenders for the contracts. UNISON[(2)] estimate that by 1998, 21 of these LAWDC had been taken over by private waste companies.

In the past, the private sector was made up of small firms operating in specific regions or specialist waste management areas. However, the market (driven by the Landfill Directive and Waste Strategy 2000) developed in such a way that smaller companies became less viable. Smaller companies either closed, merged, or were taken over such that the UK waste management market is now concentrated in the hands of the larger companies. These larger companies benefit from the economies of scale. The market has been characterised by extensive merger and acquisition activity such that the UK market is now dominated by a relatively small number of companies.

This section contains an overview of the UK waste industry, defined in terms of its processes, demography and constituent organisations.

2.2 PROCESSES

The processes typically undertaken in the UK waste industry are summarised in Table 2. These are presented in order to demonstrate what processes are undertaken, why they are undertaken and what activities are typically involved (where available, have been based on Reference 3, and amended when appropriate). This information provides a basis for the discussions in the later sections of this report.

Table 2 Processes undertaken in the UK waste industry

Process	***Description***
Civic amenity site	Sites to which the public delivers waste directly. The waste delivered typically includes bulky household items and recyclable objects. This waste then has to be disposed of.
Composting	An aerobic biological process in which organic waste (such as garden and kitchen waste) is converted into stable granular materials that can be applied to soil to improve its structure and increase its nutrient content.
Commercial waste	Waste arising from any premises which are used wholly or mainly for trade, business, sport or entertainment (excluding municipal and industrial waste).
Industrial waste	Waste from any factory and from any premises occupied by an industry (excluding mines and quarries).
Kerbside collection	Any regular collections of recyclables from premises, including collections from commercial or industrial premises as well as from households. Excludes services delivered on demand.
Landfill sites	Any areas of land in which waste is deposited. Landfill sites are often located in disused mines or quarries. In areas where they are limited or no ready-made voids exist, the practice of land-raising is sometimes carried out, where waste is deposited above ground and the landscape is contoured.
Municipal waste	This includes household waste and any other wastes collected by a Waste Collection Authority, or its agents, such as municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste and waste resulting from the clearance of fly-tipped materials.
Materials Recovery Facilities (MRF)	Facilities for receiving waste and sorting it into specific categories such as paper, cardboard, plastic and metal. This waste is then packaged for recycling elsewhere.
Skip hire	The provision of skips for hire to individuals or businesses for the purpose of collecting substantial quantities of waste which are then disposed of.
Street cleansing	The collection of litter from streets for disposal.
Transfer station	Building or area for collecting waste from a variety of sources prior to dispatch to disposal sites.
Waste-to-energy facilities	Power station that converts waste (which tends to be relatively combustible and of high calorific value) via incineration into power.

2.3 DEMOGRAPHY

The breakdown of the UK waste industry has been determined on the basis of the 1992 Standard Industry Classification (SIC) codes given in Table 3. The Annual Business Inquiry data set[4] was interrogated to obtain the number of employees, number of employing organisations and the sizes of those organisations across the various regions of the UK in 2001/02.

Table 3 SIC codes used in the definition of the UK waste industry

SIC	*Industry description*
37.100	Re-cycling of metal waste and scrap
37.200	Recycle of non-metal waste and scrap
51.570	Wholesale of waste and scrap
90.000	Sewage and refuse disposal, sanitation and similar activities
90.001	Sewage disposal activities
90.002	Refuse disposal activities
90.003	Sanitation and similar activities

2.3.1 Employment in the UK waste industry

Considering the data from the industries listed in Table 3 alone would lead to an overestimate of the number of workers employed in the UK waste industry as the 90 series of SIC codes contains both water and waste organisations. It is estimated[5] that the UK water industry employs around 44,000 people. The ABI data indicates that there are around 34,000 workers in the industries covered by SIC code 41.000 (collection, purification and distribution of water). Hence, it is assumed that the 10,000 difference between the two figures corresponds to the number of water industry workers included with the waste industry workers in SIC 90.000. Adjustments to the ABI data are also required to cater for those workers employed in waste management activities within local authorities. These amendments are discussed in Section 2.3.2.

The estimated employment figures for each of the components of the UK waste industry as defined by SIC codes are given in Table 4.

Table 4 Estimated employment in the UK waste industry

SIC	*Industry description*	*Employment numbers*
37.10	Re-cycling of metal waste and scrap	7,500
37.20	Recycle of non-metal waste and scrap	6,400
51.57	Wholesale of waste and scrap	11,600
90.00	Sewage and refuse disposal, sanitation and similar activities	
	ABI figure	111,000
	Water industry workers	-10,000
	Local authority workers not already included in ABI figure	36,000
Total		162,500

2.3.2 Employment in local authorities

Local authorities employ workers to manage waste; in particular, in refuse collection. An estimate of the number of workers employed by local authorities on waste activities could be useful to calculate accident rates, and thus determine risk profiles in relation to those in the private sector.

The ABI data cannot be used for public sector employment in local authorities. Discussion with the Office of National Statistics[6] (ONS) indicates that whilst some local authority employees are included under the SIC codes relevant to the waste industry (37.10, 37.20, 51.57 and 90.00), the majority are included under SIC code 75.10 (general public services). As such, ONS are unable to identify the number of local authority workers involved with waste management.

Other sources of data have been consulted. Whilst HSE has employment data for the public services, these data are not broken down into the level of detail required. Similarly, the local government employers' organisation does not have such figures; and, in the case of Wales, neither does the Welsh Assembly.

The one mechanism available for future collection of local authority employment data is the Municipal Waste Survey undertaken by DEFRA every year. The survey is sent out to every waste collection authority, waste disposal authority and unitary authority in England and Wales; and the response rate for the 2000/01 survey[7] was nearly 95%. If an extra question on the number of workers involved in waste management were to be added to the questionnaire, then a reasonable estimate could be obtained of the number of workers in local authorities.

In lieu of such information, an estimate of the number of local authority workers involved in waste management can be extrapolated from the accident data. One of the metropolitan waste authorities has transferred to the private sector; and, in 2001/02, had an accident rate of around 4,100 accidents per 100,000 workers. In 2001/02, 1,774 accidents were reported by local authorities. If the accident rate for those local authority waste management units that have remained in the public sector is assumed to be the same as that for the ex-metropolitan

organisation, then the number of workers employed in these authorities can be calculated to be around 43,000.

1,118 of the 1,774 local authority accidents were recorded under SIC 75.10 (general public services), whilst 297 were recorded under SIC 90.00 (sewage / refuse disposal). None were recorded under any of the recycling (37.10 and 37.20) or wholesale waste (51.57) SIC codes. If it is assumed that those local authorities who record their accidents under SIC 90.00 also record their ABI returns under SIC 90.00, then around 7,000 local authority workers have been included in the ABI returns. As such, the waste industry employment figures in Table 4 need to be increased by around 36,000 (see Table 4).

In adjusting the employment figures to include the local authority workforce, it has been assumed that these workers are distributed across the regions in proportion to the number of private sector workers in each region. This may not necessarily be representative for those regions where larger numbers of public sector workers are employed. However, sufficient information is not readily available to make such a correction.

2.3.3 Waste industry employment by region

The distribution of workers in the UK waste industry is shown in Figure 1 by HSE Field Operations Directorate (FOD) region. This indicates that the two regions with the largest numbers of workers employed in the waste industry are East and South East, and Yorkshire and North East, whilst the region with fewest workers is Wales and South West.

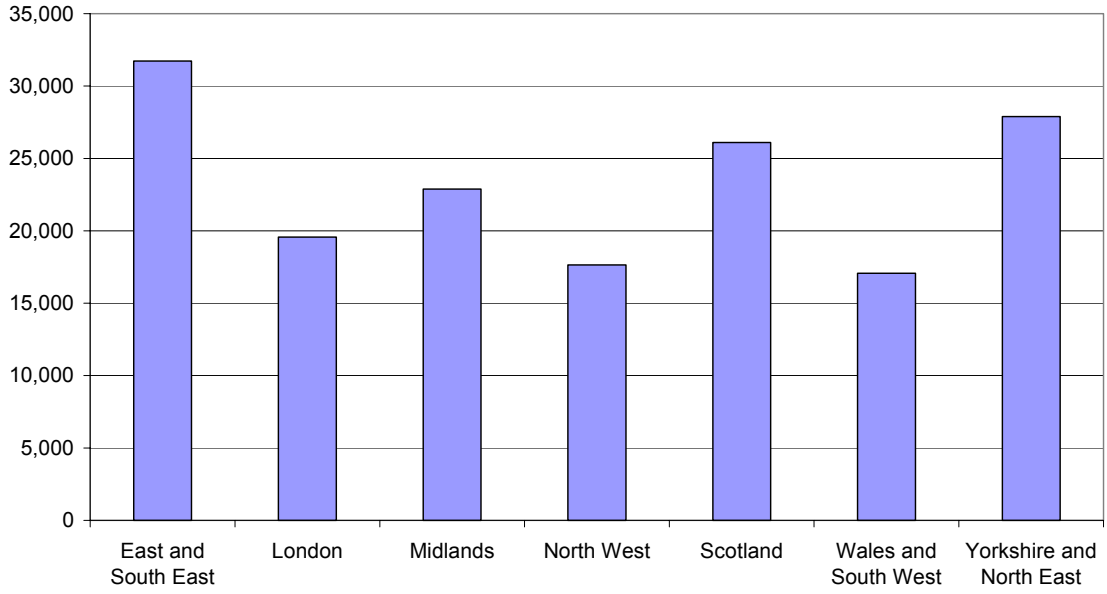


Figure 1 Distribution of workers in the UK waste industry by HSE region

2.3.4 Waste industry employment by industry sector

Figure 2 shows the distribution of workers in more detail, giving the split between each of the four waste sectors as defined by the SIC codes. This shows that the number are dominated by the number of workers in SIC 90.00, with relatively few in the SIC codes corresponding to the recycling industries. To what extent this distribution is a function of how organisations, particularly those that provide a range of waste services, code themselves on their ABI returns is unclear.

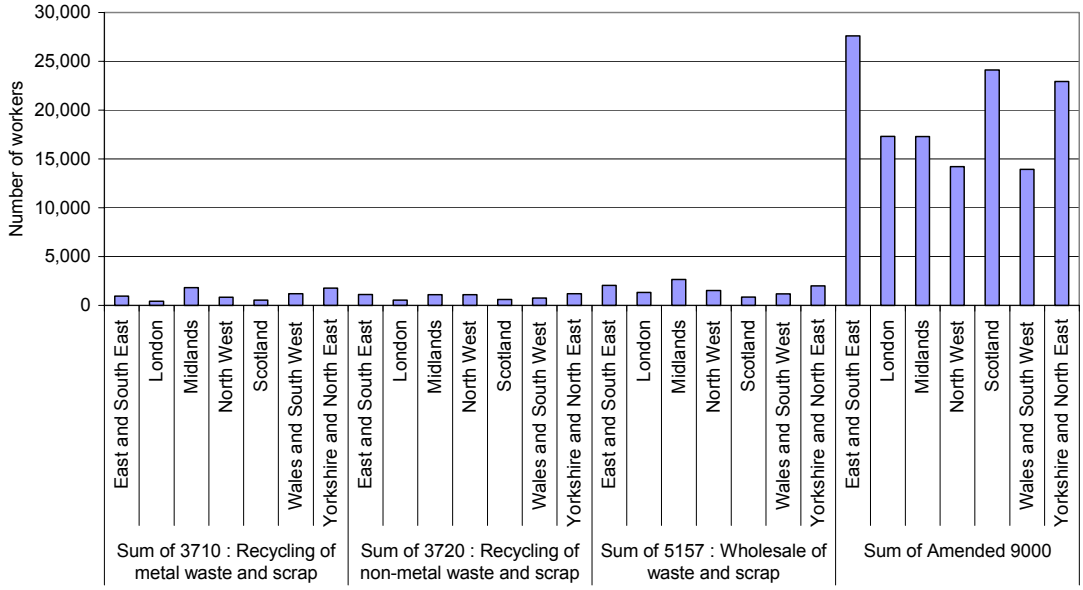


Figure 2 Regional distribution of waste sectors by employment

2.3.5 Size distribution of organisations in the waste industry

The distribution of the number of organisations of each size (defined by number of workers employed) is shown in Figure 3 for those organisation categorised as SIC code 37.10 or 37.20), 51.57, and 90.00. The SIC code 90.00 also includes water industry organisations that handle sewage, as it was not possible to exclude these with the information currently available. This figure demonstrates that the majority of organisations involved in recycling and wholesale of the waste are relatively small, with the majority of them having 10 employees or less.

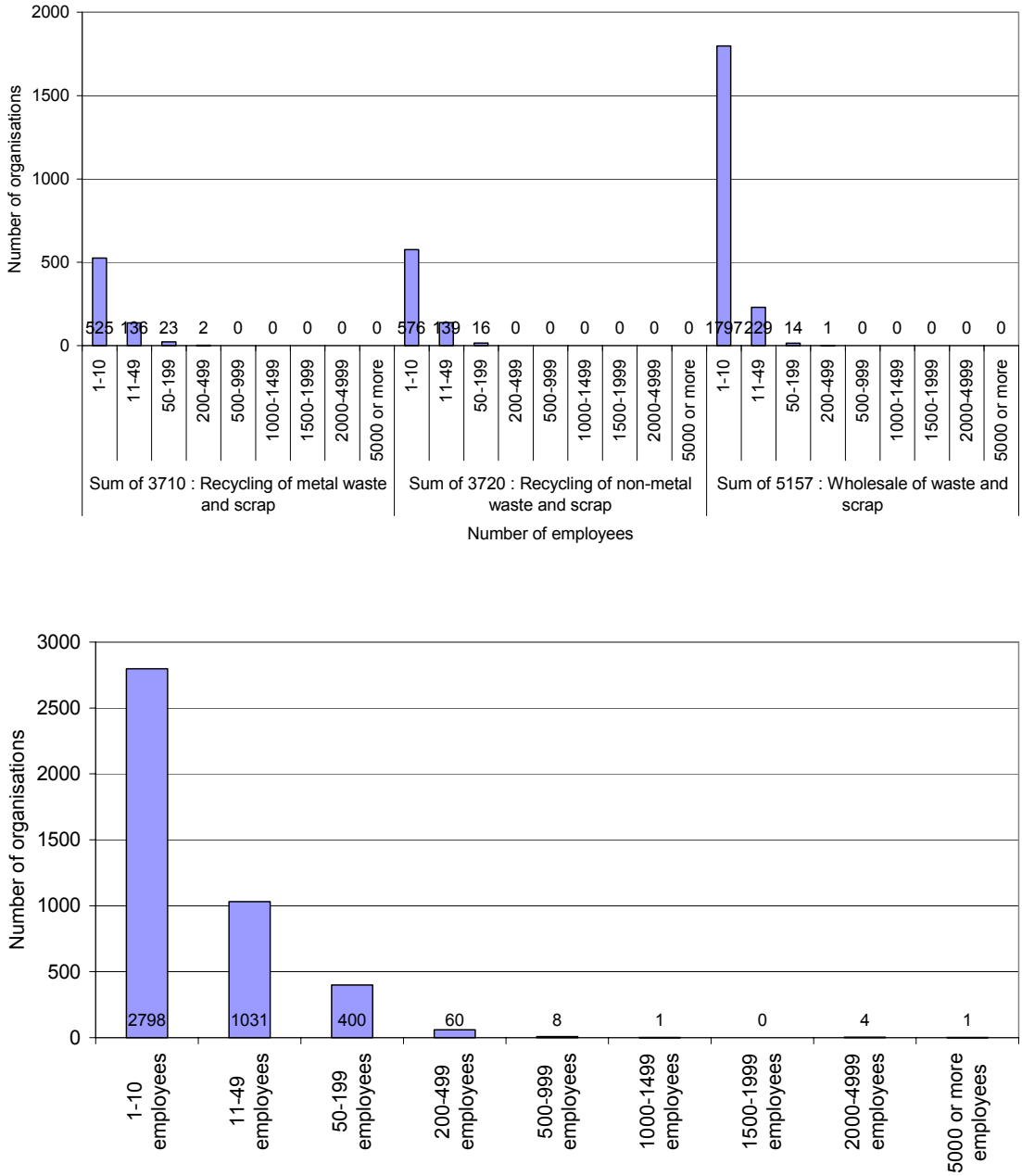


Figure 3 Distribution of the number of organisations employing varying numbers of workers in the UK waste industry (Top: SIC 37.10, 37.20 and 51.57; Bottom: SIC 90)

These data are shown by FOD region in Figure 4, where it can be seen that there are more waste recycling and wholesale organisations in the Midlands, with more of the SIC 90.00 waste organisations in the East and South East. This suggests that the profile of the waste companies is different, with more recycling and wholesale SMEs in the Midlands than the East and South East.

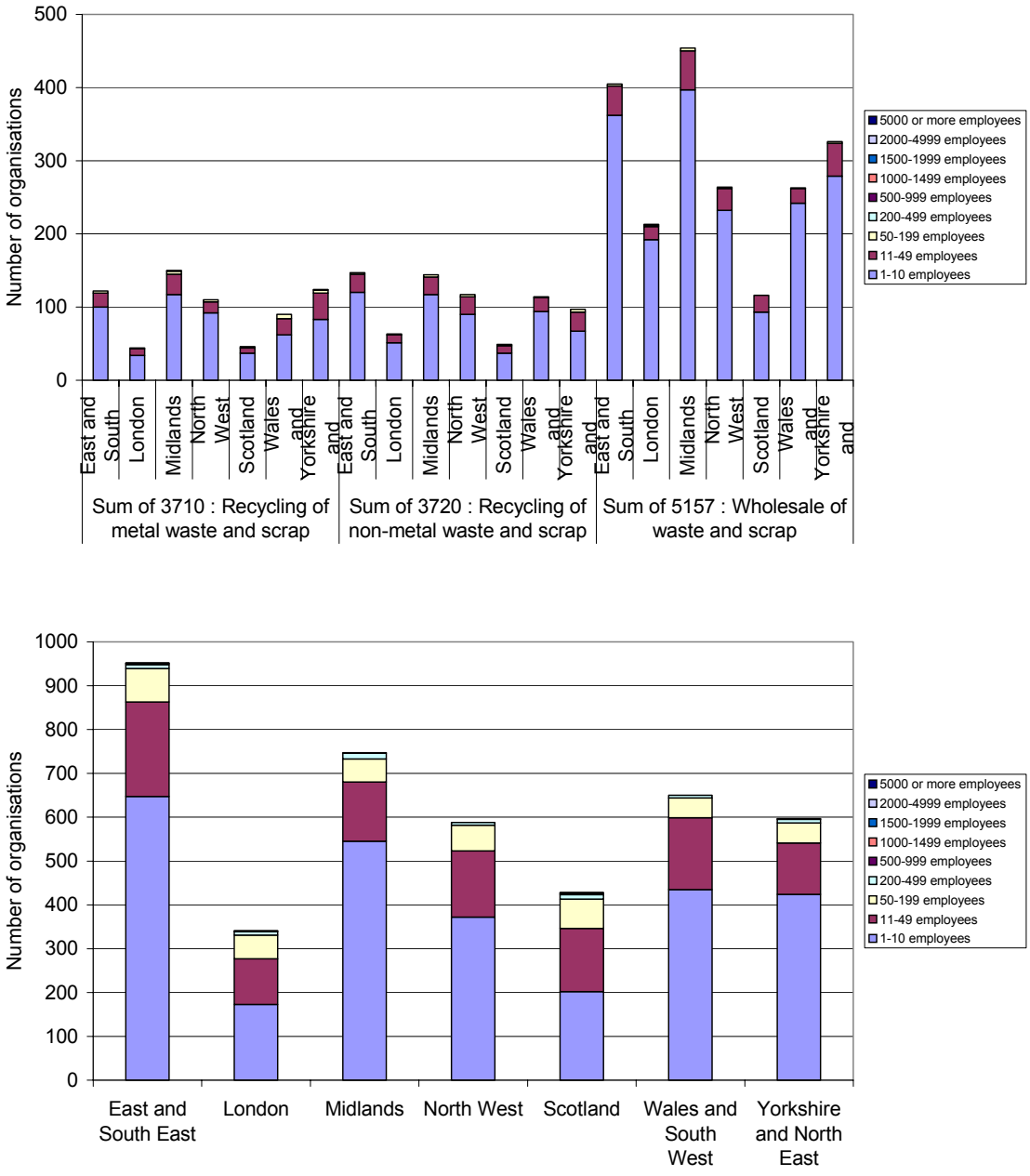


Figure 4 Distribution of the number of organisations employing varying numbers of workers in the UK waste industry by HSE region (Top: SIC 37.10, 37.20 and 51.57; Bottom: SIC 90)

2.4 WASTE HANDLED IN THE UK

Data have been obtained for the amount of municipal[7], commercial[8] and industrial[8] waste handled in the UK. Figure 5 shows the municipal waste arising for England and Wales. The proportions of waste arising from the various sources are similar across the regions except for London, where significantly more non-household waste arises. In all regions, the majority of the waste is collected via refuse collection vehicles.

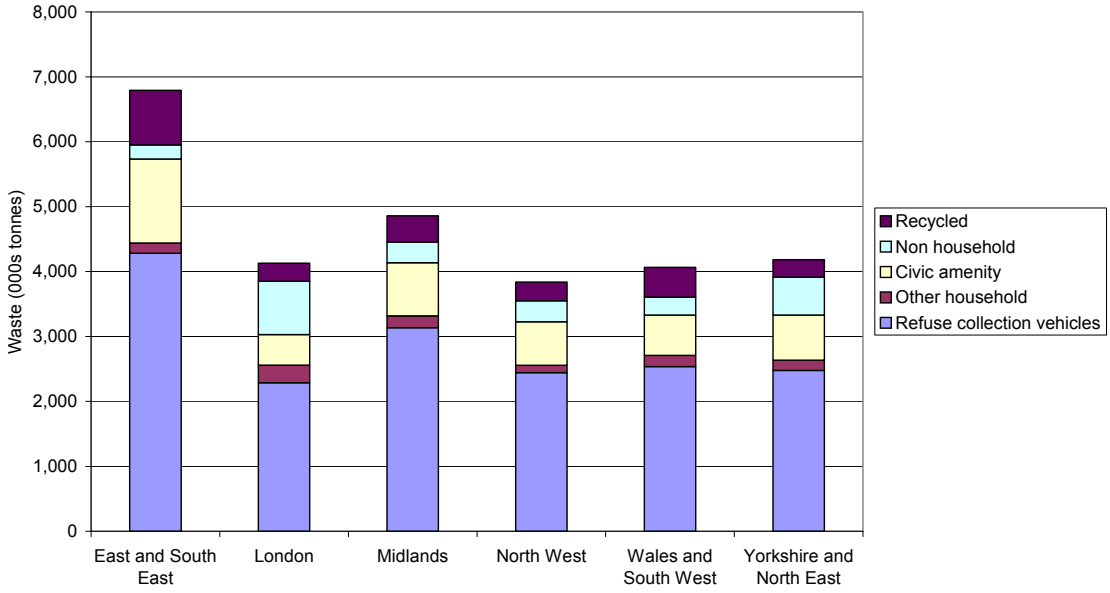


Figure 5 Municipal waste arising in England and Wales by HSE region

Note: DEFRA[3] defines household waste as including "waste from household collection rounds (waste within Schedule 1 of the Controlled Waste Regulations 1992), waste from services such as street sweeping, bulky waste collection, hazardous household waste collection, litter collections, household clinical waste collection and separate garden waste collection (waste within Schedule 2 of the Controlled Waste Regulations 1992), waste from civic amenity sites and wastes separately collected for recycling or composting through bring/drop off schemes, kerbside schemes and at civic amenity sites."

Figure 6 shows how the municipal[7] waste in England and Wales is deposited, with the majority of waste going to landfill. Recycling is highest in the East and South East, whilst energy is derived from significant amounts of waste in London, the Midlands and Yorkshire and the North East. Refuse derived fuels (derived from a process whereby municipal waste is compressed into pellets which are then used as a solid fuel supplement in power stations) only feature in the East and South East.

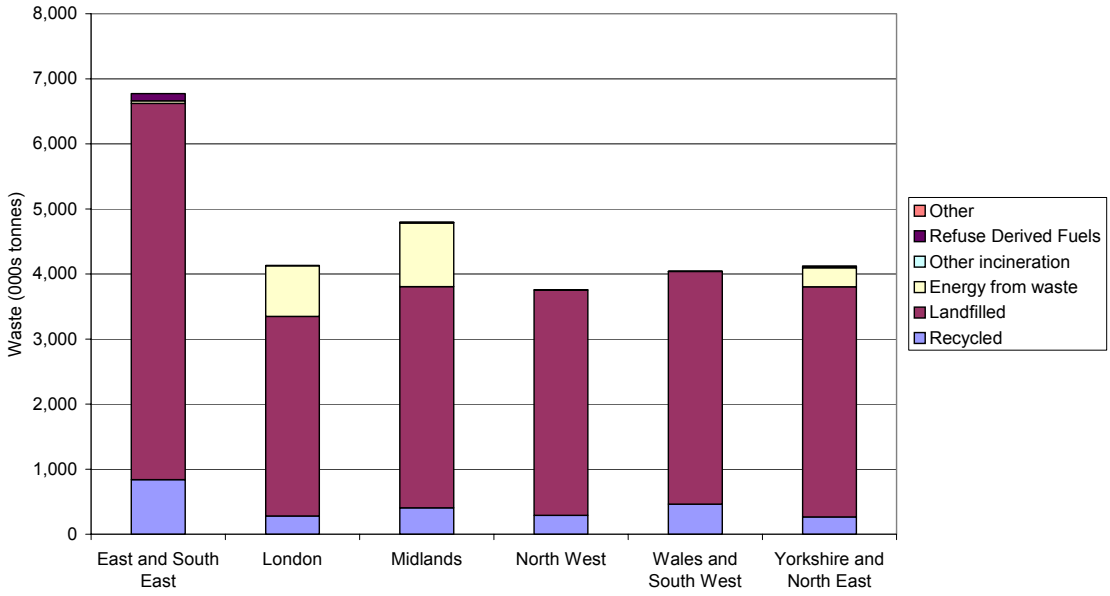


Figure 6 Municipal waste deposits in England and Wales

Figure 7 shows the industrial waste[8] generated in England and Wales. Only around half of this waste goes to landfill, with around 30 to 40% being recycled. London generates the smallest amount of industrial waste, presumably due to the lack of heavy industry. The DEFRA definition of treatment is that it "involves the chemical or biological processing of certain types of waste for the purpose of rendering them harmless, reducing volumes before land filling, or recycling certain wastes". This implies that this waste may ultimately end up in one of the other categories.

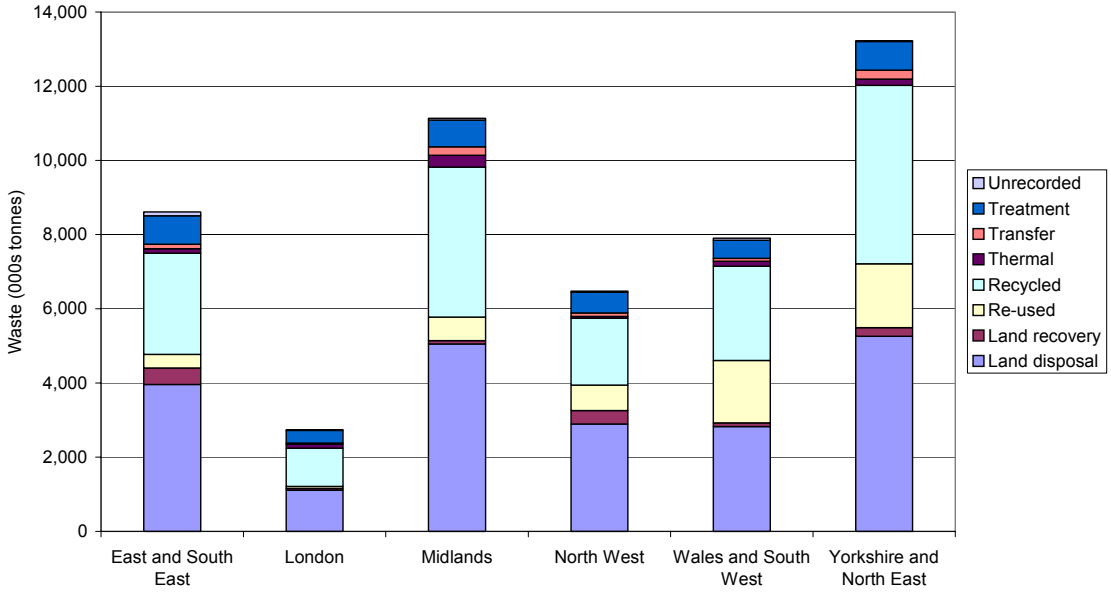


Figure 7 Industrial waste generated in England and Wales by HSE region

Figure 8 shows the commercial waste[8] generated in England and Wales. The East and South East region generates the largest amount of commercial waste, followed by London and the Midlands. Over half of commercial waste goes to landfill, with around one fifth being recycled.

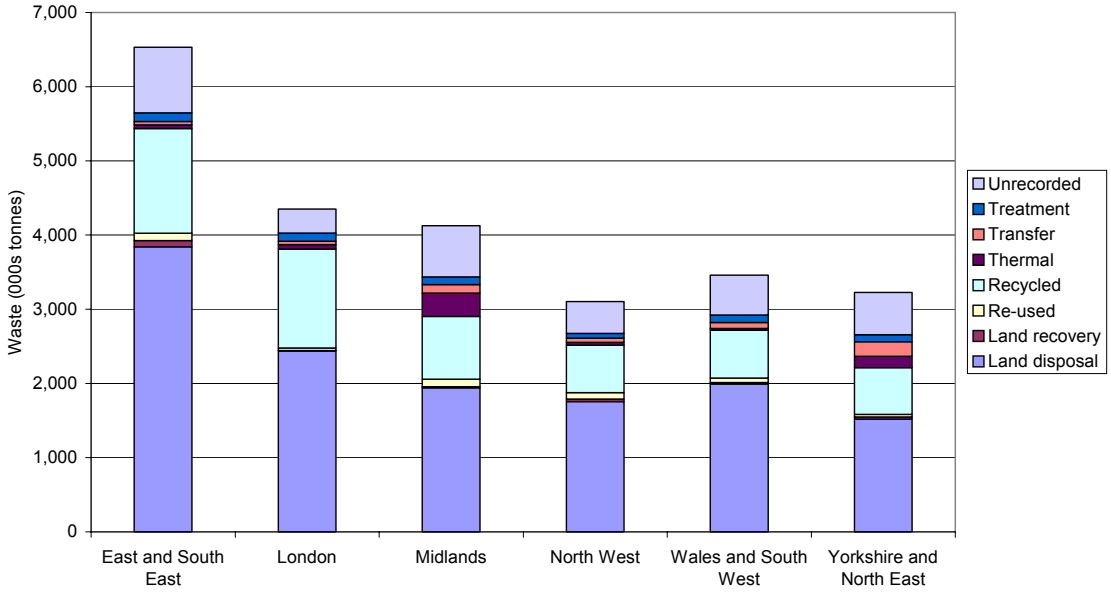


Figure 8 Commercial waste generated in England and Wales by HSE region

2.5 LICENSED WASTE FACILITIES

The Environment Agency (England and Wales) and Scottish Environmental Protection Agency issue licences for controlled waste facilities within their respective jurisdictions. These data have been obtained[9, 10] and combined into a single data source to provide an insight into the distribution of licensed waste sites throughout the UK. Licences have to be obtained by any person or organisation that wishes to operate a waste facility. As such, these data provide an insight into the total number of licensed waste sites, not just those operated by the major waste organisations (see Section 2.6)

Figure 9 shows the number of licensed waste sites in each of the HSE FOD regions. Due to the incompatibility between the FOD (HSE) and Environment Agency regions, London and the East and South East have been combined into a single London, East and South East region. Given that London, East and South East is a combined region, it is possible that the licensed waste sites are distributed relatively evenly around the UK, with around 1,000-1,200 sites per region. The exception is Scotland. However, this comparison needs to be considered in light of the amount of waste generated and handled in each region.

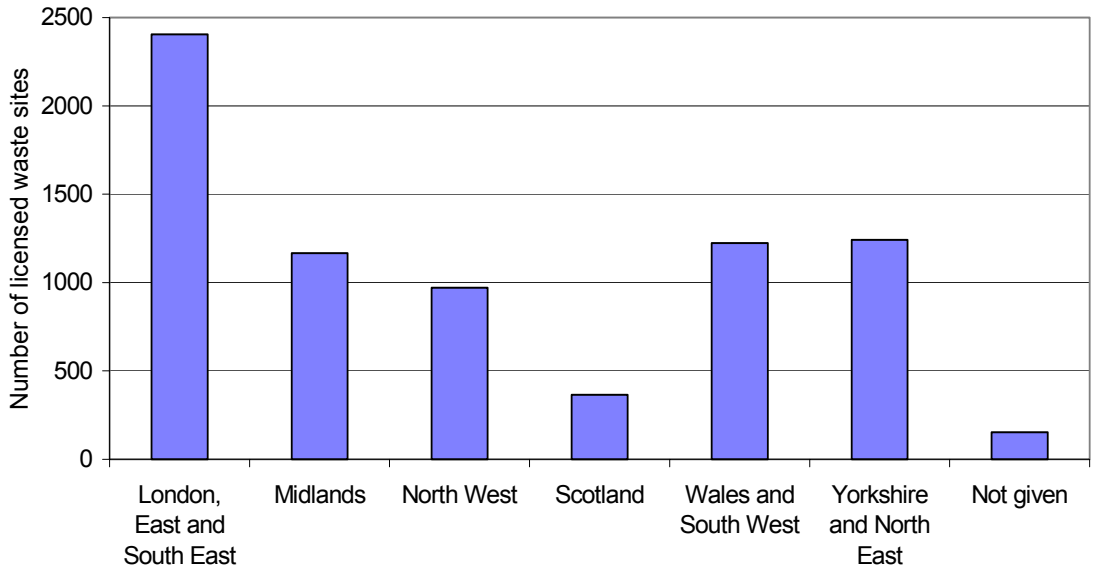


Figure 9 Distribution of licensed waste sites in the UK by HSE region

The Environment Agency (EA) data contains two classification systems, whilst the SEPA data contains a third. For clarity, the second set of EA data and the SEPA data have been mapped, as far as reasonably possible, onto the primary EA classification system ('A' followed by a two-digit number and the waste process). The resulting distribution of licensed waste sites in the UK by waste process is shown in Figure 10. Transfer stations are, by far, the most common of the licensed waste sites in all regions. Metal recycling facilities (both mixed and vehicle dismantling) account for the next largest source of sites, followed by landfill sites.

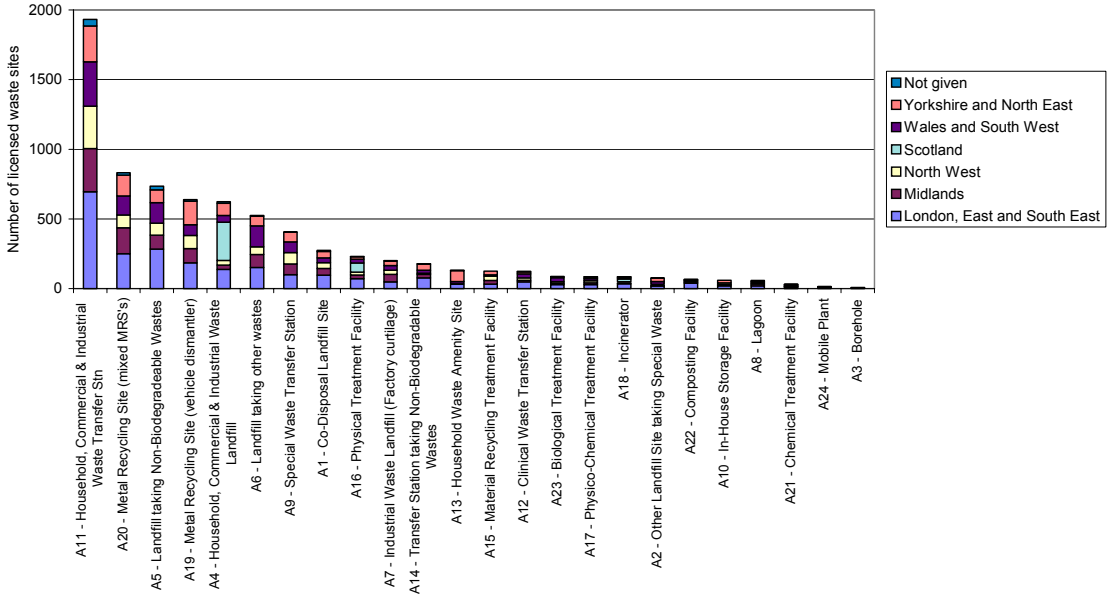


Figure 10 Distribution of licensed waste sites in the UK by waste process and HSE region

2.6 ENVIRONMENTAL SERVICES ASSOCIATION

The Environmental Services Association (ESA) collects data from its member companies, which comprise all of the major organisations in the UK waste industry. Around a third of the licensed waste sites are operated by ESA member companies. As such, a significant proportion of the number of workers employed in the UK and tonnage of waste handled are represented by these organisations. The data contained in the ESA online directory[11] are presented in terms of the waste facilities operated by the member companies. These sites have been used to build a profile of the member companies' activities within the UK.

The distribution of waste facilities operated by ESA member companies is shown in Figure 11. These data are further subdivided by HSE FOD regions. Figure 11 shows that the four most common facilities operated by ESA member companies are landfill sites, industrial and commercial collection sites, recycling sites and transfer stations. This distribution reflects the current predominance of landfill sites as a means of disposing of waste.

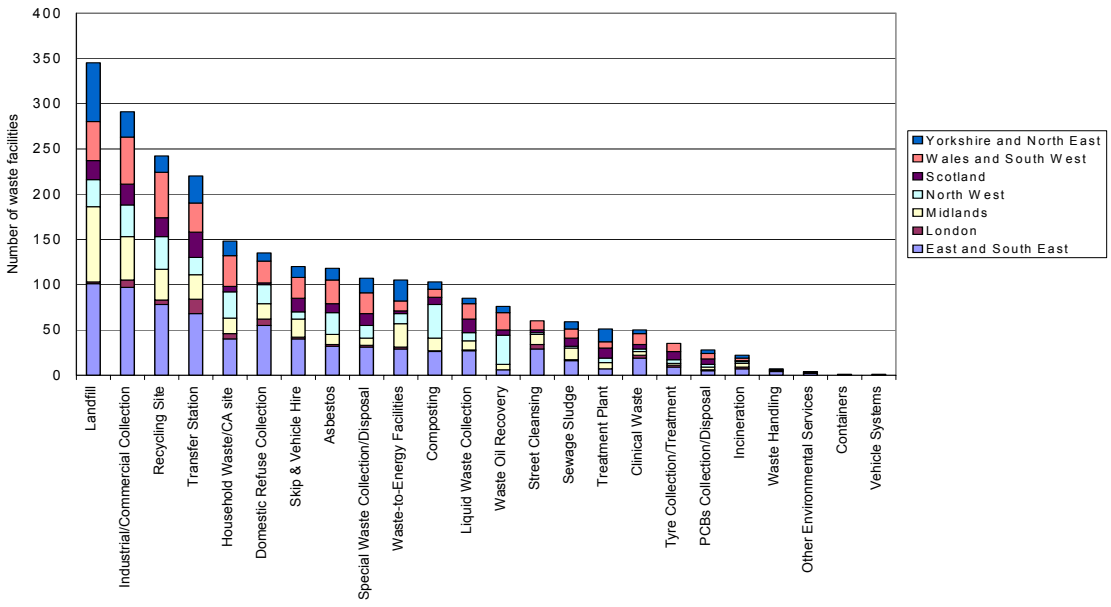


Figure 11 Distribution of waste facilities operated by ESA member companies

Figure 12 shows the same data presented in terms of the HSE FOD regions in which the ESA member companies operate. From this figure, it is apparent that the largest number of facilities are located in the East and South East, whilst few facilities are located in London. This may reflect the fact that whilst a substantial amount of waste is created in London, it is typically treated in the surrounding areas[12] of the East and South East.

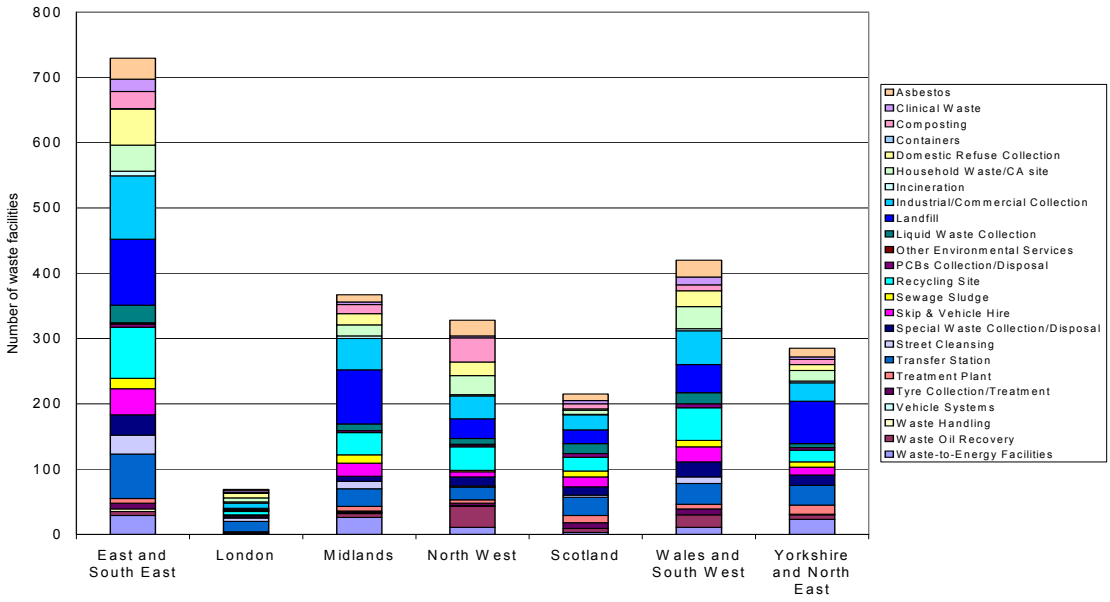


Figure 12 Distribution of ESA member companies by HSE region and waste facility

Figure 13 shows the distribution, number and type of facilities operated by the largest of the ESA member companies. This figure relates to the company structure at the time that the directory was published, and does not reflect some recent mergers and acquisitions (e.g. the merger of Cleanaway and Serviceteam, or the incorporation of Hales waste into the Biffa group). This figure shows that the majority of the top places are filled by the major national waste companies. Greater Manchester Waste Ltd is the exception to this, having a significant number of facilities in the Manchester area.

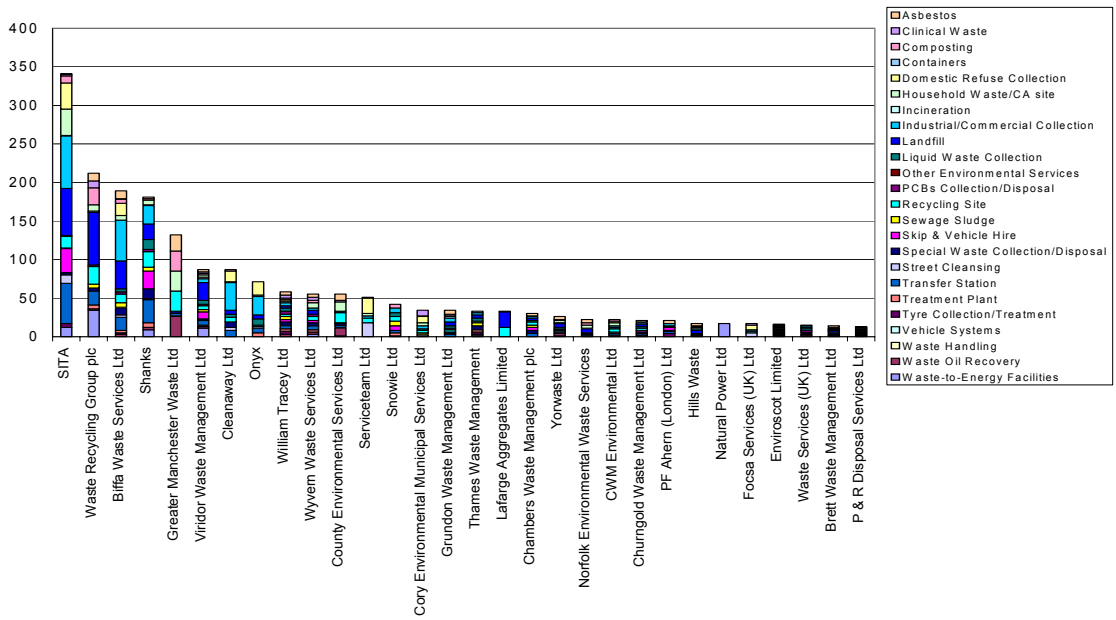


Figure 13 Distribution of ESA member companies by waste facilities

Figure 14 gives an indication of the regional distribution of the ESA members' waste facilities by HSE FOD region. This figure shows how few companies have a full national presence. Of those companies where their facilities are concentrated in one (or two) regions, the East and South East, and Wales and South West are the most common areas. Relatively few of the ESA member companies have facilities in the North West or Scotland.

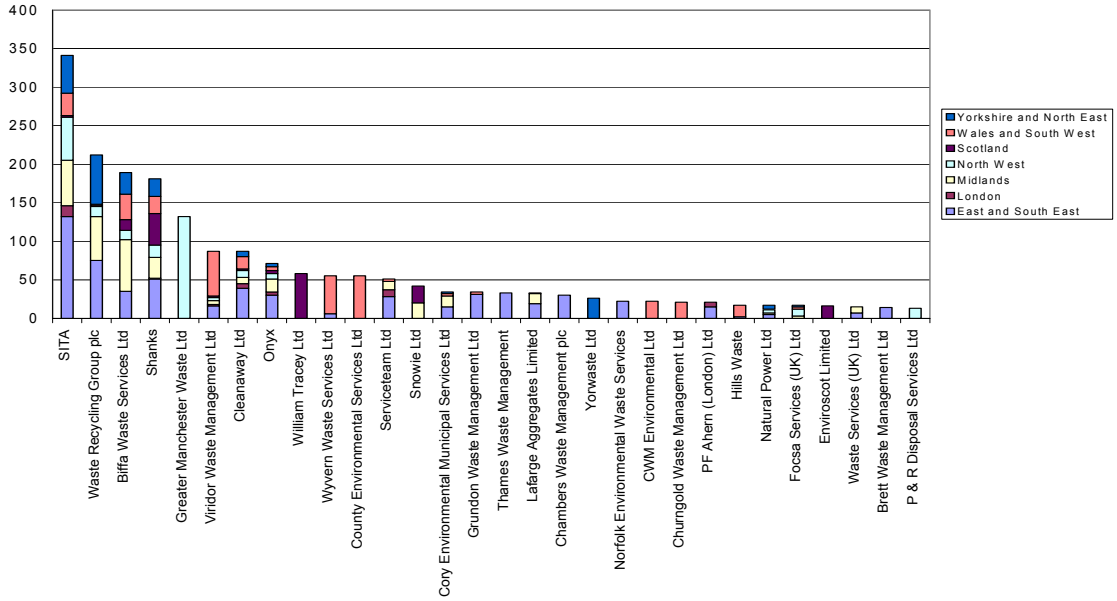


Figure 14 Distribution of ESA member companies by HSE region

2.7 SKIP HIRE

Skip hire is a business with a low barrier to entry. Businesses require a chassis and several skips to operate. Many of the smaller skip hire businesses operate locally, serving households and smaller businesses. Small skip hire companies are not required to be licensed waste carriers. However, skip hire companies do advertise through local newspapers and listing directories; and this is possibly the only way to obtain a profile of the skip hire sector.

Figure 15 shows the regional distribution of skip hire companies based on those companies who advertise via the web sites yell.com and thomweb.com. This figure indicates that there are around 2,000 skip hire companies in the UK. No figures are available for the size of each of these companies. However, if it were assumed that each company employed at least two people, the skip hire sector could be employing at least 4,000 workers in the UK.

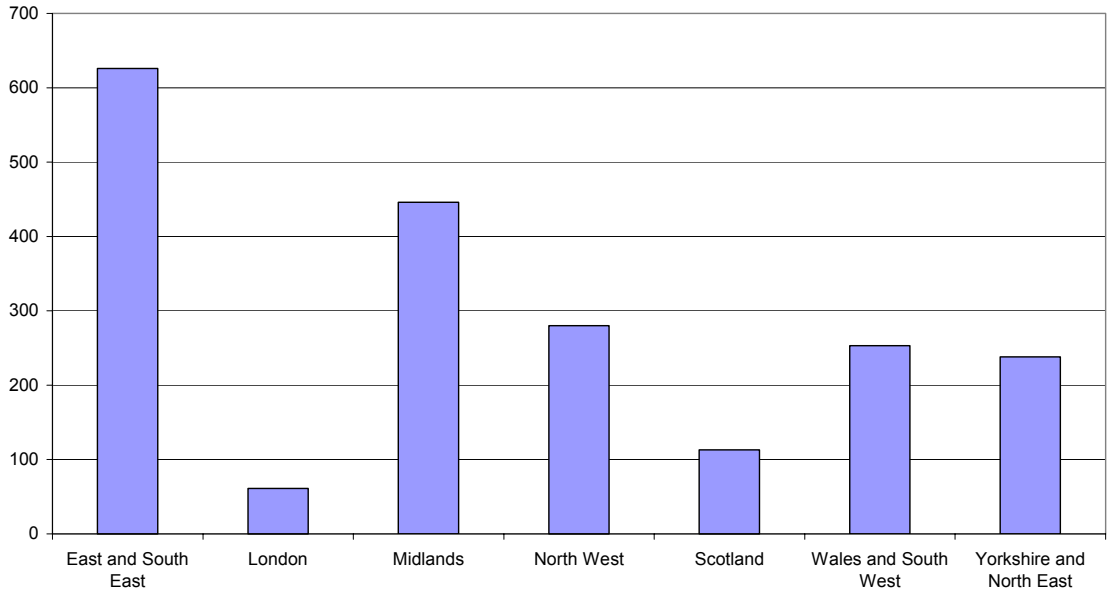


Figure 15 Distribution of skip hire companies by HSE regions

2.8 AGENCY WORKING IN THE WASTE INDUSTRY

Agency workers are used in the waste industry to cover holidays, sickness and other staff shortfalls. The TUC[13] estimates that there are around 290,000 temporary workers who were temping for agencies. This represents about 1% of all employees. Around 20% of these agency workers work in unskilled manual and non-manual jobs. In a survey carried out for the HSE in 1999, BMG[14] found that over 60% of employers had employed up to 10 agency workers in the previous year. Unfortunately, the survey data does not contain the detail required to identify waste industries.

The official labour statistics do not provide the means of identifying the number of agency workers used in the waste industry. Discussions with the Office for National Statistics[6] indicate that agencies typically record their employees under SIC code 74.50 (labour recruitment). This seems reasonable given that agency workers may be employed in the waste industry for one day, and in another industry the next day.

Views presented in the industry workshops (see Section 9) indicate that staff shortages are likely to be more prevalent in regions with high employment such as the South East, and hence there is likely to be a greater need for agency workers in these areas. Agency workers were thought to be used regularly in Material Recovery Facilities where it is more difficult to recruit and motivate workers. In waste collection, it was thought that teams would rather work a member short than use agency workers (as they were not felt to contribute to the team).

The lack of definitive data from sources such as ONS or the Labour Force survey means that it is not feasible to obtain a realistic estimate of the number of agency workers employed within the UK waste industry.

3. REGULATORY AND MARKET DRIVERS

3.1 INTRODUCTION

In recent years, the waste management industry has experienced a marked shift from an industry dominated by a larger number of independently owned operators to a more consolidated market. Changes in ownership and consolidation in the industry mean that in 2000, the top five waste management companies had around 31% combined market share, compared with only 16% in 1992[15,16]. This has been driven, in part, by the privatisation of local authority waste management activities, and the greater efficiencies and lower costs offered by companies operating integrated waste management services. By managing a range of waste treatment operations across industrial, commercial and domestic sectors (which may include recycling, composting and incineration with energy recovery), companies are developing a wide range of in-house expertise.

In parallel with the market changes, a number of regulations have been introduced which have wide ranging implications for waste management. The implications of the main regulatory changes are considered in the following sections.

3.2 REGULATORY INSTRUMENTS

Each of the primary waste regulations are summarised in this section. Further information is available in References 17 and 18.

3.2.1 Landfill Directive

The Landfill (England and Wales) Regulations 2002 came into force on 15 June 2002. These new regulations implement the Landfill Directive, which aims to prevent or reduce, as far as possible, the negative environmental effects of landfill. The regulations are having a major impact on waste management in the UK. Detailed information on the directive can be found in Reference 19.

Existing landfill sites must demonstrate that they will be able to comply with the directive if they wish to operate beyond July 2002. Nine out of 10 operators were estimated to have submitted their conditioning plans to the Environment Agency on time.

Changes are likely to be required to operating landfills over the next few years in order to comply with the Landfill Directive. For example, the directive sets challenging national targets for the reduction of biodegradable municipal waste going to landfill as follows:

- 75% of 1995 levels by 2006.
- 50% of 1995 levels by 2009.

- 35% of 1995 levels by 2016.

Countries that currently dispose of over 80% of their biodegradable municipal waste will be allowed four-year extensions to these targets.

The primary requirements of the directive are that:

- Sites should be classified into one of three categories: hazardous, non-hazardous or inert, according to the type of waste they receive.
- Operators should submit site conditioning plans for all existing sites by 16 July 2002.
- Operators should demonstrate that they and their staff are technically competent to manage the site and have made adequate financial provisions to cover the maintenance and aftercare requirements of the site.
- Higher engineering and operating standards will need to be followed.
- Biodegradable waste will be progressively diverted away from landfill sites.
- Certain hazardous and other waste, including liquids, will be prohibited from landfill sites.
- Pre-treatment of waste prior to incorporation in landfill will be required.

The Environment Agency has a statutory responsibility for the environmental regulation of landfill sites and will have a primary responsibility for implementing the landfill regulations.

3.2.2 Landfill Tax

The Government introduced the Landfill Tax in October 1996. The tax has an explicit environmental objective to reduce the overall volume of biodegradable waste sent to landfill, and has had a significant impact on waste management practices. There are two tax rates currently, £13 per tonne for active wastes and £2 per tonne for inactive wastes. The rate of Landfill Tax for active wastes has increased at £1 per tonne each year until 2004/5. The Government has yet to announce what its intentions for the tax are beyond this date. However, it is expected that a significant step change in the rate will be introduced to encourage more rapid diversion of waste from landfill.

Another important lever will be the Government's introduction of a system of tradable landfill permits to minimise the costs of meeting the requirements of the Landfill Directive, and provide local authorities with some flexibility in meeting the targets. A framework for the new system is set out in a DETR consultation paper published in March 2001.

Under the proposed system, waste disposal authorities (such as county councils) would be allocated an initial number of free permits at a level which, when aggregated, would be

consistent with the UK meeting the national target. Moreover, the allocation would be reduced for each successive year closer to the statutory target years (2010, 2013 and 2020). Disposal authorities will need to ensure that they hold sufficient permits to cover the actual amount of biodegradable municipal waste that they intend to send to landfill sites over a given period. Those disposal authorities that successfully divert waste away from landfill such that they do not need all of their allocation of permits will then be able to trade the surplus permits with those authorities that have a shortfall. The Government favours financial penalties for those authorities that send more waste to landfill than they have permits for, and that do not acquire permits to meet the shortfall.

The benefits to individual authorities of tradable permits will depend partially on the price of the permits, and in turn, on the number of buyers and sellers. There will only be a finite number of permits available in any year. The allocation of the permits will ensure that it will not be possible for all disposal authorities to buy permits in preference to taking positive action to divert from landfill. Therefore, if past national recycling performance is a guide to the future, there is likely to be a shortage of permits of one sort or another in the future. The Government is not in favour of setting any maximum price restriction.

A key feature of the trading system is that in interim years (not statutory target years or across such years) local authorities may be given the power to bank permits for use at a later date or to trade with other authorities.

3.2.3 Integrated Pollution and Prevention Control Directive

The Integrated Pollution Prevention and Control Directive (IPPC) was introduced by the EU in 1996. Details are given in Reference 20. The main aim of IPPC, according to DEFRA, is to achieve:

A high level of protection of the environment taken as a whole by, in particular, preventing or, where that is not practicable, reducing emissions into the air, water and land.

In the UK, the current systems for preventing and controlling emissions under Part 1 of the Environment Protection Act are:

- **Integrated Pollution Control (IPC)** for the most potentially polluting industries, enforced by the Environment Agency.

- **Local Air Pollution Control (LAPC)** for generally less polluting industries, enforced by local authorities and concerns emissions to air only.

A new UK regime, Pollution Prevention and Control (PPC), will eventually replace the existing legislation (under Part 1 of the Environment Protection Act 1990) and implement the EC Directive on integrated pollution prevention. IPPC embodies an approach broadly similar to IPC but takes on a wider view of integrated permits. The LAPC regime will be replaced by Local Air Pollution Prevention and Control (LAPPC) which is similar to IPPC in procedures but will still regulate emissions to air only. IPPC and LAPPC will both fall under the same regulatory framework of PPC.

The intention of the IPPC Directive is to minimise pollution from various sources throughout the European Union. Installations covered by the Regulations include those in the energy, production and processing of metals, minerals, chemical, and waste management industries. According to the Directive, the following waste management activities / sites are covered:

- Installations for the disposal or recovery of hazardous waste, and those sites that dispose more than 10 tonnes of oil per day.

- The incineration of municipal waste from existing plants with a capacity exceeding 3 tonnes per hour.

- Installations for the disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day.

- Landfill sites receiving more than 10 tonnes per day or with a total capacity exceeding 25,000 tonnes, excluding landfill sites for inert waste.

Affected installations are required to obtain an authorisation (permit) from the Environment Agency, or their local authority prior to operation. Unless operators have a permit, they will not be allowed to operate. The permits must be based on the concept of *Best Available Techniques* (or *BAT*), which is defined in Article 2 of the Directive. In many cases BAT means quite radical environmental improvements and, in some instances, it may be costly for operators to adapt their plants to BAT. To impose new and considerably tougher BAT rules on all existing installations could jeopardise many jobs, and therefore the Directive grants these installations an eleven year transition period from the day that the Directive came into force.

3.2.4 Animal By-Products Regulation

The EU Animal By-Products Regulation lays down rules for the processing, use, disposal, trade and import of animal by-products and products, such as petfood and meat and bone meal. The Regulation came into force from 1 May 2003. Further details are given in Reference 21.

The European Commission has undertaken to provide transitional measures in certain areas. In relation to the UK waste industry, these measures may affect small (less than 50 kg/hour) incinerators which do not burn specified risk material. There will be no transition period that will allow the land application of blood or the burial of fallen stock.

The Commission has sought the opinion of the EU Scientific Steering Committee on a number of issues, with a view to developing suitable proposals to allow current practices to continue. These include:

- The UK's risk assessment on the use of small incinerators to incinerate specified risk material.

- The conditions under which burial and burning can be achieved safely, so that the Commission can propose suitable measures to apply in the limited circumstances in which burial and burning are permitted.

The relevant parts of the Commission are also liaising to resolve a number of queries concerning the relationship between the Animal By-Products Regulation and the environmental controls in the Waste Framework Directive and the Waste Incineration Directive. However, in most cases, environmental controls will apply in addition to the controls in the Animal By-Products Regulation. For example, whilst an activity such as the land application of digestive tract contents may be permitted by the Animal By-Products Regulation, environmental regulatory constraints will still need to be complied with.

This regulation is not likely to affect mainstream waste management, only the more specialised operations.

3.2.5 Composting Directive (draft)

Composting has a vital role to play in the treatment of municipal solid waste, sludge and putrescible wastes, but it will have to be 'effective composting' in the words of the EU Commission. The standards of composting and the safety and quality of the end product of the composting process will be subject to tougher criteria imposed progressively through legislation. Further details are available in Reference 22.

The forthcoming EU Composting Directive will require that suitable standards be enshrined in the legislation of each member state. The Composting Association in the UK has produced recommendations for composting standards to ensure that the resulting end product from the compost process is fit for its purpose.

It is possible that the EU Directive on Composting may involve two standards of treatment for different groups of waste according to the perceived risk to public health as follows:

- **Group 1** - Green waste from parks and gardens, wood waste, paper, cardboard, paper mill sludge, waste vegetables etc. These and similar materials can be composted to produce a useable soil improver in a low technology composting operation.

- **Group 2** - Covers putrescible waste, food waste from kitchens, canteens, restaurants, fast food outlets and food processors. These would require the higher 'enhanced' standard of treatment if composting is to be a sustainable method of recycling such waste. The higher 'enhanced' standard will, in time, also apply to waste from abattoirs, fish, tannery, dairy, food and drink, distillers and brewers, some pharmaceutical wastes and sewage sludge.

The date for implementation has not yet been finalised.

3.2.6 Renewables Obligation Order

The Renewables Obligation Order requires all licensed electricity suppliers in England and Wales to source a growing proportion of their total output from eligible renewable sources. This is likely to create a substantial demand for renewable energy. This proportion is required

to increase from 3% in 2003 to 10.4% by 2011. The Order came into force in April 2002 and covers the use of biomass, including wood, but would exclude gas from landfill and gas from sewage treatment. Further details are available in Reference 23.

3.2.7 Climate Change Levy

The Climate Change Levy (CCL) is a tax on industrial and commercial use of energy and was introduced on 1st April 2001. The levy has been established to respond to concern over global warming. Under the 1997 Kyoto Protocol, the UK government agreed to reduce emissions of greenhouse gases to 12.5% below the 1990 levels by 2012. The levy is designed to stimulate increased energy efficiency across businesses, thereby reducing the UK's emissions of greenhouse gases. Further information is available in References 24 and 25.

3.2.8 Waste Incineration Directive

The new incineration directive will replace the two previous 1984 directives on municipal incineration and the 1994 directive on hazardous waste incineration. It will also apply to the burning of waste as fuel in cement kilns, boilers etc. The directive will apply to new facilities from Autumn 2002, and to existing facilities from Autumn 2005. Challenging emission limits for nitrogen oxides from existing municipal incinerators and cement kilns that burn waste will apply from January 2008.

Other relevant amendments to the existing directives include:

- Animal carcass incinerators will not fall under the directive (many would be forced to close if the directive covered them). However, a revision is proposed to the 1990 Directive on animal waste to provide for high environmental standards.

- Exemptions for the burning of vegetable waste from the food processing industry (but only if heat is recovered) and to certain wastes from the pulp and paper industry.

- No exemptions for burning wood waste from construction and demolition, any waste that contains halogenated organics, or heavy metals as a result of coating or treatment with wood preservatives, or for waste oil.

3.3 PRODUCER RESPONSIBILITY DIRECTIVES

Producer responsibility initiatives involve producers (and others) taking greater responsibility for goods at the end of their lives. These initiatives can take the form of voluntary agreements or mandatory obligations. European directives on end of life vehicles, electrical and electronic goods and batteries (see Sections 3.3.2, 3.3.3 and 3.3.4), are examples of producer responsibility initiatives.

3.3.1 Packaging and Packaging Waste Regulations

The Government has introduced statutory producer responsibility for packaging and packaging waste. The packaging regulations required such businesses to recover 52% of packaging waste in 2001, and at least half of that to be recycled. These actions may be undertaken by the producer or an accredited agent. The Government is considering new packaging targets for 2006.

3.3.2 End of Life Vehicle Directive

Vehicles reaching the end of their life may be dealt with by scrap dealers or car breakers which tend to be small businesses. Larger operations and dismantlers remove hazardous items from the vehicle such as tyres, fluids and batteries. Once the spare parts have been removed, the crushed vehicles are typically sold on to shredder operators, where they are mixed with other discarded equipment such as cookers and bicycles.

The hazardous nature of shredder residue and the growing number of vehicles in use (and going to landfill) prompted the European Commission to propose a Directive on End of Life Vehicles (ELV). The Directive has been adopted by the Commission, and is due to be transposed into domestic law. The Directive aims to:

- Introduce controls on the scrapping of ELVs by restricting treatment to authorised treatment facilities.

- Set rising reuse, recycling and recovery targets to be met by January 2006 (85% of all ELVs reused or recovered, 80% reused or recycled) and 2015 (95% reused or recovered, 85% reused or recycled).

- Require manufacturers to design and manufacture their vehicles with recycling and reuse in mind.

- Restrict the use of certain heavy metals, such as lead, in vehicles.

3.3.3 Waste Electrical and Electronic Equipment Directive

The Waste Electrical and Electronic Equipment (WEEE) Directive was adopted by the European Parliament in May 2001, and requires producers to contribute towards the costs of collecting and recycling redundant electrical equipment. It also sets minimum operating standards for recyclers and bans the use of heavy metals and some brominated flame-retardants.

The WEEE Directive contains a number of requirements including:

- Producers should finance the collection of WEEE from drop off facilities as well as finance the treatment, recovery and disposal of such items. Finance can be channelled through individual or collective systems.

- Collection systems, retailer take-back, authorised treatment facilities and systems to channel finance from producers will have to be up and running 30 months after the implementation of the WEEE Directive.

- Product levies will be allowed on a voluntary basis to ensure costs are passed down the chain to retailers for a transitional period (based on the average life of the equipment), but for no longer than ten years after the Directive comes into force.

- Retailers do not have to provide free take back services as long as alternative return routes are available, free of charge. Equipment containing hazardous materials must be taken back by specific collection facilities.

- At least 5% (by weight) of plastic components of WEEE will have to be recycled.

- The mandatory collection target will be to collect 6kg of WEEE per household per capita per year until 31 December 2005.

- A new target, expressed as percentage of equipment sales to households in preceding years, must be set by 3 December 2007.

- Member States will have to ensure that WEEE is collected separately and is no longer disposed of together with unsorted domestic waste.

3.3.4 The Batteries and Accumulators Directive

The European Commission issued its first draft proposal on batteries in 1997. The second draft was issued in April 2001, and is still under discussion. Within two years of the Directive's implementation:

- 75% of all consumer batteries, disposable or rechargeable, will have to be collected separately, including at least 75% of those containing cadmium or lead.

- Similarly, 95% of all industrial and car batteries, including at least 95% of those containing cadmium or lead will need to be collected separately.

For both of the above categories, 55% of the batteries collected will have to be recycled. Collection targets are to be achieved no later than 31 December 2004. The targets are to be reviewed by 31 December 2008.

Unlike WEEE and ELV Directives, manufacturers will not necessarily be legally and financially responsible for ensuring recovery and proper disposal.

3.4 MARKETS FOR RECYCLABLE MATERIALS

One key consideration in moving towards an intensive waste diversion strategy to maximise materials recovery and composting will be to secure long-term markets for the recyclable materials recovered and the products produced. A three to four-fold increase in current national markets will be needed to support a high diversion strategy. This will require the development of new uses for the materials produced or collected (e.g. the use of green waste-derived compost in agriculture, alternative uses for glass to recycle into more bottles). The benefits of a successful market development strategy are not limited to increased diversion and recycling of wastes, but can include the local development of small to medium sized firms engaged in recycling.

In setting the national recycling and recovery targets and the statutory performance standards the Government has recognised that the necessary changes cannot take place without an aggressive agenda to develop new commercial applications for the materials recovered from the waste stream. If there is to be a sustainable increase in recycling, then it must be economically viable. That will depend on the development of markets for recycled materials. Waste Strategy 2000[26] announced the establishment of WRAP (the Waste and Resources Action Programme) as a body dedicated to overcoming market barriers to re-use and recycling. It will aim to do this through a programme of market facilitation, promotion of investment, strategic research and the provision of advice. Local authorities have the opportunity to engage with WRAP to seek out examples of best practice and to develop demonstration projects that could be extended locally.

3.5 REVIEW BY NUMBER 10 STRATEGY UNIT – WASTE NOT WANT NOT

The intention of the Number 10 Strategy Unit [27] is to ensure that, by 2020, England has a waste management system that allows the nation to prosper whilst reducing harm to the environment and preserving resources for future generations. Waste strategies have also been developed for Scotland and Wales. The Number 10 strategy implies a need for:

- Reducing growth in waste volumes to less than the growth in GDP.
- Fully covering the true costs of disposing of waste in the prices of products and services.
- Implementing waste management options that deliver the overall aim at least cost.

A strategy was considered to be required to realise the overall aim, and is to be underpinned by three key principles:

1. The 'waste hierarchy' provides a sensible framework for thinking about how to achieve a better balance between waste minimisation, recycling, incineration and landfill (See Figure 16).

2. Measures taken to advance the strategy should take full account of the balance of benefits and costs.

3. Sustainable waste management is not just a responsibility of government, but also of individuals, businesses and other stakeholders.

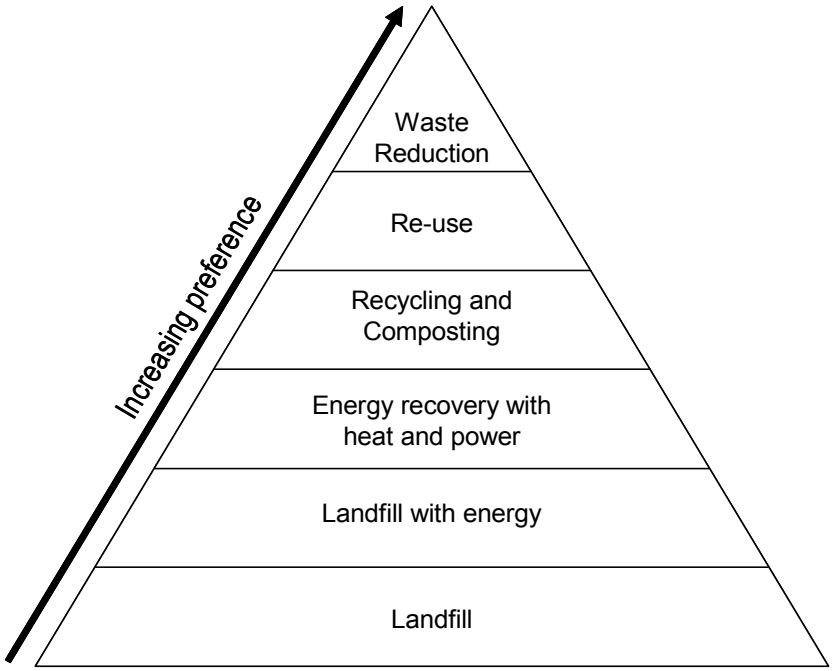


Figure 16 Waste hierarchy

The Waste Not Want Not report sets out how these principles can be put into practice. It emphasises waste reduction, re-use and recycling together with creating the right environment and new institutional structures to help bring about change. The report recommends:

- A long term economic and regulatory framework. This should include significant increases in the landfill tax and new incentives for households to reduce and recycle waste.

- A package of short to medium term measures to put England on the path to more sustainable waste management, including measures to slow the growth in the amount of waste, investment in recycling infrastructure, and support for new alternative waste management technologies.

- Additional funding accompanied by radical reform of delivery structures to ensure the overall aim is realised.

It is intended that the implementation of the strategy would enable England to match best practice in other countries and at lower cost. In combination, it is suggested that the elements of the Strategy Unit package would:

- Slow waste growth from 3% to 2% per annum; thus reducing environmental damage, saving money and reducing the number of new waste management facilities required in the longer term.

- Boost recycling by developing the infrastructure needed for increased recycling (including national kerbside collection, focusing on organics, and more civic amenity sites designed for re-use and recycling). This would raise national recycling rates to at least 45% by 2015.

- Increase choice by creating the economic environment within which a wider range of options for managing waste can develop; giving industry, local authorities and households greater flexibility over how they manage their waste, as well as the incentive to reduce damage to the environment.

- Stimulate innovation in waste treatment and waste management organisations in England.

- Reduce environmental damage and improve resource productivity by reducing reliance on landfill and other disposal options; preserving resources for future generations and reducing environmental impacts.

The Secretary of State for the Environment, Food and Rural Affairs is the Ministerial Champion for this strategy.

3.6 EMPLOYMENT OPPORTUNITIES FROM RECYCLING

The implementation of the UK waste strategy[26] is likely to have an impact on employment numbers and patterns within the waste industry. In particular, if targets to decrease waste generated and increase the amount of waste recycled are met, there may be a transfer of jobs from the traditional collection and landfill sectors to materials recovery facilities (MRFs) and material reprocessing.

A recent pan-European study[28] undertaken by Risk and Policy Analysts (RPA) for the European Commission presents a cautious picture. They suggest that the relationship between waste management policies and employment is more complex than the ongoing debate might indicate. Although waste management policies may increase demand for waste management services, this may not necessarily result in additional jobs. Instead, they suggest technology

substitution for labour, increased productivity and consolidation in the waste management sector may constrain job creation. They also suggest that there is some evidence that these factors could reduce employment opportunities for the socially-excluded in waste management.

Overall, the RPA study demonstrates that waste management measures are likely to have only a small effect, either positive or negative, on employment. However, the study suggests that the detailed way in which a policy is implemented and complied with is most likely to determine the direction and scale of the effect, and this is often the hardest to predict. Hence, the potential effects of the policies are likely to vary between individual countries.

In a study undertaken in 1999, Waste Watch[29] estimated that if the 30% national recycling target is to be met in 2010, then around 45,000 extra jobs could potentially be created in the UK. This estimate consists of around 9,000 extra jobs in collection, 26,000 in sorting and 9,000 in reprocessing.

3.7 SUMMARY

The primary requirements on waste authorities are to meet the targets set out in the National Waste Strategy and the Landfill Directive. The key targets are summarised in Table 5.

Table 5 National waste targets

Date	*National Waste Target*
2005	• Recycle or compost at least 25% of household waste by 2005 (Waste Strategy 2000, May 2000). • Recover value from 40% of municipal waste by 2005 (Waste Strategy 2000, May 2000). • Reduce the amount of industrial and commercial waste sent to landfill to 85% of that produced in 1995 by 2005 (Waste Strategy 2000, May 2000).
2010	• Recycle or compost at least 30% of household waste by 2010 (Waste Strategy 2000, May 2000). • Recover value from 45% of municipal waste by 2010 (Waste Strategy 2000, May 2000). • Reduce biodegradable municipal waste sent to landfill to 75% of that produced in 1995 by 2010 (Landfill Directive).
2013	• Reduce biodegradable municipal waste sent to landfill to 50% of that produced in 1995 by 2013 (Landfill Directive).
2015	• Recycle or compost at least 33% of household waste by 2015 (Waste Strategy 2000, May 2000). • Recover value from 67% of municipal waste by 2015 (Waste Strategy 2000, May 2000).
2020	• Reduce biodegradable municipal waste sent to landfill to 35% of that produced in 1995 by 2020 (Landfill Directive)

The timeline for the introduction of the various waste regulations is shown in Figure 17.

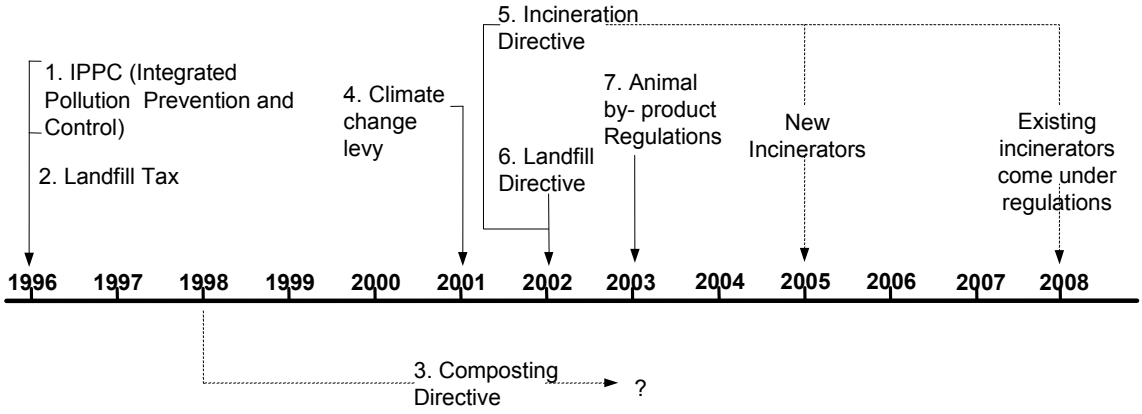


Figure 17 Timeline for the introduction of various waste regulations in the UK

Each of the regulations is likely to have different impacts at different times, with some already impacting on the waste industry. Potential health and safety issues that may arise as a result of implementing these regulations in the UK are summarised in Table 6.

Table 6 Potential health and safety implications resulting from actions taken in implementing forthcoming regulations

Actions taken in implementing regulations	*Potential health and safety implications*
Minimise waste in the first instance and, thereafter, stimulate recycling and recovery of waste to reduce the need to landfill. Disposal at landfill will be the last resort.	Recycling requires more jobs per tonne of waste to process, leading to an increased potential for manual handling injuries.
Increase the recycling of waste materials through separate kerbside collection of more (pre-sorted) recyclable materials from residents' homes.	Manual handling associated with sorting and collecting material will increase. Additional kerbside collection increases the potential for traffic accidents. Slips and trips have the potential to increase given road and footpath usage.
Maximise recycling and the segregation of green waste at civic amenity sites and recycling centres for composting; and provide sufficient processing capacity at central composting facilities.	Increased sorting of materials at household waste centres by members of the public may increase their risk; it is less easy to control the behaviour of the public than that of workers.
Increase the composting of green waste, where necessary, by the kerbside collection of separated green waste (garden waste) from households and processing it at managed central composting facilities.	Manual handling associated with collecting material will increase. Additional kerbside collection increases the potential for traffic accidents. Slips and trips have the potential to increase given road and footpath usage.
Make use of high technology waste recovery methods, including energy from waste, in order to achieve the diversion targets for biodegradable waste that cannot be recycled or composted.	Operation of complex technology (in comparison to the alternative of, for example, landfill) may increase accident frequency.
Continue to landfill the residue (which is left after recycling) or recovery processes to around the permitted level whilst this remains cost-effective.	Landfill is less labour-intensive than other waste management techniques. The risks associated with landfill sites are more obvious.
Reduce the amount of waste production.	Reduction in health and safety risk in the waste industry.
Emphasise product re-use.	Overall reduction in health and safety risk in the waste industry, although risk may be transferred to the re-use industries.
Maximise the quantity of materials recovered from Civic Amenity sites.	Increase in public usage of (unfamiliar) waste sites leading to potential risk transfer to the public.
Increased role of community groups in waste recycling.	Issues of competence and safety management in such operations remain unknown. A possible risk transfer area.
Growth of waste incinerators.	Amplification of current risk associated with waste incineration. For example fire, pollution, explosion.

4. LITERATURE RELATING TO HEALTH AND SAFETY IN THE WASTE INDUSTRY

4.1 INTRODUCTION

In this section, literature relevant to health and safety issues in the waste industry is reviewed. Two components of literature are reviewed in this section:

- Literature specific to health and safety in the waste industry either in the UK or overseas.

- Literature from other industries that addresses health and safety issues relevant to the waste industry, and where there are potential lessons to be learned (particularly in relation to the Re*vital*ising Health and Safety[30] topics).

The two components are presented in the context of the original papers and reports, and are then summarised in relation to and the priority programme topics relevant to the waste industry, namely falls from height, workplace transport, slips and trips, musculoskeletal disorders and stress.

4.2 HSE – REDUCING RISKS IN THE WASTE INDUSTRY

The HSE, in conjunction with the Waste Industry Safety and Health Forum (WISH) has produced a leaflet[31] aimed at supervisory staff and employees, and provides a series of checklists of standards to aim at. The leaflet addresses generic and specific issues relating to workplace transport, machinery guarding, slips and trips, health precautions, welfare facilities and manual handling. These are considered to be the main risks facing workers in waste management. Whilst the leaflet does not interpret health and safety law, it provides practical information for duty holders to develop their own systems.

4.3 US OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

The United States Occupational Safety and Health Administration (OSHA)[32] provide a comprehensive guide to working in the hazardous waste industry. Reference is made to the health and safety issues in an information bulletin on the hazards of working in thermal desorption units. Many of the issues relating to manual handling, trips and workplace transport are likely to be relevant to health and safety in the waste industry. Thee are summarised in Table 7

Table 7 Risks and risk controls identified by OSHA

Risk	*Risk controls*
Manual handling	
• Lifting or performing a movement with too much force and/or in an awkward position, or repeating the lift/movement too often	• To provide conveniently located equipment. For example, carts, adjustable work stations for the operators and appropriate tools • To train workers on ergonomic risks and prevention
Slips and trips	
• Storing materials or other unnecessary items on walkways and in work areas. • Creating and / or using wet, muddy, sloping or otherwise irregular walkways and work surfaces. • Constructing and or using improper walkways, stairs or landings or damaging these surfaces • Creating and / or using uneven terrain in and around work areas • Working from elevated work surfaces and ladders • Using damaged steps to enter vehicles	• Keep walking and working areas free of debris, tools, electrical cords etc. • Keep walking and working areas as clean and dry as possible. • Install handrails and guardrails on work platforms. • Train workers on fall hazards and use of ladders.
Workplace transport	
• Moving and stockpiling untreated and treated material using earth moving equipment • Loading and unloading units using heavy equipment • Receiving and transferring process chemicals and other materials from commercial vehicles	• Establish vehicle inspection schedules and procedures. • Train affected employees on the limitations of equipment and drivers. • Train equipment and vehicle operators in safe operation. • Set acceptable speed limits and traffic patterns. • Ensure that equipment has, and that workers use, back-up alarms, mirrors and seat belts. • Set the parking brake and, if on an incline, chock the wheels • Ensure the equipment has the required roll-over protection systems installed. • Conduct routine maintenance.

4.4 OSHA HAZARDOUS WASTE SITE SAFETY HAZARDS STUDY

OSHA[33] also conducted a small scale study to investigate the claim that hazardous waste inspections usually focus on health hazards rather than safety hazards. This was a concern to OSHA since employers reported to them that safety hazards are far more common than health hazards and are the cause of most recordable incidents. To address this claim, an information gathering study of safety hazards was undertaken at six hazardous waste sites in the United States. The objective of the study was to identify potential safety hazards and implemented control measures. These hazards were identified by observations of as many site activities as possible along with occasional interviews with site workers and safety representatives.

The following hazards were identified from the information gathering exercise:

- **Electrical hazards** - this included improper use of chords, damaged chords and unlabelled circuit breakers.

- **Surface hazards** - these included a lack of fall protection on elevated surfaces, and inadequate floor surfaces leading to slips and trips.

- **General environmental controls** - hazards involving general environmental controls such as confined spaces, lockout / tagout operations and sanitation were found to be common.

- **Material handling equipment and motor vehicles** - these included inappropriate use of heavy equipment on vehicles (leading to rollovers) and operating heavy equipment too close to power lines. In addition, site representatives reported that workers driving leased or rented vehicles were a source of many accidents. This was attributed to crossing dangerous road junctions and frequently falling asleep at the wheel. However, why this particularly applied to workers with rented vehicles is not explained.

4.5 FLORIDA CENTRE FOR SOLID AND HAZARDOUS WASTE MANAGEMENT

Engelhardt[34] conducted research into the health and safety risks associated with solid waste management in the United States, which was supported by the Florida Centre for Solid and Hazardous Waste Management. The investigators found that rates of injury to municipal solid waste (MSW) workers in Florida and Denmark were six to seven times greater than those of the general workforce. In addition, they found MSW collection to be one of the most hazardous occupations with Danish studies indicating a 50% higher illness rate in MSW workers, with infectious diseases being six times that of other workers.

The Florida Centre for solid and hazardous waste management conducted a large-scale study into the management of health and safety risks for solid waste. The objective of the study was to evaluate and reduce occupational risks to Florida's municipal solid waste (MSW) workers,

and to determine what is known concerning risks to residents of communities near to MSW sites. The first part of the study involved a literature review and was conducted by Fleming et al[35].

Fleming et al state that a global relationship has been determined between solid waste handling and increasing health risk. They add that human exposure takes place at every step of the waste management process – from the generation of waste to its disposal and that the population at greatest risk for the highest and most concentrated exposures is the solid waste industry workers. Despite this, there is little information available to solid waste workers for reducing such risks. To address this issue, they reviewed the literature for potential exposures for refuse collectors, incinerator workers, compost workers, landfill workers, recycling workers, maintenance workers and hazardous waste workers. These issues are discussed in Table 8.

Table 8 Health safety issues relating to various workers in the US waste industry identified by Fleming et al[35]

Workers	***Health and safety issues***
Refuse collectors	• Fleming et al noted that in the United States, a refuse truck tends to have a crew of two or three refuse collectors, with collections taking place six days a week in all types of weather, traffic and neighbourhoods, often at peak times. Collectors often thought to be inattentive and negligent in that they ride on the back of trucks, collect from two sides of the street at the same time and retrieve refuse from inside the truck (Campbell[36], NIOSH[37]). • Poor visibility associated with the large vehicles can lead to traffic accidents due to the large number of blind spots. In addition, the design of US trucks leads to the exhaust pipe directing fumes towards the workers, thus aggravating the effects of working in small areas with high levels of dust. • The 'ready and go home scheme' which refuse collectors operate can result in more time off, the associated increase in the speed of work can lead to accidents (Verbeek et al[38]).
Incinerator workers	• The health hazards highlighted by Fleming et al generally relate to the effects of exposure to chemicals and dust inhalation. This is due to acids such as nitrous oxide and sulphur dioxide, and micro organisms which exist in the air at incineration plants.
Compost workers	• Fleming et al(35) note that composting is a biological process and that, if prepared properly, compost should eliminate most pathogens. Hence, working with waste prior to composting may lead to the greatest potential exposure to biological pathogens. Similar to incineration, it was found that the health hazards generally related to micro organisms and the presence of bioaerosols in the air.
Landfill workers	• The primary health hazards in landfill sites were identified as methane gas and carbon dioxide produced from the waste. Landfill workers are also potentially exposed to high levels of dusts containing micro organisms which can be spread during the dumping or moving of waste. • In terms of the workplace transport, Fleming et al refer to relatively old research by

Workers	*Health and safety issues*
	Cimino[39] who cites hazardous road conditions.
Recycling workers	• Fleming et al comment that recycling is a labour intensive industry with manual handling being the main hazard, particularly in relation to glass (Sigsaard et al[40]) • Fleming et al also raise the phenomenon of 'urban recyclers' (male, homeless individuals in the United States who rummage through other people's waste in order to recycle). Here there is the danger of encountering hazards such as sharp edges of cans, broken bottles and other sharp objects.
Maintenance workers	• Fleming et al state that these workers are at high risk from all of the hazards which affect other workers, but there is little research into the health and safety problems that occur with this group of workers.
Hazardous waste workers	• A large number of workers are involved with the transport of industrial hazardous wastes, with the drivers usually being responsible for the loading and unloading of the waste that they transport. Subsequently, this leads to manual handling risks for the workers. Other risks that were identified included exposure to substances, many of which were of unknown compositions at the time of exposure. • The literature regarding solid waste workers is incomplete with the link between exposure and health rarely confirmed. Fleming et al point to musculoskeletal disorders, dermal effects, and both acute and chronic respiratory health effects as the most well-documented among solid waste workers. However, they point out that the lack of information on the types, volumes and characteristics of solid waste has resulted in many unanswered questions regarding the risk of occupational injuries and irreversible chronic health effects for the solid waste worker.

4.6 REGIONAL WASTE MANAGEMENT TASK FORCE

The Regional Waste Management Task Force (RWMTF)[41] was established in 1998 by the Canadian state of Manitoba to review waste management activities both throughout the state and throughout North America. The objectives of the Task Force were to understand Manitoba's current solid waste management system and regional waste activities and compare this to other authorities which also deal with solid waste management. They examined solid waste management strategies in other authorities across North America, and found that there were a number of significant trends that had impacted on waste management practices over the previous decade. These commonly included the establishment of waste reduction targets and the adoption of new approaches to managing the waste stream to improve efficiency and environmental protection. These trends are likely to have both positive and negative impacts on health and safety, and include:

- **Larger engineered landfills** - new larger landfills constructed using better environmental protection technologies than older generation landfills.

- **Regionalization of waste management services and planning** - communities increasingly forming planning and service partnerships on a regional scale.

- **Increased transfer of solid waste** - the establishment of transfer stations and the transporting of solid waste to distant sites as an alternative to the development of new landfills.

- **Higher solid waste management regulatory standards** - the standards for the design, construction and operation of solid waste management facilities and systems have increased.

- **Greater emphasis on waste reduction and diversion, and the development of solid waste management systems** - communities are utilising better methods of reducing and diverting material away from landfills such as employing integrated solid waste management systems, collecting and managing source segregated waste streams and banning materials from landfill.

- **Movement towards product stewardship** - manufacturers and distributors are taking more responsibility for the environmental impact of their products.

- **Employment of full-cost accounting methods** - solid waste management decision and evaluation criteria are increasingly based on full cost analysis (i.e. the inclusion of environmental, social and economic costs).

4.7 US BUREAU OF LABOUR STATISTICS

Drudi[42] investigated the hazards facing waste industry workers in the United States. He suggests that whilst refuse collection is a high hazard job, until recently there had been little research conducted into hazards in the waste industry. He noted that during the period 1992-1997, refuse collectors were identified as having one of the most dangerous jobs in the United States. There are four Standard Industrial Classification (SIC) codes which cover the waste industry in the United States. These include secondary smelting and refining of nonferrous metals; local trucking without storage; refuse systems; and wholesale durable scrap and waste materials. Drudi suggested that the wide dispersion of the SIC codes throughout the SIC system and the fact they are not recognised as an integrated economic activity could explain why little research has been undertaken on fatalities in the US waste industry. This is similar to the situation with the SIC codes in the UK. The data that Drudi located for each of the four SIC codes are summarised in Table 9.

Table 9 Fatal injury accidents in the United States waste industry between 1992 and 1997

Industry	*Issues*	
Local transport without storage	• This industry includes transportation of debris and collecting and hauling of local refuse without disposal. In addition, local government agencies and private companies who collect refuse but transfer it to another agency or firm for disposal are classified in this industry	
	Occupation	**Number of fatalities (%)**
	Refuse collectors	39 (61)
	Truck drivers	17 (27)
	Non-construction labourers	6 (9)
	Total	64 (100)
Refuse systems	• This classification includes organisations engaged in the collection and disposal of refuse by processing or destruction, or in the operation of incinerators, waste treatment plants or other disposal sites. Nearly three quarters of the fatalities were attributed to refuse collectors, truck drivers or non-construction labourers. More than half the 223 fatalities were due to workplace transport incidents.	
	Event	**No. of fatalities(%)**
	Worker struck by vehicle or mobile equipment	66 (30)
	Highway transportation crashes and other incidents	58 (26)
	Caught in or compressed by equipment or objects	25 (11)
	Other	74 (33)
	Total	223 (100)
Wholesale trade in scrap and waste materials	• Organisations in this industry are predominantly involved in assembling, breaking up, sorting, and wholesale distribution of scrap and waste materials. Typical activities include the recycling of cars; plastic, paper and glass; scrap iron, steel and other metals; and rags and other textile waste. Drudi suggests that workers in this industry confront a wider range of hazards than other waste industry workers.	
	Accident kind	**Fatalities (%)**
	Struck by object	42 (22)
	Caught in equipment or objects	36 (19)
	Fires and explosions	24 (13)
	Homicide	16 (9)
	Total	187 (100)

Industry	*Issues*
Refuse collection	• Drudi found that refuse collection entails a number of high-risk activities such as jumping on and off trucks, carrying rubbish, working in close proximity to large refuse collection vehicles and walking on busy roads collecting rubbish from both sides of the pavement. • Furthermore, the vehicles obscure the collectors' views which both affects their ability to spot traffic and stops them from being noticed by approaching traffic. Vehicles inflict most fatal injuries to refuse collectors as a result of being struck by refuse trucks or struck by passing vehicles. The latter frequently occurred after the worker had fallen from the refuse truck. • Drudi also highlighted non-fatal injuries and illnesses to refuse collectors. He refers to the Bureau of Labour Statistics' annual Survey of Occupational Injuries and Illnesses which estimates that 2161 refuse collectors suffered non-fatal job injuries and illnesses every year from 1992 to 1997 due to cuts, lacerations, punctures, bruises; sprains, strains and muscle tears; and fractures. This was attributed primarily to over-exertion, particularly from the manual handling.
Secondary smelting and refining of nonferrous metals	• This SIC refers to establishments that are primarily involved in recovering nonferrous metals and alloys from used scrap and refuse or in producing alloys from purchased refined metals. Between 1992 and 1997 there were 25 fatalities in this industry which were commonly due to workers being struck by objects, being caught in equipment, being exposed to harmful substances or from assaults and violent acts. • Drudi states that twenty percent of the workers in this SIC have reported injuries and illnesses which have required more than basic first aid. The most common causes include sprains, strains and muscle tears. These are followed by cuts, lacerations, punctures and bruises and to a lesser extent, heat burns.

4.8 WRAP - KERBSIDE COLLECTION OF GLASS

British Glass[43] undertook a study on behalf of the Waste and Resources Action Programme (WRAP) into the coverage and effectiveness of kerbside glass collection in the UK. Five case studies of municipal collection authorities (MCA) were undertaken whereby the basic operation of the glass collection schemes and the experiences of the operators were studied. The primary objective of the report was to assess glass collection rates and provide recommendations on increasing these rates. Health and safety issues such as handling sharp glass and repetitive lifting operations among the collectors were also investigated in the study.

A significant number of authorities operate kerbside schemes that do not include glass. The reasons most often cited are concerns regarding health and safety and also a preference to use plastic sacks. Whilst these sacks are cheap, they are unsuitable for glass collection. However, where sacks are used, a small quantity of glass still does find its way in with the other materials to be recycled. Protective clothing and some form of separation is, therefore, still required. It was suggested that as some glass will always be present in co-mingled materials there is a strong argument that it is preferable to include glass as a collected fraction.

Contamination of the paper fraction with shards of glass can cause serious problems at the paper mills and, for this reason, some form of segregation is perceived as best practice.

Those councils operating kerbside collections have raised few concerns over health and safety. There has been some debate over the potential for collectors to develop repetitive strain injury, but participating councils seemed confident that provision of proper training would avoid this problem. Injury from broken glass does not appear to present a significant problem, provided the correct safety clothing is worn.

Many authorities contract all kerbside collection operations out to waste management companies, though some operate internal schemes.

4.9 HSL MANUAL HANDLING IN REFUSE COLLECTION

HSL[44] undertook a study to review the literature on manual handling in refuse collection and followed this with a small study of refuse collectors at work. The main conclusions and the associated recommendations are summarised in Table 10.

Table 10 Findings and recommendations from the HSL study on manual handling in refuse collection

Findings	*Recommendations*
1. Stressful postures, including stooping and twisting, were adopted by the refuse collectors, but only for short durations.	1. Where possible, refuse collection should be carried out using appropriate size wheelie bins rather than bags or small dustbins.
2. Refuse bags are typically thrown into refuse collection vehicles. However, the heights at which bags have to be thrown in are such that half of the male working population would have problems throwing the heaviest bags into the lorries.	2. Where possible, lorries without lifting gear and a low rave height should be provided for collection rounds dealing solely with bags. Consideration should be given to demounting the lifting gear for bag-only rounds.
3. Refuse in bags can be hazardous due to the presence of sharp objects, discarded syringes and infectious materials.	3. Refuse collectors should be provided with PPE for their hands and legs. Not only would this reduce the risk of cuts, it would enable them to carry bags closer to their bodies.
4. On some occasions, old-style round non-wheeled dustbins are used and have to be lifted and emptied into the vehicle.	4. Where these dustbins are still used, householders should be encouraged to line them with black bags before putting refuse into them.
5. Considerable amounts of pushing and pulling are required on rounds with wheelie bins, with pulling more frequent than pushing.	5. Eurobins should be handled by two people wherever possible and transported across dropped kerbs, particularly when they are being pulled.
6. Even on rounds that primarily contain wheelie bins, significant manual handling of bags and other loose refuse also occurs.	6. Refuse collectors, residents, proprietors and local authorities should work together to identify areas where improvements can be made.
7. The size of wheelie bins observed ranged from the domestic 240 litre size to 1100 litre Eurobins and Paladin bins.	7. Manufacturers should be encouraged to increase wheel diameters and use lightweight material – particularly in the larger bins.

4.10 BOMEL - FALLS FROM HEIGHT

BOMEL prepared Research Report 116[45] for the Falls from Height Priority Programme Board of the Health and Safety Executive, and describes a pan-industry study into the underlying influences on, and control of, falls from height. Influence Network workshops were held with a wide range of delegates representing key stakeholders in Agriculture, Construction, Roofing, Specialists/Utilities and Transport. The analyses have given an insight into the underlying organisational and human factors influencing falls from height; risk control measures; and their potential effectiveness. These indicate that there are many similarities pan-industry with human, cultural and organisational issue dominating.

Of particular relevance to the waste industry are those issues relating to transport. The following potential risk control measures were suggested as means to generate improvements in relation to falls from height in transport:

- **Encourage a greater take-up of training** - The discussions on *competence* and *training* were closely linked. The feeling was that major companies will train their staff, whereas small operators are not likely to have any training resulting in employees of the former being more competent in terms of health and safety.

- **Raising the situational awareness of drivers** - Improvement to drivers' *situational awareness / risk perception* offers scope for reducing accidents. As in other industries, there is an 'it won't happen to me' attitude, especially when the risks are not obvious such as at low levels on a flat bed lorry. Effort needs to be aimed at raising awareness in this area, perhaps as part of training. Also, drivers need to be more aware of when not to do a job due to unacceptable risk.

- **Improved communications between haulage firm and destination site** - Improved *communication* and the passing of the relevant *information / advice* were thought to offer simple but effective means to improve transport safety. This could involve as little as a telephone call or fax between the contractor and site to make sure adequate provisions are in place for delivery. A simple checklist could be used to ensure all the important points are covered. Responsibilities for safety should be clearly defined. Driver feedback needs to be encouraged as part of this process.

- **Improved design and use of equipment** - Several points were made in relation to how either the design or use of *equipment* could help to reduce risk. These included: retro-fitting protection to trailers, scissor lifts etc.; vehicle lock-ins at loading bays; assessment of suitability of hardware for getting in / out of cabs or on/off trailers; and training / raised awareness on the correct use of equipment

- **Improvements in safety culture** - *Safety culture* needs to be encouraged in the industry especially among smaller non-dedicated operators. This should concentrate on the following: incident reporting and feedback; long term thinking; better clarification of responsibilities; more ownership of safety at the management level; and guidance for small operators on the best ways to improve safety.

4.11 BOMEL - WORKPLACE TRANSPORT

BOMEL undertook a wide-ranging study of health and safety in the construction industry for the HSE addressing falls from height, workplace transport and HSE mechanisms. Of particular relevance to the landfill are the construction plant related issues identified as part of the work on construction transport[46]. The following issues were identified as means to control risk and grouped under the following themes:

- **Training measures / raising awareness** - means of raising workers' awareness of the risks that they face include: training and advice on the risks in and around plant are provided for all workers; practical elements in training courses for plant operations, and the use of on-site training; raising awareness of people's limitations in terms of what is safe and what they are qualified to do; focus training on plant performance, in particular in hazardous conditions and highlighting where the limits are; raise awareness of plant risks among general workforce, perhaps using toolbox talks; and Integrate the training schemes better with the range of organisational and practical needs.

- **Site / management measures** - means of improving site practice include: better recruitment and training leading to managers and supervisors with a good knowledge of the industry relevant site experience; checks on the hearing and eyesight of the workforce (this may not just be a problem with the ageing workforce, but also with younger workers who are unaware of the problem); communicate the safety critical information for plant using checklists etc. so that it does not get lost in the midst of user manuals or other procedures; ensure information about safe operations is communicated daily as part of the planning activity, reviewing the risks and controls with the workforce to be involved; review of the use of mobile phones and radios by workers while operating plant as they may cause undue distraction in the cab; encourage reporting and feedback, and the development of an incident monitoring system as a basis for learning and making changes to avoid the recurrence of problems.

- **Organisational measures** - measures for adoption by organisations in order to improve safety performance include: establishing consistent priorities throughout organisations from senior management to workers to improve culture (emphasising the fundamental importance and commitment to safety); limiting the practice of small groups having different agendas; demonstrating commitment to constructive learning from incidents being built into future safe working practices and procedures; and ensuring procurement staff have necessary awareness of health and safety issues and / or require site staff to provide full specifications.

4.12 HEALTH EFFECTS OF WASTE MANAGEMENT

Two papers from the 2001 conference 'Health impacts on waste management activities' provide a qualitative overview of the significance of the health issues facing workers in waste management.

Rushbrook[47] notes that several studies undertaken in Sweden and Denmark have found some incidence of respiratory illness among waste collection workers, workers in covered waste reception halls, staff on materials recovery picking lines and manual workers at composting facilities and landfills. He indicates that the results are open for interpretation when confounding factors are considered. However, the body of evidence seems to suggest that inadequate extraction systems expose workers to higher concentrations of microbial contaminants from dusts and aerosols. A study is referred to, whereby the occupational hazards associated with waste management, both physical and microbiological, have been considered. Based on published statistics, the largest threats to waste management workers were judged to be from traffic accidents, falls from height or strains resulting from lifting incorrectly. However, he acknowledges that the data for toxic and microbiological risks are not readily available whilst those for physical injuries are. Interestingly, he notes that in 1989 UK data indicate that the risk of an occupational accident in waste management was comparatively high, at about the same level as on a construction site.

Broomfield[48] provides a qualitative summary of the likely significance of materials emitted to air during various stages of the waste management process. These are summarised in Table 11.

Table 11 Potential significance to health of exposure during the waste management process

Stage	*Description*	*Characteristics*	*Likely significance*
Collection	• Dusts and micro-organisms during transfer from household to collection vehicle, and during transportation to transfer / disposal point. • Collection operators are most likely to be exposed. • Public living close to transfer stations could also be affected.	• Ground level source. • Close to potential receptors (public)	• Low (no reported increase in disease amongst operators)
Transfer	• Dusts and micro-organisms at waste transfer station. • Transfer station staff most likely to be exposed. • Public living close to transfer station could also be affected.	• Enclosed source. • Potential release point from building ventilation systems. • Transfer stations are frequently located in urban / suburban areas.	• Low (no reported increase in disease amongst transfer station staff)
Sorting	• During sorting / separation for recycling. • Staff sorting waste most likely to be exposed. • Public living close to sorting facility could also be affected.	• Enclosed source. • Potential release point from building ventilation systems. • Storing facilities are frequently located in urban / suburban areas.	• Low (no reported increase in disease amongst sorting facility staff)

Stage	*Description*	*Characteristics*	*Likely significance*
Composting	• Dusts, micro-organisms and gases generated during composting processes. • Emissions could be increased during turning of composting waste – indicated by increased odour emissions.	• Typically open source at ground level. • Composting facilities are often located in sparsely populated areas.	• Moderate (pending quantitative information on emissions during composting)
Tipping at landfill	• Dusts and micro-organisms produced when waste is tipped, and from open tipping face. • Emissions likely to be reduced when the tipping face is covered. • Site staff most likely to be affected. • Public living close to landfill could also be affected.	• Open source at ground level. • Usually a separation of several hundred metres to nearest off-site property	• Low (pending quantitative information on emissions during tipping)
Landfill gas – un-burnt	• Trace constituents of landfill gas. • Key components may include chlorinated VOCs, and organic micro pollutants such as PCBs and dioxins.	• Open source at ground level. • Hard to quantify the amount of landfill gas being produced.	• Low to moderate. • Will depend on effectiveness of landfill gas capture and control system.
Landfill gas – flaring	• Combustion products of landfill gas. • Key components may include oxides of nitrogen, oxides of sulphur and PCBs and dioxins.	• Elevated source – emissions focussed from a few individual points. • Usually a separation of several hundred metres to nearest off-site property	• Low (high temperature designed to give complete combustion and provide good dispersion)
Landfill gas – generation	• Combustion products of landfill gas. • Key components may include oxides of nitrogen, oxides of sulphur and PCBs and dioxins.	• Source close to ground level – emissions focussed from a few individual points. • Usually a separation of several hundred metres to nearest off-site property	• Moderate (plant designed to maximise power generation, and may not minimise emissions). • Lower temperature than flare.
Waste incineration	• Dusts and micro-organisms generated during tipping and handling in reception hall. • Site staff most likely to be exposed. • Ventilation air can be extracted via combustors and chimneys. • Combustion products of wastes. • Key components may include oxides of nitrogen, oxides of sulphur and PCBs, dioxins and furans, and heavy metals. • Handling and disposal of ash.	• Source elevated well above ground level. • May be located in urban or rural areas.	• Low (emissions can be well understood and controlled. • Process must be well designed to minimise emissions and provide adequate dispersion).

The Composting Association and HSL[49] undertook a study to critically review published literature related to studies of airborne micro-organisms or their constituent parts (bioaerosols) associated with organic waste composting facilities, and to establish whether there is a risk to worker health from the inhalation of these bioaerosols. The review aimed to identify the personnel at risk on compost sites, identify the circumstances which increased the risk and indicate suitable control measures to control the risk.

The authors obtained detailed information on levels of bioaerosols associated with composting. However, many composting studies focussed on environmental emissions and the potential risk to sensitive receptors (e.g. people susceptible to ill health in the nearby vicinity), rather than occupational exposure. They found that there is limited information available on workers' personal exposure to bioaerosols associated with specific tasks in composting, and few studies have described the risk controls used. Data that have been reported indicate that workers at compost sites are at risk of regular exposure to bioaerosols - between 10 and 1,000 times greater in concentration than may be expected normally in ambient air.

The authors report that in waste handling, as in other industries where workers may be exposed to large concentrations of organic dust, there is reported evidence, mainly from studies in continental Europe, of raised levels of antibodies and inflammatory mediators associated with compost handling. Also, as with other industries where workers are exposed to organic dust, there is the potential for progressive respiratory ill-health with continued high exposure. As composting on a major scale is a relatively new and rapidly expanding industry and symptoms of chronic ill health may not yet have had time to develop, there may be justification for long-term health monitoring of workers. Only two published case studies reported evidence of respiratory infection, one from USA and one from mainland Europe.

The authors have noted that the methods used in some previous studies to measure occupational exposure to bioaerosols released during composting may have underestimated workers' total exposure to allergenic or immunotoxic agents, or missed peaks of exposure related to specific work tasks. The use of longer term sampling methods may be relevant to address this potential discrepancy, while simpler sampling methods may make regular monitoring of sites more achievable. They suggest that personal worker exposure data are required to identify the personnel at risk from exposure to bioaerosols on composting sites, to identify work tasks which increase risks, and to measure the effectiveness of controls. Long term monitoring at selected sites would establish a more complete picture of bioaerosol levels, especially at the periphery of sites.

4.13 SUMMARY

The key issues from the literature review are summarised in Table 12 in terms of the Re*vital*ising themes. These issues are used to inform later sections of this report.

Table 12 Key issues from the literature review in relation to the Re*vital*ising themes

Revitalising theme	***Key findings***
Falls from height	• Getting in and out of vehicle cabs presents a risk of falling. • Greater take-up of training should be encouraged. • The standards of situational awareness should be raised. • Communication between company and client premises should be improved. • Design and use of equipment needs to be improved. • Safety culture needs to be improved.
Workplace transport	• Poor visibility leading to traffic accidents around refuse collection vehicles. • Refuse collectors working in streets during busy times. • Improve training measures and raise awareness of risks. • Site / management measures need improving. • Organisations need to improve their in-house systems and culture. • Regulatory information on good practice for issues such as visibility.
Slips and trips	• Kerbs and footpaths present tripping hazards.
Musculoskeletal disorders	• Lifting or moving (heavy) containers in awkward positions is a repeated problem. • Refuse bags have to be lifted to a significant height to be thrown into some refuse collection vehicles. • Older-style dustbins are still used, and can be particularly difficult to lift. • The size of some wheeled bins is considered excessive.
Other health issues	• Cuts from handling sharp objects during collection and sorting. • Exposure of workers to dust and other emissions is noted, but little information on the health impact is available. • Violence towards waste workers. • Excessive noise from glass being tipped into empty chambers at the start of collection rounds.

5. WASTE INDUSTRY HEALTH AND SAFETY DATA SET

5.1 RIDDOR ACCIDENT DATA

5.1.1 Introduction

The available data on accidents and ill health in the UK waste industry have been analysed in order to provide:

- A baseline from which future improvements may be measured.
- A means of informing and targeting the Influence Network workshops.
- An insight into the areas where future risk control measures and interventions may best be targeted.

The main sources of data are the RIDDOR accident data as provided by HSE and the self-reported work-related illness in 2001/02. The analysis of this data is discussed in the following sections.

5.1.2 RIDDOR accident reporting

Reporting of the fatal, major or minor (over three days away from work) injury accidents to workers associated with workplace activities is a statutory requirement of RIDDOR. This section provides a brief overview of the RIDDOR data as collected by HSE and subsequently processed and analysed by BOMEL. Detailed information is provided in References 50, 51 and 52.

In the period 1996/7 to 2000/01, RIDDOR forms, once completed, were sent to the local HSE offices, where the information on them was coded with reference to HSE guidance on coding[53], and entered into the central HSE FOCUS database by trained clerical staff. As of April 2001, a central Incident Contact Centre (ICC) was established where dedicated staff deal with hard copy, web and telephone notifications, as well as coding and entry of all RIDDOR report forms.

The fields available for analysis are summarised in Table 13. Those fields that have changed with the introduction of the ICC system are denoted in bold. Those fields marked with an asterisk in Table 13 were not completed in the FOCUS database when the reports were received from the local authority enforced sectors in the period 1996/97 to 2000/01 as they ran a different coding scheme.

At the 1 April 2001 juncture when the ICC system was activated, a new scheme for coding accident agents and work processes was also introduced and the categorisation of accident kinds was modified slightly. It is understood there is no clear mapping between agents and work processes for the pre- and post-ICC schemes and therefore the data sets are presented separately in the graphs which follow. Although accident kinds, ‘high fall, ‘low fall’ and ‘fall’ remain, the

guidance on coding falls has apparently been clarified so that a fall initiated by a 'trip' (e.g. when getting out of a vehicle or on stairs) is now coded as a 'slip or trip' as opposed to a fall. As such, it may be anticipated that the number of recorded falls in 2001/2 would reduce even if the control of risks did not alter. Caution must therefore be exercised in interpreting trends and changes from 1996/7-2000/1 to 2001/2 in terms of fall accident numbers and rates.

Table 13 RIDDOR accident / injury data available for analysis

Field	*Description*
Accident Kind	**Kind of accident e.g. slip, fall, drown**
Age group	Age of injured person
Agent*	**Agent associated with the kind e.g. ladder, fragile roof etc. (The agent contains a direct reference to the accident kind in the pre-ICC data i.e. 'Fall vehicle', but not in the 2001/02 data)**
Area	HSE area office (old type areas 1-21 excluding 4)
Body Part	Site on body of injury e.g. back, leg
Casualty Name	Name of the injured party
Client Employees UK	Number employed by client in UK
Client Name	Name of client
Client No	Client identification number
Client Function	Status of the client e.g. private company, NHS
Date	Date of accident
Employment Status	Employment status of injured person e.g. employee
Event No	Serial number of the accident
FMU Unit No	Field management unit enforcing in HSE office
Gender	Gender
HSE Year	Year in which the accident occurred
inc_role	Role of the client at location e.g. designer, landlord
Total Workers Site	Number employed by client at particular location
Incumbent No	Incumbent (client at location) identification number
Industrial Workers Site	Number of industrial workers employed by client at location
Injury Nature	Nature of injury e.g. fracture, burn
InternalID	Unique System ID for this entry
inv_no	Investigation number
Investigated	Flag to indicate if investigation required
Local authority	Name of local authority
Location Type	Type of location e.g. fixed, quarry, roadside
Occupation*	Occupation of injured person
Originator	HSE Directorate/Division or local authority identification field
Region	HSE region (7 regions)
Report type	Accident report type e.g. fatal, major, over 3-days
Severity	F = Fatality, M = Major injury accident, O = Over 3-days accident
SIC92 Industry	Industry classification
SIC92 Sector	Industry Classification Group e.g. Agriculture, Construction, Extractive/Utilities, Manufacturing or Services
Work Process*	**Work process taking place at time of accident**

5.1.3 BOMEL RIDDOR data tool

Fatal, major and over 3-day injury accident records from FOCUS were supplied to BOMEL in separate files for each of the six years 1996/97 to 2001/02, together with 'look-up' tables cross-referencing the FOCUS codes to short and long descriptions as contained in the HSE coding systems.

The RIDDOR data as supplied by HSE was processed by BOMEL using the following steps in accordance with Reference 50:

- The raw accident data and updated look-up tables as received from HSE were imported into a Microsoft Access database.
- The data was validated and anomalies were resolved in conjunction with HSE statisticians.
- The BOMEL RIDDOR Data Tool was updated to include all accidents notified between 1996/97 and 2001/02.
- Analysis of the accident data was carried out using Excel spreadsheet Pivot Tables and Charts contained in the RIDDOR Data Tool.

In updating the database and Data Tool, reference was made to the HSE manual[54] covering the new accident kind, agent and work process codings.

Figure 18 shows the layout of the BOMEL RIDDOR database. There are three main tables in the database, containing the information on:

- Accidents / Injuries.
- Investigations.
- Reports.

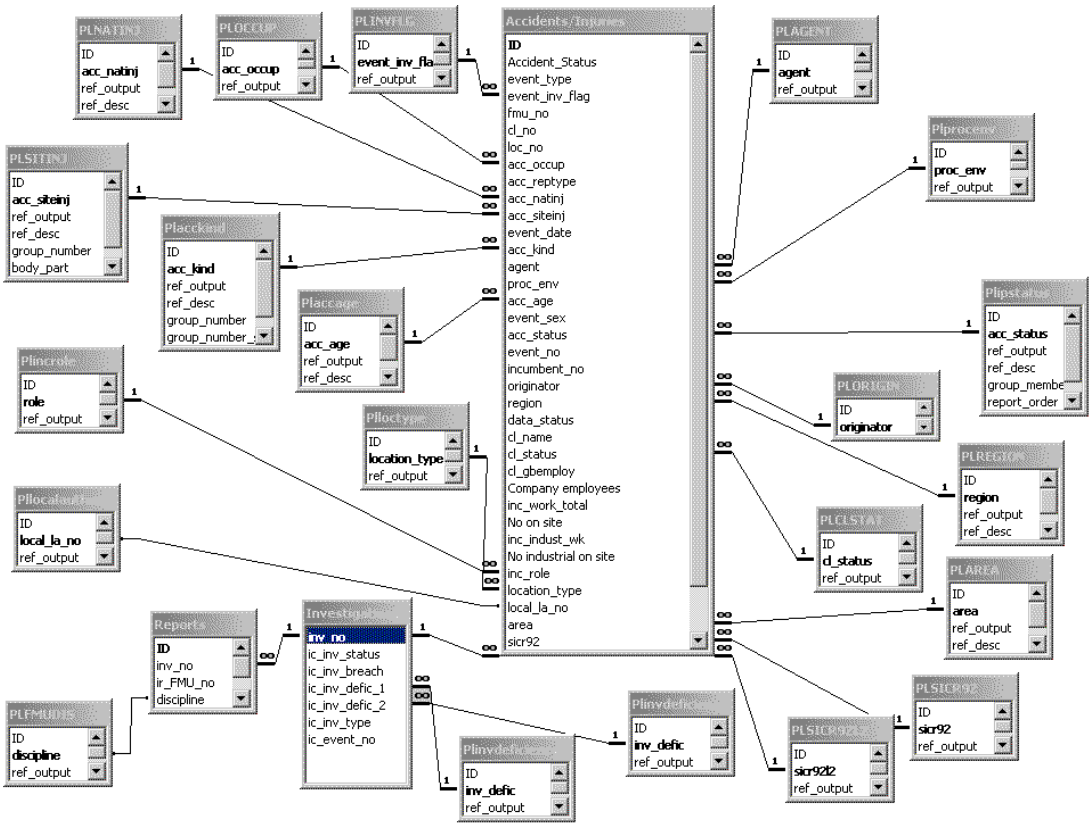


Figure 18 Data table relationships in the BOMEL RIDDOR database

The primary table used for this study is the Accidents / Injuries table. The data contained in this table are summarised in Table 13. The database tables contain the numerical FOCUS codes rather than the text descriptions. The associated look-up tables shown in Figure 18 provide access to the textual descriptions required for meaningful analyses.

It is important to note that inv_no (investigation number) is the field linking the principal tables. Furthermore the term ‘event’ is misleading in that each person injured constitutes an ‘event’ even when there are multiple injuries resulting from an accident.

5.2 DEFINITION OF THE WASTE INDUSTRY DATA SET

In order to carry out a meaningful analysis of the UK waste industry, all of the relevant accident data in the RIDDOR database needs to be collected together. This has been done by identifying the industries, work processes, occupations and agents that are deemed to constitute the waste industry and building a separate data set. This process is described in this section. This data set is subdivided further in order to identify the workplace transport accidents.

The individual codes used to select the accident records for inclusion in the waste industry data set are given in Table 14. Each of these codes has a marker against it in the RIDDOR accident database indicating that it is part of the waste industry data set. A query is used within the database to select only those accident records where one or more of the codes in Table 14 is present. These accidents are assigned a waste industry 'switch'. Those codes considered to constitute a workplace transport activity are also listed (see Section 7 for further details).

Also indicated in Table 14 are the codes that are considered to constitute workplace transport accidents. The same principle is applied to that used for the creation of the waste data set, and a separate WPT switch has been created.

A similar problem to that described in Section 2.3 for employment figures was encountered with the 90 series SIC codes. Both waste and sewage activities are included within the 90 series, but only the waste activities are required for this study. In order to exclude water and sewage activities from the waste industry data set, the following exclusion criteria were set in the database query:

- No occupations containing code 892 WATER/SEWAGE were to be included.
- No client names containing the word 'water' were to be included.

In order to validate the exclusions to the waste data set, the following comparisons were made with the water industry:

- The accident rate in the water industry is around 1,200 per 100,000 workers[55,56,57]. This is around half of that reported in the waste industry.
- The total number of workers employed in the waste industries within the SIC 90 series can be obtained by reducing the total number of workers within the SIC 90 series by around 10% to allow for those who are employed in the water industry (see Section 2.3).
- As such, the number of accidents removed from the database would be expected to be around half of 10%, i.e. around 5%.
- The number of accidents removed is 913 (25,533 – 24,620). This equates to 3.5% of the unmodified waste data set. As such, the exclusions are considered to be compatible with what was expected.

Table 14 Definition of the waste industry used in selecting notified accidents

Reference	*Code*	*Description*	*WPT*
SIC 92 Industries			
37.100	RECYCLING METAL	Re-cycling of metal waste and scrap	
37.200	RECYCLING NONMET	Recycle of non-metal waste and scrap	
51.570	WSALE WASTE	Wholesale of waste and scrap	
90.000	SEWAGE/REF DISP	Sewage and refuse disposal, sanitation and similar activities	
90.001	SEWAGE DISPOSAL	Sewage disposal activities	
90.002	REFUGE DISPOSAL	Refuse disposal activities	
90.003	SANITATION	Sanitation and similar activities	
Occupation			
933	REFUSE		
957	ROAD SWEEPER		
Work process	**pre-ICC**		
3514	WASTE DISPOSAL	Waste disposal (including all incoming site activity, tipping, compaction, winning and spreading of cover material)	Yes
7500	REFUSE COLLECTN	Refuse collection	Yes
7510	REFUSE DISPOSAL	Refuse disposal (inc tips, incinerators)	
7700	WASTEPAPER PROCS	Waste paper / board processing (inc sorting, shredding, hogging, compacting, baling)	
8001	WASTE PLASTIC	Waste plastic processing (Inc sorting, waste compacting and bailing).	
9660	WOOD WASTE PROCS	Wood waste processing (inc chip, hogging, burn, briquette)	
9870	GNRL WASTE DSPSL	General disposal (waste) (inc shred, bale, compress, flush)	
Work process	**ICC**		
217	TIPPING	Tipping at spoil heaps e.g. tipping/spreading from a dump truck	Yes
1112	METAL SCRAP	Metal Scrap, including car scrap yards	
1113	REFUSE COLLECT	Collection of refuse	Yes
1114	REFUSE SORTING	Sorting of refuse, e.g.:- materials recycling facilities	
1115	REFUSE DISPOSAL	Disposal of refuse/waste, including landfill, composting, incineration	Yes
1116	REFUSE SPEC DISP	Specific waste disposal such as paper, cardboard and rag shredding / compressing	
Agent	**pre-ICC**		
TW	VEH TRANSP/WASTE	Waste disposal vehicle	Yes
TWREFUSE	VEH REFUSE	Refuse collection vehicle	Yes
TWSKIP	VEH SKIP	Skip truck	Yes
Agent	**ICC**		
07.22	REFUSE	Refuse collection vehicle	Yes
07.23	SKIP TRUCK	Skip truck	Yes

5.3 WASTE INDUSTRY DATA SET

Using the criteria described in Section 5.2, 24,620 accidents have been identified as having occurred in the waste industry over the last six years. The breakdown of fatal, major and over 3-day injury accidents for each of the last six years is shown in Table 15.

Table 15 Fatal, major and over 3-day injury accidents in the waste industry data set

HSE Year	*Fatal*	*Major*	*Over 3-day*	*Total*
1996/97	13	593	3,765	4,371
1997/98	13	594	3,660	4,267
1998/99	17	584	3,505	4,106
1999/2000	11	610	3,515	4,136
2000/01	11	575	3,403	3,989
2001/02	17	548	3,186	3,751
Total	82	3504	21,034	24,620

5.4 ACCIDENT RATES IN THE UK WASTE INDUSTRY

Using the RIDDOR data, the frequency of different types of accidents over a given period of time can be obtained. If this information is combined with the associated population data, accident rates can be estimated. This allows assessment of relative risk to be made, and enables the comparison of risk between different groups.

Accident rates are calculated by dividing the number of accidents in a period by the number of people working in that industry during the same period. Accident rates can help to show whether or not an increase or decrease in the absolute number of accidents is significant for the working population. A baseline can be established from which performance can subsequently be measured, and the success of intervention strategies evaluated. To maintain compatibility with HSE practice, the accident rates are presented as the number of people injured per 100,000 workers.

In the following figures, the number of accidents in 2001/02 is represented by the histogram with the scale on the left hand axis, and the accident rate for 2001/02 is represented by the line plot with the scale on the right hand axis. Population data are not available for earlier years and, as such, it is not possible to compare rates historically.

The accident rates quoted in this section are calculated from the number of accidents reported and an estimate of the number of workers employed. However, it should be noted that accident reporting levels are variable (see Table 16), and not all major and over 3-day injury accidents are reported. As such, it is not feasible to compare accident rates reported by individual companies or associations with the average values quoted in this section. Those rates reported by individual companies or associations are likely to be based on full reporting of the accident numbers, whereas the average values are likely to reflect an element of under-reporting.

5.4.1 Regional variations

Figure 19 shows the number and rate of accidents per 100,000 workers in the UK waste industry by HSE region. This shows that whilst the highest number of accidents occur in the East and South East, the highest rate occurs in the Wales and South West region.

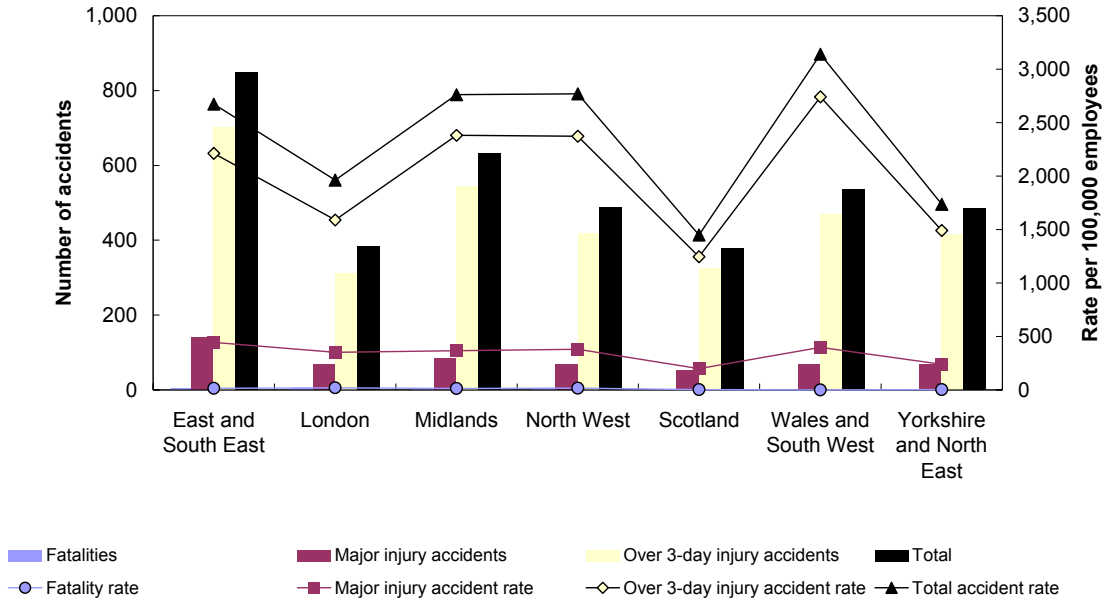


Figure 19 Number and rate of accidents (per 100,000 workers) in the UK waste industry by HSE region in 2001/02

Figure 20 shows the number and rate of accidents per million tonnes of waste arising by HSE region. The highest rates are in the East and South East, and Scotland. This contrasts with Figure 19, where Scotland had the lowest rate expressed in terms of rate per 100,000 workers. The accident rate for Yorkshire and the North East was low by both measures of rate.

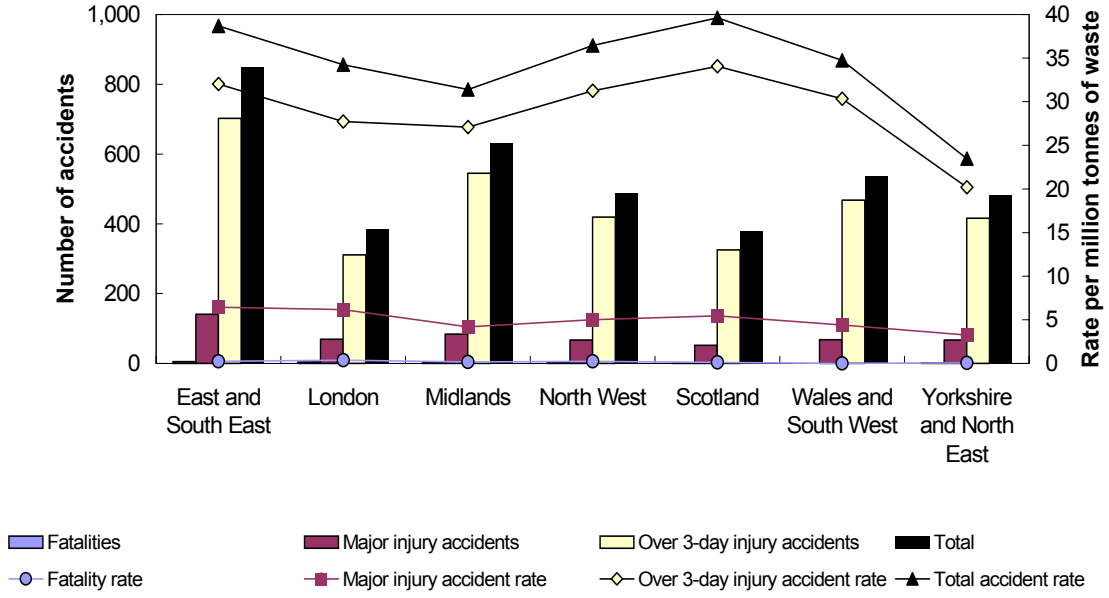


Figure 20 Number and rate of accidents (per million tonnes of waste arising) by HSE region in 2001/02

5.4.2 Comparison with other industries

In order to put the accident rates in the waste industry in context with those in other industries, a comparison has been made with the five primary industry sectors (agriculture, construction, extractive / utility, manufacturing and services). This comparison is shown in Figure 21, where it can be seen that the overall accident rate for the waste industry is three times that for the construction industry. The rates for each of the accident severities are given in Table 16.

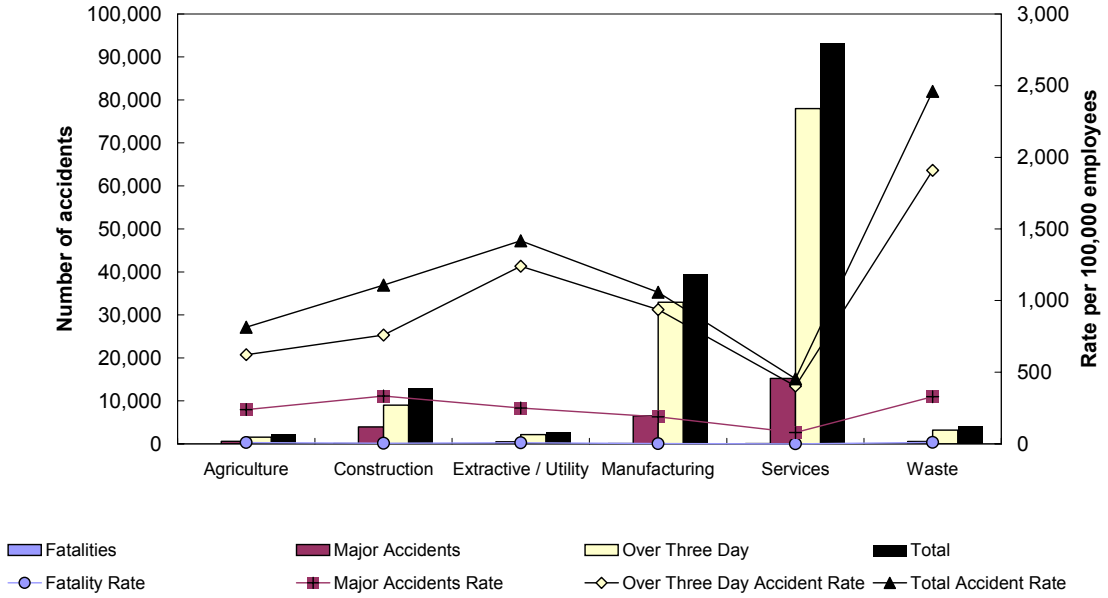


Figure 21 Number and rate of accidents in UK industry in 2001/02

Table 16 Accident rates in UK industry in 2001/02

Industry	*Reporting levels*	*Accident rates per 100,000 workers*			
		Fatalities	*Major*	*Over 3-day*	*Total*
Agriculture	28	9.2	239	622	813
Construction	52	4.2	333	759	1107
Extractive/Utility	100	7.6	251	1239	1418
Manufacturing	57	1.2	187	936	1058
Services	19-83	0.3	79	404	454
Waste	N/A	10.2	328	1909	2459

In comparing the accident rates, the relative reporting rates[58] for the non-fatal injury accidents should be borne in mind. For instance, with reporting rates of around 30%, the non-fatal accident rates for agriculture may be three times those presented in Table 15.

In relation to the national accident rates [59]:

- The overall accident rate for the waste industry in 2001/02 is estimated to be around 2,500 per 100,000 workers. This is around four times the national rate (559 per 100,000 workers as reported by HSE).

- The fatal injury accident rate for the waste industry in 2001/02 is estimated to be around 10 per 100,000 workers. This is ten times the national rate (0.9 per 100,000 workers).

- The major injury accident rate for the waste industry in 2001/02 is estimated to be around 330 per 100,000 workers. This is more than three times the national rate (101 per 100,000 workers).

5.5 ILL HEALTH DATA

Due to the nature of illness, reported data on the incidence of ill health in UK industry is not as readily available as accident data. However, The Health and Safety Executive (HSE) commissioned a module of questions in the winter 2001/02 Labour Force Survey (LFS), to gain a view of work-related illness based on individuals' perceptions. The LFS is a household survey, and is intended to be representative of the UK population. This is the fourth survey of self-reported work-related illness undertaken in conjunction with the UK LFS. The results[60] provide the first estimates since 1995 of the overall prevalence (including long standing as well as new cases) of self-reported work-related illness in the 12 months preceding the survey and of working days lost that year due to work-related illness.

Reference 60 does not provide the level of detail to identify ill health in the waste industry by SIC code. However, HSE[61] were able to provide expanded versions of Tables 3.19 and 3.28 from Reference 60. These tables identified ill health for SIC 90 (sewage and refuse disposal), and the information is reproduced in Table 17. Table 17 is of limited use due to the small LFS sample and the combination of sewage and refuse disposal in one industry code. However, if the estimated prevalence (of illness caused or made worse by the current or most recent job) is of the right order of magnitude, it would indicate that around 10% of the waste industry workforce may be affected by work-related ill health. By way of comparison, Table 18 shows the corresponding figures for other industry sectors and UK industry overall. This indicates that the upper end of the range of days lost per 100 workers employed in the SIC 90 industries may be somewhat higher than the average for UK industry.

Table 17 Self-reported illness caused or made worse by current or most recent job for people working in the 8 years up to 2001/02 for SIC 90 (sewage and refuse disposal)

Criteria	*Sample cases*	*Estimated prevalence*	*Rate per 100 employed*
Prevalence and rates	22	6,000 to 14,000	4.4 to 10.4
Days off work	9	Sample too small to estimate days off work	

Table 18 Self-reported illness caused or made worse by current or most recent job for people working in the 8 years up to 2001/02 by industry sector

Industry sector	*Sample cases*	*Estimated prevalence*	*Rate per 100 employed*
Agriculture	66	23,000 to 38,000	4.9 to 8.0
Construction	286	121,000 to 154,000	4.9 to 6.2
Extractive / utility	45	15,000 to 28,000	4.0 to 7.2
Manufacturing	528	229,000 to 273,000	4.0 to 4.8
All industries	3,127	1,430,000 to 1,538,000	4.2 to 4.5

6. ACCIDENTS AND INJURIES IN THE UK WASTE INDUSTRY

6.1 INTRODUCTION

A variety of information about accidents can be obtained from the RIDDOR data. For example, fields such as work process, agent involved in the accident, occupation and age of the injured person have been analysed to assess the basic circumstances of an accident.

Where the accident data for 2001/02 have been recorded using different coding systems (i.e. work processes and agents) this is noted, and the data are plotted in separate graphs from the 1996/97 to 2000/01 data. The total number of accidents are presented for the first five year period. To make comparisons with the number of accidents in 2001/02, the data for the first five years would need to be averaged (i.e. divide the total by five). It should be noted that the population by category is also likely to be different and, as such, care should be taken in making comparisons.

The figures in the following sections contain data on fatal, major and over three-day injury accidents. The following legend is used in the figures to denote the accident types:

- **O** – over three-day injury accident.
- **M** – major injury accident.
- **F** – fatal accident.

Where the year ends in 'F' this indicates that the accident data available for that year has been finalised by HSE. Where the year ends in 'P' this indicates that provisional data was available at the time that this project was initiated.

6.2 DETAILED ANALYSIS OF THE RIDDOR ACCIDENT DATA

Figure 22 shows the variation in the number of accidents in the waste industry over the last six years. The overall number of accidents appears to have been reasonably consistent between 1996/97 and 2001/02, with a gradual year-on-year decline. Over three-day accidents predominate, accounting for around 85% of the yearly totals.

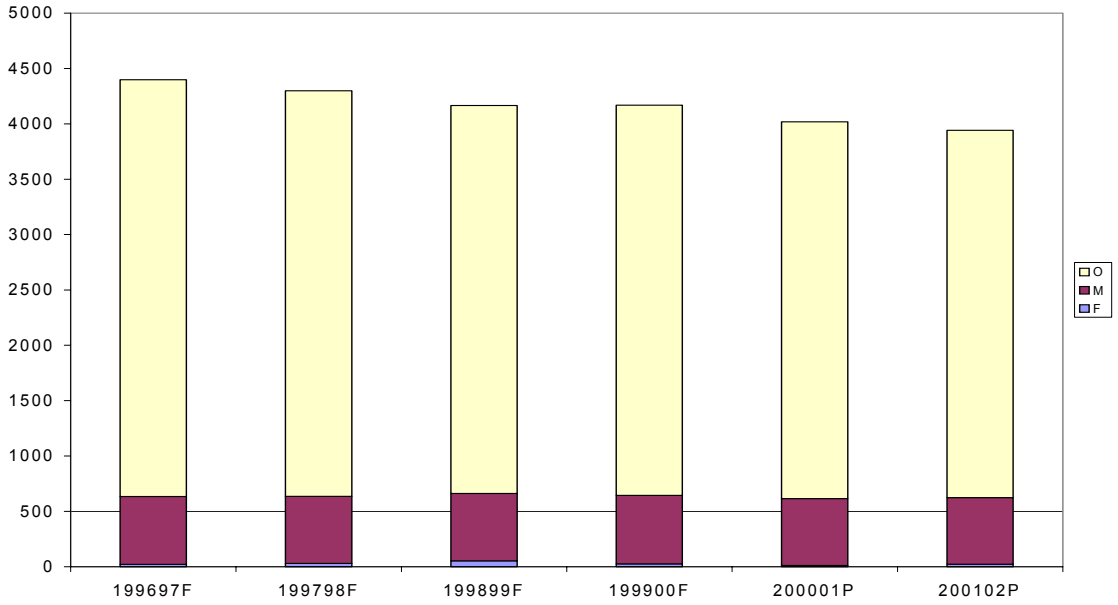


Figure 22 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by HSE year

Figure 23 shows the breakdown of waste accidents by organisational status. It can be seen that public sector organisations have been involved in around 55% of the waste accidents over the last six years, whilst private companies have been involved in around 45%.

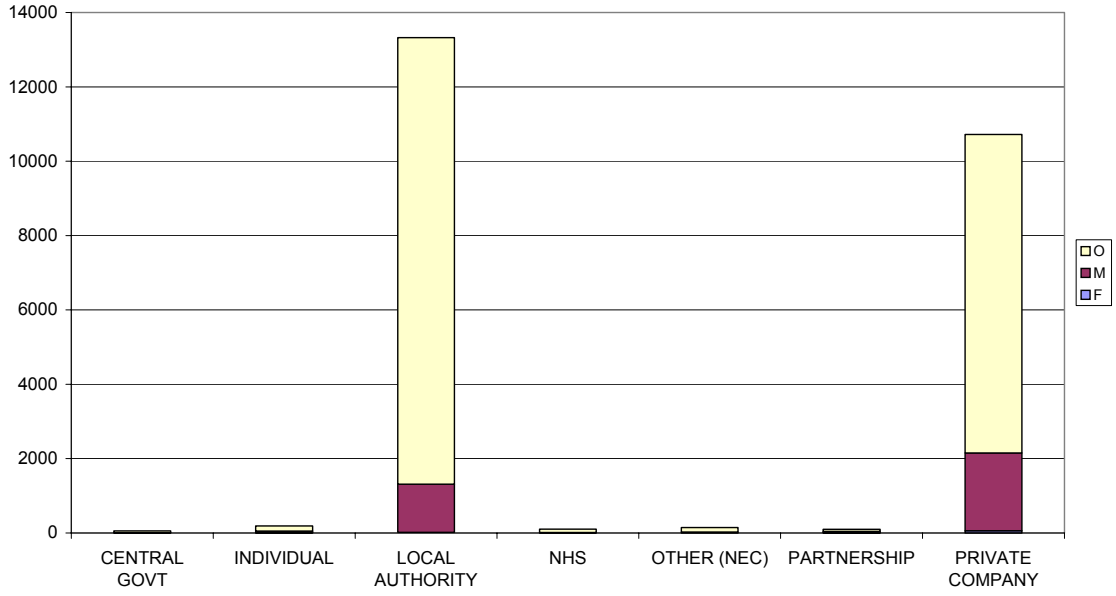


Figure 23 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by organisational status

Figure 24 shows the distribution of accidents by HSE region. This shows that the largest number of accidents occur in the East and South East, with the lowest number occurring in London. However, this is may be a little misleading, as much of London's waste is transported out of London into the East and South East for treatment / disposal. The highest number of fatal injury accidents are reported in the Midlands.

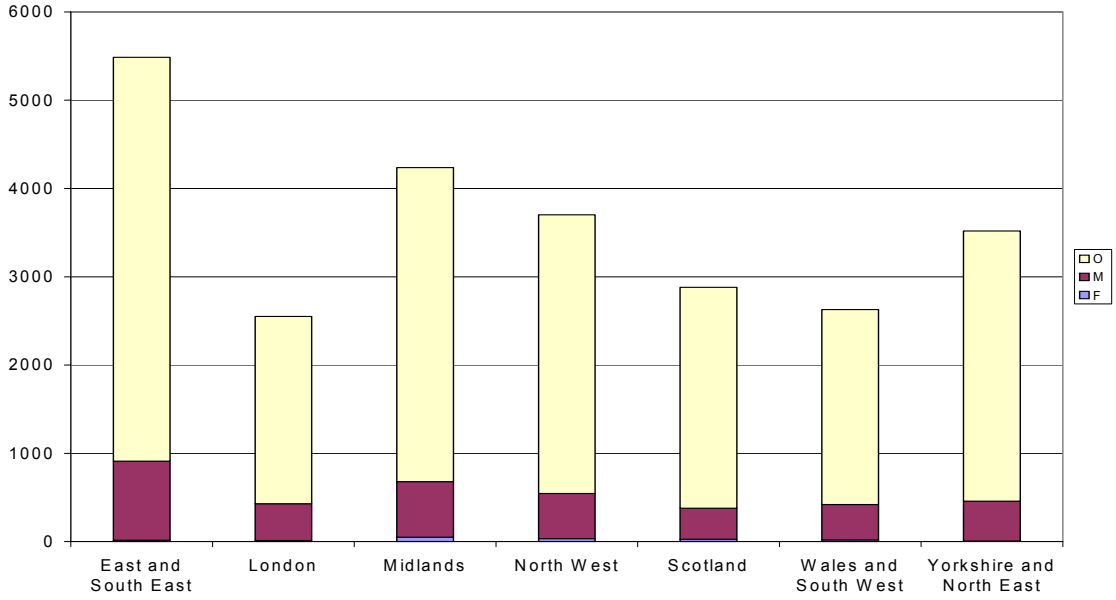


Figure 24 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by HSE region

Figure 25 shows that the largest number of accidents occurs in the sewage / refuse disposal and general public services industries. This figure is slightly misleading due to the grouping together of both sewage and refuse disposal into one single SIC category code. However, this category should contain few sewage-related accidents as a result of the way in which the data set was defined (see Section 5.2). The accident profile is different for wholesale waste, demolition and recycling (metal and non-metal), with the major injury accidents forming a larger proportion of the accidents.

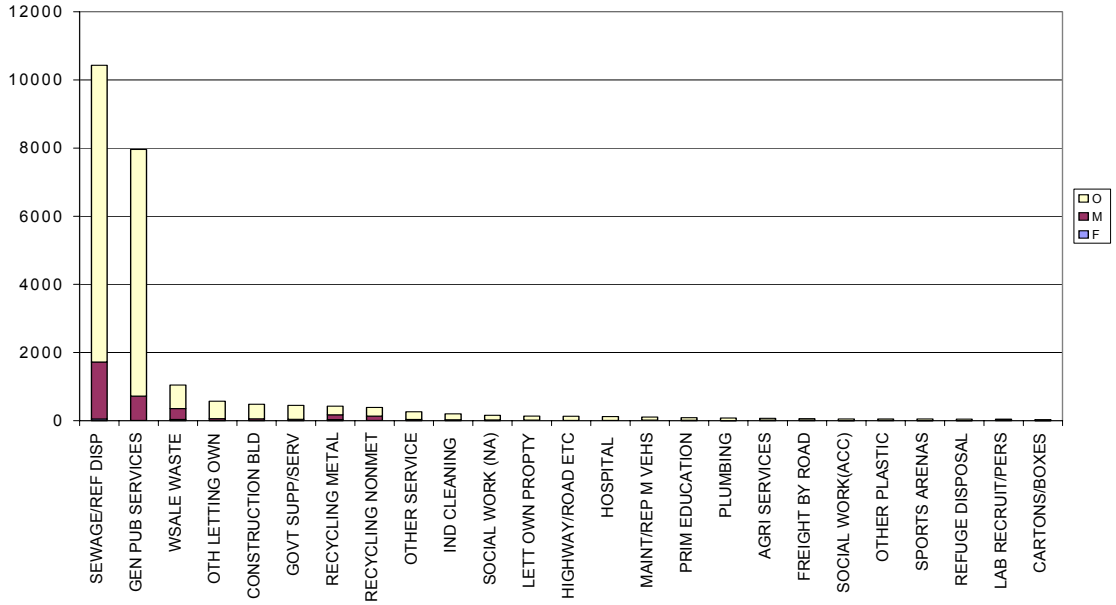
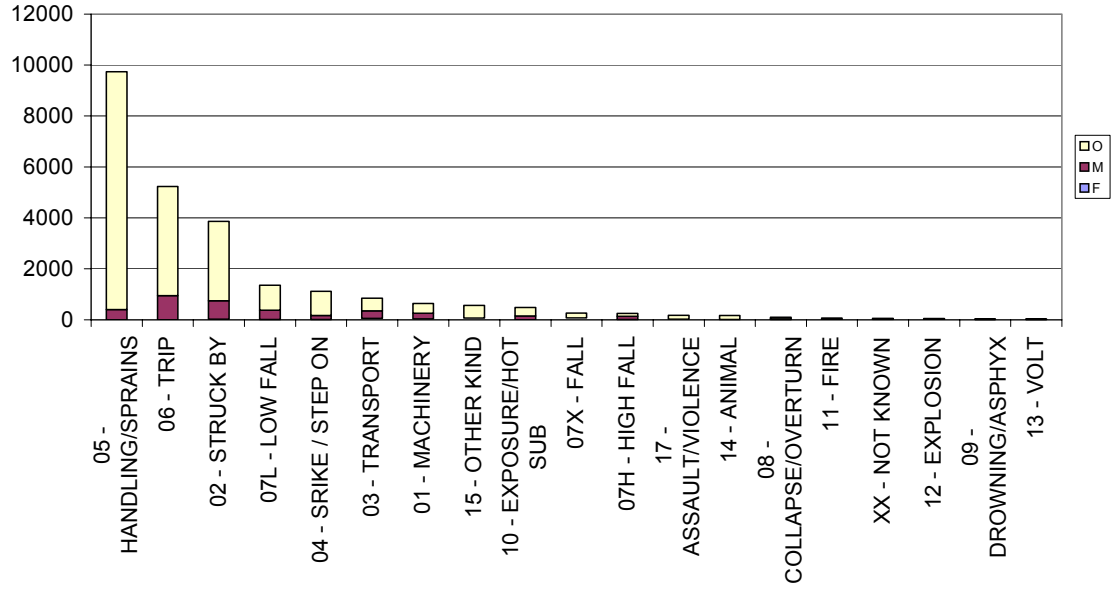
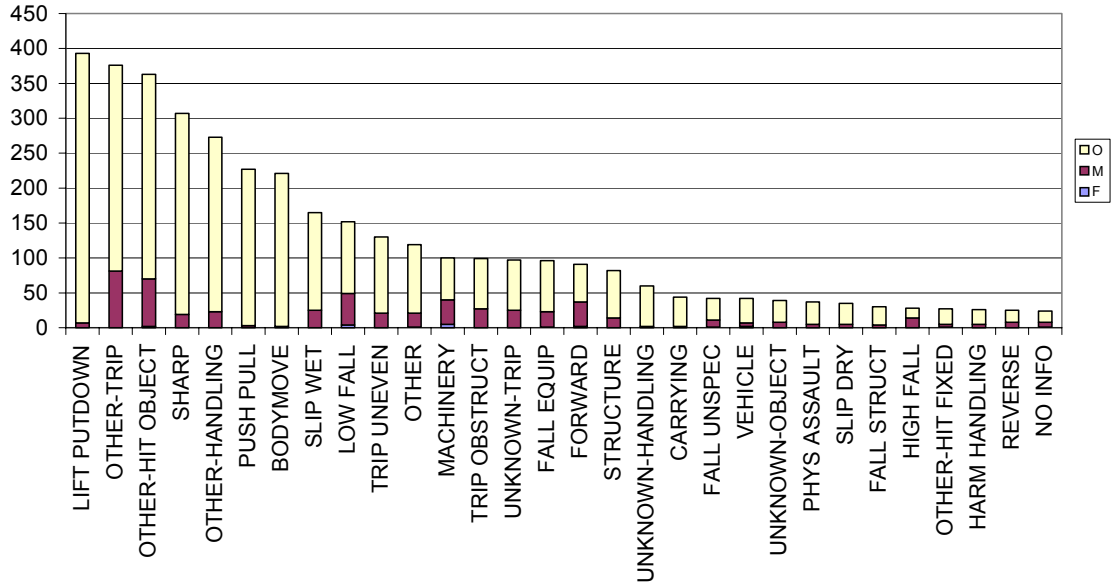


Figure 25 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by SIC industry

Figure 26 shows the kinds of accidents that have occurred in the UK waste industry. The figure is split into two to reflect the change in coding system for accident kind in 2001/02. Between 1996/97 and 2000/01, the largest number of accidents involved handling and sprain incidents, with the majority of these accidents resulting in over 3-day injuries. In terms of fatal and major injury accidents, trips, struck by (something falling), transport (struck by a moving vehicle) and low fall are the most significant. In 2001/02, a similar pattern emerges, but with the subdivision of the accident kinds into their individual components, no one individual accident kind dominates to the same extent.



a) 1996/97 to 2001/02



b) 2001/02

Figure 26 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by accident kind

Figure 27 shows that the occupation predominantly involved in accidents in the waste industry is the refuse worker. This perhaps reflects the large numbers of refuse collectors and the hazards to which they are exposed on a daily basis. Goods drivers and road sweepers have been reported to be involved in the second and third largest number of accidents. Machinery and plant operators are involved in the fifth highest number of accidents, perhaps reflecting the activities undertaken in the treatment of waste.

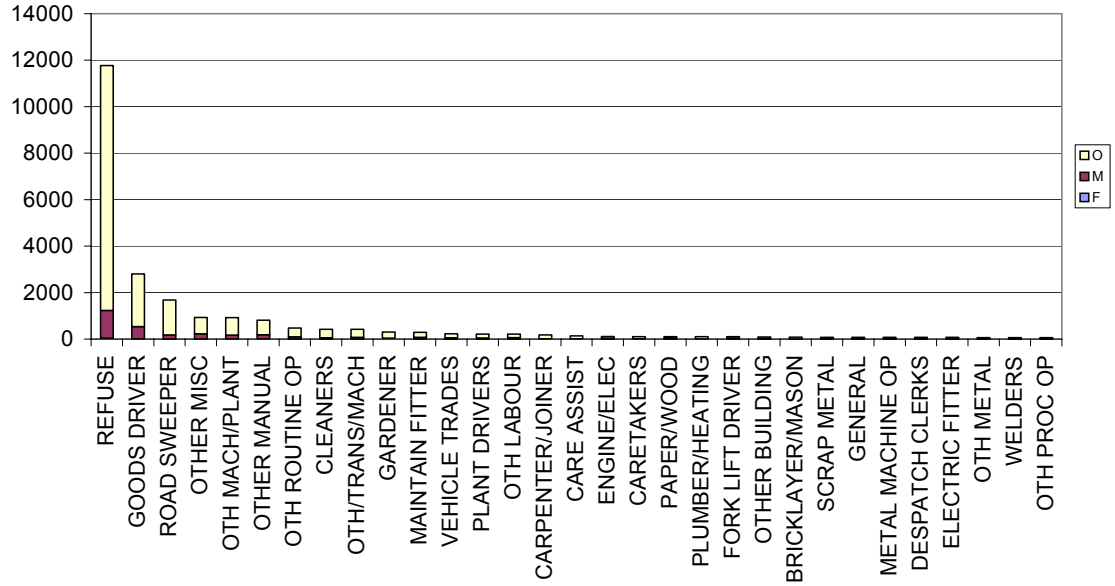
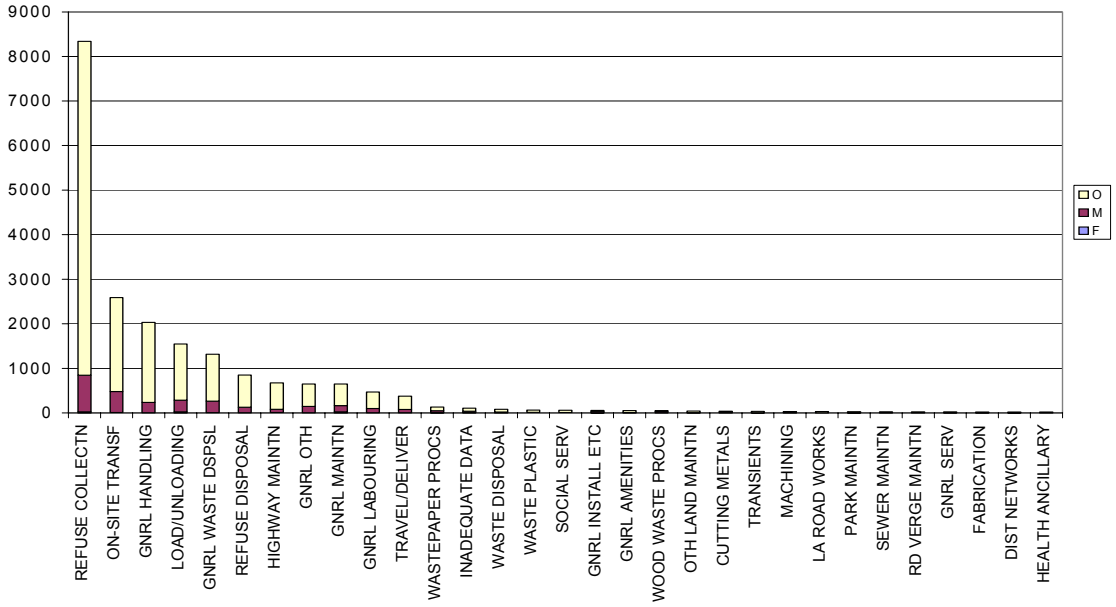


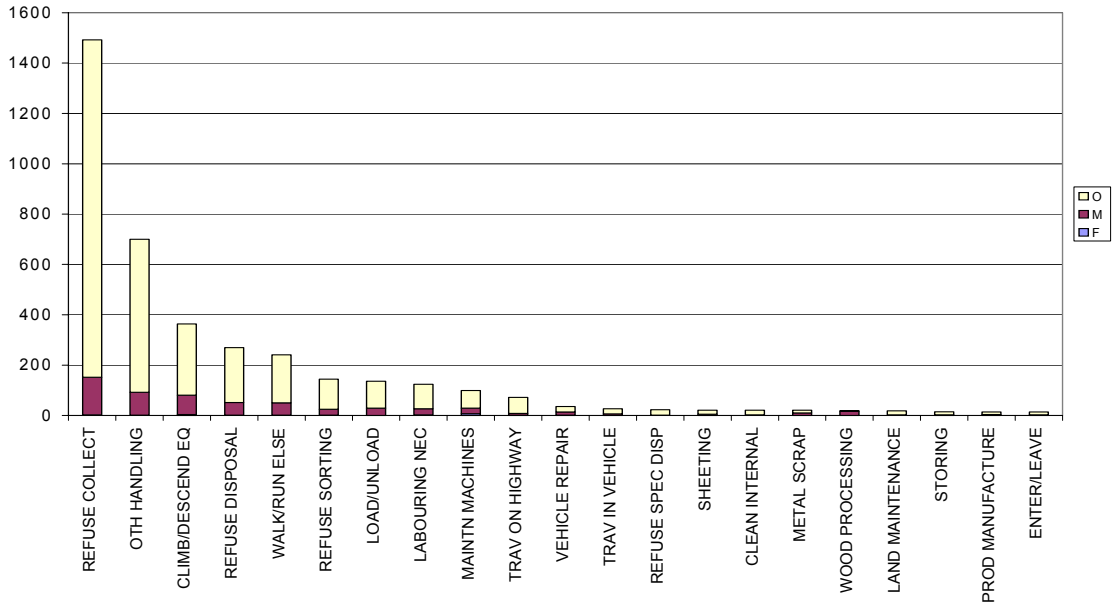
Figure 27 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by occupation

Figure 28 shows the work processes that were being undertaken at the time of the accidents. Again, the figure is split into two to reflect the change in the coding system in 2001/02. For the five years between 1996/97 and 2000/01, refuse collection was the dominant work process in terms of both the overall number of accidents and the number of fatal and major injury accidents. On-site transfer, general handling, loading/unloading and general waste disposal were also involved in significant numbers of accidents. On-site transfer is a very general work process relating to workers moving between and within their places of work and, as such, does not provide information on specific risks. The number of accidents involving loading and unloading is indicative of the risks associated with these activities, in particular, unloading. Separating out the loading and unloading work processes in the accident coding system would be more informative as the two processes take place in different environments with different risk profiles.

The new work processes (2001/02) are a little more informative, as they classify waste collection, sorting and disposal as discrete work processes. This should provide useful information in future years, as the waste sorting and disposal work processes involve somewhat different activities (and thus risk profiles). Of these categories, the largest number of accidents were reported to involve waste collection. Handling activities result in significant numbers of accidents. Climbing or descending from equipment, stairs or vehicles resulted in the third highest number of accidents. Most of these accidents involved floors and stairs. However, refuse collection vehicles were involved in the third largest number of the climbing or descending equipment accidents.



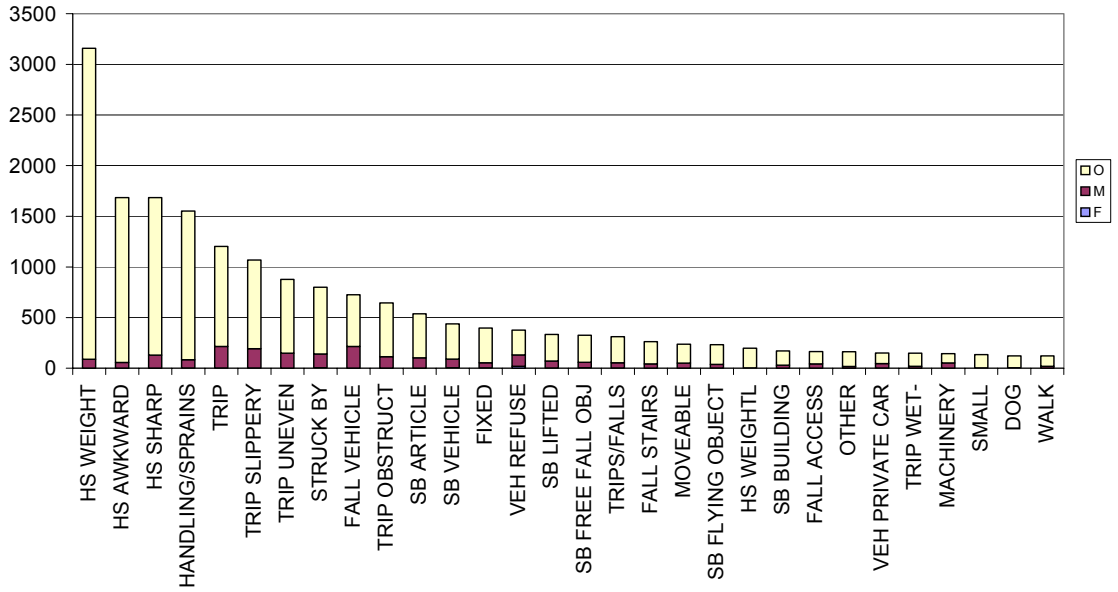
a) 1996/97 to 2000/01



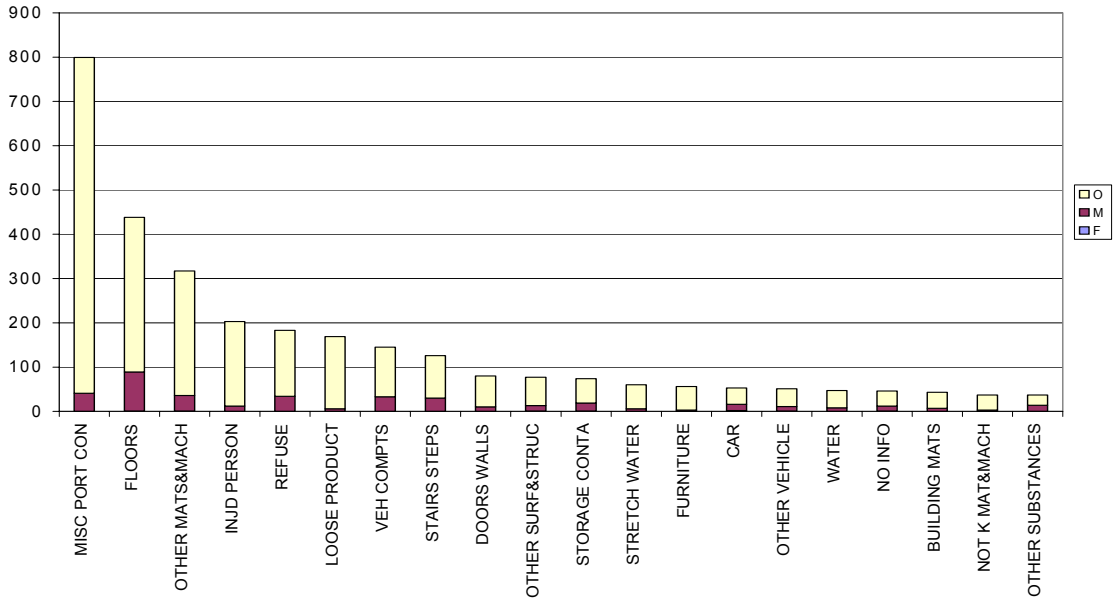
b) 2001/02

Figure 28 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by work process

The agents involved in waste industry accidents are shown in Figure 29. Due to the predominance of over 3-day injuries, the most common agents are 'weight' (lifting or moving heavy weights) and 'awkward' (strains or sprains not involving handling or lifting e.g. awkward movement). Agents that initiate trips (such as slippery or uneven surfaces and obstructions) are the next most common category. Agents that strike the workforce, such as those being lifted or falling from vehicles are the third most common category of agents. Being struck by a refuse collection vehicle resulted in the highest proportion of fatal and major injury accidents. The agent coding system used for the 2001/02 data is somewhat less informative, as the link with the accident kinds has been discontinued. However, the data does indicate the prevalence of waste containers in the accident statistics.



a) 1996/97 to 2000/01



b) 2001/02

Figure 29 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by agent

Figure 30 shows the age distribution of those involved in accidents in the UK waste industry. This figure is normally distributed with the number of accidents peaking in the 30 to 39 age range. There are relatively few accidents involving either younger or older workers.

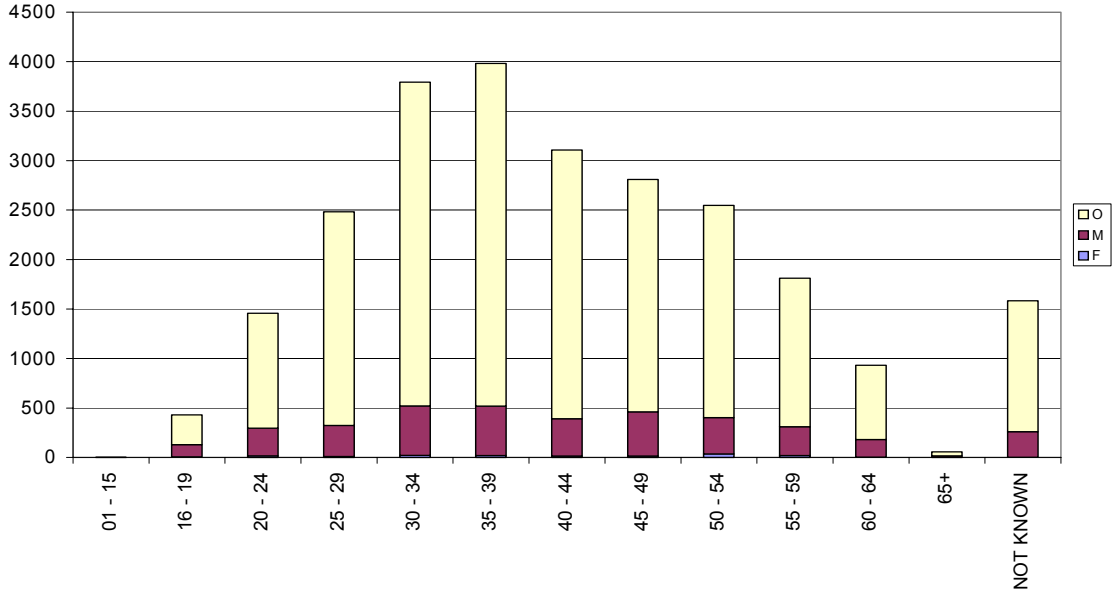


Figure 30 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by age

No data are available on the age distribution of the workforce for the UK waste industry. Figure 30 is very similar to the distribution of ages for workers injured in UK industry as a whole. The main differences being that the proportion of accidents reported involving younger workers (under 30 years old) is slightly lower for the waste industry, whilst the proportion involving older workers (over 30 years old) is slightly higher than that for UK industry.

Given that people join the waste industry at a variety of ages, data on length of service in the waste industry would be useful to give an indication of how experienced those involved in the accidents were.

Figure 31 shows the number of accidents by employment status. Employees are involved in the majority of the accidents. This is likely to reflect the employment practices within the waste industry. However, it does not differentiate between agency and full-time workers.

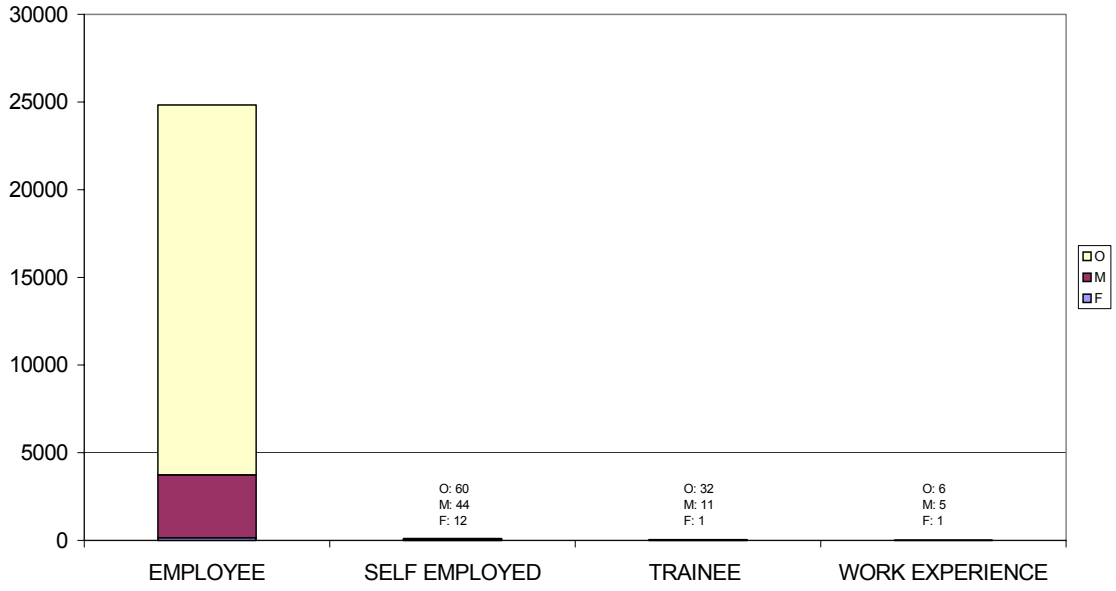


Figure 31 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by employment status

6.3 KEY RISK AREAS

6.3.1 Introduction

In the previous sections, the accident statistics were presented for a range of items including the occupations, work processes and agents involved in those accidents. In this section, the intention is to use that accident data in order to identify the most significant risks affecting the UK waste sector. Two techniques have been used in order to identify the key risks:

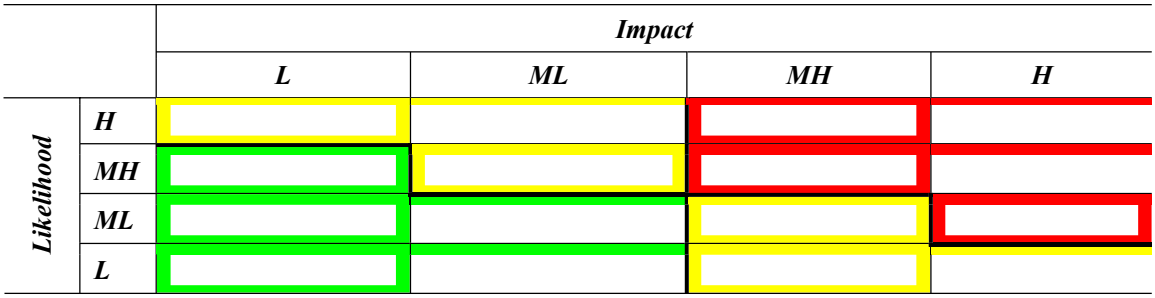
- Risk ranking matrices
- Pattern matching analyses

These techniques are described in the following sections.

6.3.2 Risk ranking methodology

Analyses are undertaken in order to rank each of the occupations, work processes and agents involved in the waste industry accidents in terms of their relative number of occurrences ('likelihood') and impact. Each of these items can then be inserted into a risk matrix in the form shown in Figure 32, and broadly categorised as being of relatively low risk (green), relatively high risk (red) or somewhere in between (amber). This categorisation acts as a guide to the relative significance of an item. Where there are a large number of items in the risk matrices, only those items with medium-high and high likelihoods are shown in the figures.

Figure 32 Risk matrix combining likelihood and impact



The impact is calculated as a function of the cost of the accidents associated with a field (e.g. occupation, agent etc.), both to society as a whole and to an individual worker. The two impacts are combined to give an overall impact ranging between low ('L') and high ('H'). The monetary value of impact is calculated from the cost of accidents estimated by HSE[62]. The overall cost to society is estimated by summing the costs to society of all of the fatal, major and over 3-day injury accidents reported in relation to a particular item. The cost to individuals is estimated by summing the costs to individuals of all of the fatal, major and over 3-day injury accidents and dividing the total cost of an item by the total number of accidents relating to that item.

Each item of data is assigned to a quartile on the basis of its cost. The quartile positions are obtained from the minimum, maximum and average cost values along with cost values mid-way between the minimum and average, and average and maximum. The highest cost items whose values fall between the maximum and the first quartile point are assigned to the first quartile. Similarly, the remaining items are assigned to the second, third and fourth quartiles. The first quartile corresponds to high (H) impact, with the fourth quartile corresponding to low (L) impact.

The 'likelihood' is estimated from the overall number of accidents reported under a particular item. If population and exposure data were available, for each item within a field, it would be possible to calculate a 'true' likelihood. However, such population and exposure data are not available for the type of global data being analysed here. Overall accident numbers are thus used as a surrogate measure of likelihood. The underlying assumption is that those accidents that occur in the largest numbers are the accidents that have the greatest likelihood of occurring. The likelihood is determined by assigning each item within a field to a quartile on the same basis as the accident costs.

6.3.3 Risk ranking for the UK waste industry

Figure 33 highlights general public services and sewage / refuse disposal as key risk areas. This was self-evident from Figure 25 due to the large overall number of accidents that had been reported in these SIC industries. However, the red zone of the risk matrix also contains a number of industries where there have been fewer accidents, but those that have occurred are more severe (e.g. the recycling and wholesale waste industries).

		Impact			
		L	ML	MH	H
Likelihood	H		GEN PUB SERVICES		SEWAGE/REF DISP
	MH	PLUMBING	CONSTRUCTION BLD GOVT SUPP/SERV OTHER SERVICE IND CLEANING SOCIAL WORK (NA) LETT OWN PROPTY HIGHWAY/ROAD ETC HOSPITAL PRIM EDUCATION	WSALE WASTE OTH LETTING OWN RECYCLING METAL RECYCLING NONMET MAINT/REP M VEHS	
	ML	SOCIAL WORK(ACC) SPORTS ARENAS		AGRI SERVICES FREIGHT BY ROAD OTHER PLASTIC LAB RECRUIT/PERS	

Figure 33 Risk matrix for SIC industry 1996/97 to 2001/02

Figure 34 shows the risk matrix for the accident kinds over the full six year period, with the 2001/02 accident kinds mapped onto the pre-ICC kinds. Figure 34 indicates that handling / sprains, trips, struck by falling items and struck by moving are the key risks. Handling / sprains are significant due to the large number of accidents, whilst the trips and 'struck by' accidents are significant due to their severity. Figure 35 shows the risk matrix for the detailed accident kind criteria used in 2001/02. The extra detail provides a slightly different picture as the handling/sprain injuries are split into individual categories. With the machinery category remaining similar and the transport categories only being subdivided into a few categories, this boosts the apparent significance of those accident kinds with little or no subdivision. This sensitivity to categorisation underlines that the risk matrices provide 'indicators' rather than absolute risk ranking.

		Impact			
		L	ML	MH	H
Likelihood	H			05 - HANDLING/SPRAINS	
	MH		07L - LOW FALL	06 - TRIP 02 - STRUCK BY	
	ML		04 - STRIKE / STEP ON		03 - TRANSPORT
	L	15 - OTHER KIND 10 - EXPOSURE/HOT SUB 07X - FALL 17 - ASSAULT/VIOLENCE 14 - ANIMAL 12 - EXPLOSION	07H - HIGH FALL 08 - COLLAPSE/OVERTURN 11 - FIRE XX - NOT KNOWN 13 - VOLT	01 - MACHINERY 09 - DROWNING/ASPHYX	

Figure 34 Risk matrix for accident kind 1996/97 to 2001/02

		Impact			
		L	ML	MH	H
Likelihood	H		LIFT PUTDOWN SHARP OTHER-HANDLING	OTHER-TRIP OTHER-HIT OBJECT	
	MH		PUSH PULL BODYMOVE SLIP WET LOW FALL TRIP UNEVEN OTHER TRIP OBSTRUCT FALL EQUIP UNKNOWN-TRIP STRUCTURE	FORWARD MACHINERY	
	ML	UNKNOWN-HANDLING UNKNOWN-OBJECT PHYS ASSAULT		CARRYING VEHICLE FALL UNSPEC	

Figure 35 Risk matrix for accident kind 2001/02

The risk matrix for occupations is shown in Figure 36, and confirms the conclusions reached in association with Figure 25, with refuse workers being the occupation facing the most significant risks.

		Impact			
		L	ML	MH	H
Likelihood	H			REFUSE	
	MH		GOODS DRIVER ROAD SWEEPER OTHER MISC OTH ROUTINE OP OTH/TRANS/MACH CLEANERS GARDENER MAINTAIN FITTER CARPENTER/JOINER	OTH MACH/PLANT OTHER MANUAL VEHICLE TRADES PLANT DRIVERS OTH LABOUR	
	ML	PLUMBER/HEATING BRICKLAYER/MASON	CARE ASSIST CARETAKERS OTHER BUILDING	ENGINE/ELEC FORK LIFT DRIVER PAPER/WOOD	

Figure 36 Risk matrix for occupation 1996/97 to 2001/02

Figure 37 shows the risk matrix for the work processes undertaken in the first five years, whilst Figure 38 shows the corresponding data for 2001/02. Refuse collection is highlighted as one of the two work processes facing the most significant risks in both figures. Refuse disposal and refuse sorting also feature as significant risks in 2001/02.

		Impact			
		L	ML	MH	H
Likelihood	H			REFUSE COLLECTN	
	MH			ON-SITE TRANSF GNRL HANDLING LOAD/UNLOADING GNRL WASTE DSPSL REFUSE DISPOSAL HIGHWAY MAINTN GNRL OTH GNRL MAINTN GNRL LABOURING TRAVEL/DELIVER	
	ML	SOCIAL SERV	WASTE PLASTIC	WASTEPAPER PROCS INADEQUATE DATA WASTE DISPOSAL	

Figure 37 Risk matrix for work process 1996/97 to 2000/01

		Impact			
		L	ML	MH	H
Likelihood	H			REFUSE COLLECT	
	MH		OTH HANDLING LOAD/UNLOAD	CLIMB/DESCEND EQ WALK/RUN ELSE REFUSE DISPOSAL REFUSE SORTING LABOURING NEC MAINTN MACHINES	
	ML			TRAV ON HIGHWAY	

Figure 38 Risk matrix for work process 2001/02

Figure 39 shows the risk matrix for the agents involved in the first five years, whilst Figure 40 shows the corresponding data for 2001/02. In the first five years, various agents associated with handling / sprain accidents feature as significant risks, along with being struck by vehicles and objects, and trips. Being struck by a refuse vehicle has one of the highest impacts of any of the agents. With the loss of the connection between accident kinds and agents in the coding scheme from 2001/02, it is less obvious how the agents were involved in accidents. However, the most significant agents appear to be vehicles (presumably people being struck by them), floors and surfaces (for trips) and refuse / containers (for handling / sprain and struck by accidents).

Likelihood	Impact: L	Impact: ML	Impact: MH	Impact: H
H			HS WEIGHT HS AWKWARD HS SHARP	
MH		TRIP UNEVEN TRIP OBSTRUCT SB ARTICLE SB VEHICLE FIXED SB LIFTED SB FREE FALL OBJ TRIPS/FALLS FALL STAIRS MOVEABLE SB FLYING OBJECT HS WEIGHTL SB BUILDING FALL ACCESS OTHER VEH PRIVATE CAR TRIP WET-OUTDOOR MACHINERY SMALL DOG WALK FALL LADDER-MOVE	HANDLING/SPRAINS TRIP TRIP SLIPPERY STRUCK BY FALL VEHICLE VEH REFUSE	
ML	SB HOISTS NOT	FALL OTHER RELEASE6 BODY SB HANDTOOL VEH TRAN/GENERAL SB CHIPS EXPOSURE SPLASH FALL SHEETING VEH TRANSPORT LIFT/CONVEYOR	VEH TRANSP/WASTE VEH FLT VEH SKIP FALL PLANT	

Figure 39 Risk matrix for agent 1996/97 to 2000/01

		Impact			
		L	ML	MH	H
Likelihood	H			MISC PORT CON FLOORS	
	MH		INJD PERSON REFUSE LOOSE PRODUCT VEH COMPTS STAIRS STEPS DOORS WALLS STRETCH WATER FURNITURE WATER BUILDING MATS DOMESTIC EQUI NOT K MAT&MACH PARTICLES OTHER CONVEY EQU PERS NK TO EM SKIP TRUCK SUB NO RISK	OTHER MATS&MACH OTHER SURF&STRUC STORAGE CONTA OTHER VEHICLE NO INFO OTHER SUBSTANCES OTHER MACH&EQU	CAR
	ML	MEDIC NEEDLE HAND TRUCKS OTHER HAND TOOL	MACH COMPTS STORAGE ACCESS FLT MOVEABLE LADD	LORRY LOADER OTHER HGV LIGHT VAN TREE PLANT	

Figure 40 Risk matrix for agent 2001/02

The risk matrix for age (Figure 41) shows that the workers primarily at risk are those in the 30 to 55 age group.

		Impact			
		L	ML	MH	H
Likelihood	H			35 - 39 30 - 34 40 - 44	
	MH			45 - 49 50 - 54 25 - 29	
	ML		NOT KNOWN 20 - 24	55 - 59	
	L	01 - 15	60 - 64 16 - 19	65+	

Figure 41 Risk matrix for age 1996/97 to 2001/02

6.3.4 Pattern matching analyses

The techniques described in Sections 6.2 and 6.3.2 provide an insight into the relative significance of single issues. Pattern matching analyses permit combinations of accident kinds, occupations, work processes and agents to be compared in order to identify which feature most frequently. These analyses are carried out by comparing each accident record with every other accident record in order to see how many matches each one has. Those combinations that appear most frequently give an indication as to what may be considered to be priority areas.

The pattern matching analyses can also be used in conjunction with the risk ranking matrices described in Section 6.3.2 in order to prioritise the combinations in terms of their potential likelihood and impact.

The blank cells result from those accidents reported via the local authority enforced sectors during the period 1996/97 to 2000/01 where the HSE coding system was not used for occupations, work processes or agents. As the pattern matching analyses are carried out for all six years (1996/97 to 2001/02), the accidents reported via the local authority enforced sectors are included for 20001/02.

The most frequently occurring combinations of accident kinds and agents are shown in Table 19 for all injury severities, and in Table 20 for fatal and major injury accidents. In terms of the overall accident numbers, handling and sprain injuries are predominant, with heavy objects being more significant than sharp objects. Trips (on slippery and uneven surfaces) are the second most frequent combination, which is not surprising given the amount of time that refuse workers spend walking in roads and on footpaths. Being struck by items falling (from vehicles) is the third most common combination, followed by low falls from vehicles.

When fatal and major injury accidents are considered, trips are the most significant combination by a large margin, followed by being struck by objects. Handling injuries from sharp objects are the third most common followed by handling injuries from heavy objects. Being struck by refuse collection vehicles has resulted in the largest number of fatal injury accidents and the fifth largest number of fatal and major injury accidents.

Table 19 Most frequently occurring matches – accident kind and agent

Accident kind	*Agent*	*F*	*M*	*O*	*Total*
HANDLING/SPRAINS		0	0	2517	2517
HANDLING/SPRAINS	HS WEIGHT	0	88	2182	2270
TRIP		0	0	1236	1236
HANDLING/SPRAINS	HS SHARP	0	117	1022	1139
HANDLING/SPRAINS	HS AWKWARD	0	46	943	989
HANDLING/SPRAINS	HANDLING/SPRAINS	0	76	882	958
STRUCK BY		0	0	892	892
TRIP	TRIP	0	207	578	785
TRIP	TRIP SLIPPERY	1	179	544	724
TRIP	TRIP UNEVEN	0	147	487	634
STRUCK BY	STRUCK BY	2	125	377	504
TRIP	TRIP OBSTRUCT	0	109	354	463
LOW FALL	FALL VEHICLE	0	154	280	434
STRUCK BY	SB ARTICLE	0	101	297	398
STRIKE / STEP ON		0	0	298	298
STRUCK BY	SB VEHICLE	2	81	200	283
LOW FALL		0	3	265	268
STRIKE / STEP ON	FIXED	1	46	194	241
STRUCK BY	SB FREE FALL OBJ	2	51	176	229
STRUCK BY	SB LIFTED	2	63	164	229

Table 20 Most frequently occurring matches of fatal and major injury accidents – accident kind and agent

Accident kind	*Agent*	*F*	*M*	*O*	*F+M*
TRIP	TRIP	0	207	578	207
TRIP	TRIP SLIPPERY	1	179	544	180
LOW FALL	FALL VEHICLE	0	154	280	154
TRIP	TRIP UNEVEN	0	147	487	147
STRUCK BY	STRUCK BY	2	125	377	127
HANDLING/SPRAINS	HS SHARP	0	117	1022	117
TRIP	TRIP OBSTRUCT	0	109	354	109
STRUCK BY	SB ARTICLE	0	101	297	101
HANDLING/SPRAINS	HS WEIGHT	0	88	2182	88
TRANSPORT	VEH REFUSE	6	82	83	88
STRUCK BY	SB VEHICLE	2	81	200	83
HANDLING/SPRAINS	HANDLING/SPRAINS	0	76	882	76
STRUCK BY	SB LIFTED	2	63	164	65
STRUCK BY	SB FREE FALL OBJ	2	51	176	53
STRIKE / STEP ON	FIXED	1	46	194	47
HANDLING/SPRAINS	HS AWKWARD	0	46	943	46
TRIP	TRIPS/FALLS	0	46	133	46
STRIKE / STEP ON	MOVEABLE	0	44	120	44
MACHINERY	MACHINERY	0	44	51	44
TRANSPORT	VEH PRIVATE CAR	1	39	60	40

Additional information can be obtained by considering the most frequently occurring combinations of work processes in combination with the accident kinds and agent. These combinations are shown in Table 21 for all injury severities, and in Table 22 for fatal and major injury accidents.

As expected, when considering all injury severities, the most frequently occurring work process for the handling and trip accidents is refuse collection. General handling work processes also feature significantly, as does on-site transfer (for trips). Loading and unloading processes also feature for both trips and handling injuries.

When considering the fatal and major injury accident combinations, refuse collection is predominant for most accident combinations. The exception is low falls, where loading and unloading and on-site transfer processes appear as frequently as refuse collection.

Table 21 Most frequently occurring matches – accident kind, work process and agent

Accident kind	*Work process*	*Agent*	*F*	*M*	*O*	*Total*
HANDLING/SPRAINS	REFUSE COLLECTN		0	0	1325	1325
HANDLING/SPRAINS	REFUSE COLLECTN	HS WEIGHT	0	40	1187	1227
HANDLING/SPRAINS	REFUSE COLLECTN	HS SHARP	0	38	511	549
TRIP	REFUSE COLLECTN		0	0	485	485
HANDLING/SPRAINS	GNRL HANDLING		0	0	446	446
STRUCK BY	REFUSE COLLECTN		0	0	407	407
HANDLING/SPRAINS	REFUSE COLLECTN	HANDLING/S PRAINS	0	26	380	406
TRIP	ON-SITE TRANSF		0	0	378	378
HANDLING/SPRAINS	REFUSE COLLECTN	HS AWKWARD	0	13	356	369
HANDLING/SPRAINS	GNRL HANDLING	HS WEIGHT	0	12	290	302
TRIP	REFUSE COLLECTN	TRIP	0	57	223	280
TRIP	REFUSE COLLECTN	TRIP SLIPPERY	0	51	214	265
TRIP	REFUSE COLLECTN	TRIP UNEVEN	0	54	209	263
TRIP	ON-SITE TRANSF	TRIP	0	64	163	227
HANDLING/SPRAINS	GNRL HANDLING	HS SHARP	0	30	177	207
TRIP	ON-SITE TRANSF	TRIP SLIPPERY	0	62	140	202
HANDLING/SPRAINS	LOAD/UNLOADING		0	0	197	197
HANDLING/SPRAINS	LOAD/UNLOADING	HS WEIGHT	0	9	182	191
TRIP	ON-SITE TRANSF	TRIP UNEVEN	0	50	134	184
STRUCK BY	REFUSE COLLECTN	STRUCK BY	0	37	142	179

Table 22 Most frequently occurring matches of fatal and major injury accidents – accident kind, work process and agent

Accident Kind	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
TRIP	ON-SITE TRANSF	TRIP	0	64	163	64
TRANSPORT	REFUSE COLLECTN	VEH REFUSE	4	60	57	64
TRIP	ON-SITE TRANSF	TRIP SLIPPERY	0	62	140	62
TRIP	REFUSE COLLECTN	TRIP	0	57	223	57
TRIP	REFUSE COLLECTN	TRIP UNEVEN	0	54	209	54
TRIP	REFUSE COLLECTN	TRIP SLIPPERY	0	51	214	51
TRIP	ON-SITE TRANSF	TRIP UNEVEN	0	50	134	50
HANDLING/SPRAINS	REFUSE COLLECTN	HS WEIGHT	0	40	1187	40
TRIP	REFUSE COLLECTN	TRIP OBSTRUCT	0	39	118	39
HANDLING / SPRAINS	REFUSE COLLECTN	HS SHARP	0	38	511	38
STRUCK BY	REFUSE COLLECTN	STRUCK BY	0	37	142	37
STRUCK BY	REFUSE COLLECTN	SB ARTICLE	0	37	115	37
TRIP	ON-SITE TRANSF	TRIP OBSTRUCT	0	33	113	33
LOW FALL	REFUSE COLLECTN	FALL VEHICLE	0	33	72	33
HANDLING/SPRAINS	GNRL HANDLING	HS SHARP	0	30	177	30
LOW FALL	LOAD/UNLOADING	FALL VEHICLE	0	29	34	29
STRUCK BY	REFUSE COLLECTN	SB VEHICLE	0	28	93	28
LOW FALL	ON-SITE TRANSF	FALL VEHICLE	0	27	75	27
HANDLING/SPRAINS	REFUSE COLLECTN	HANDLING/SPRAINS	0	26	380	26
STRUCK BY	REFUSE COLLECTN	SB LIFTED	0	25	111	25

The fourth field of information to be considered in the accident combinations is the occupation of the injured worker. The most frequently occurring combinations of accident kind, occupation, work process and agent are shown in Table 23 for all injury severities, and in Table 24 for fatal and major injury accidents. However, due to the nature of the data set, all of the most frequent occupations involve refuse workers, and the conclusions are thus the same as those drawn from Table 21 and Table 22. This implies that a more sophisticated coding system is required that better reflects the range of subsidiary occupations and activities in the waste industry.

Table 23 Most frequently occurring matches – accident kind, occupation, work process and agent

Accident Kind	*Occupation*	*Work Process*	*Agent*	*F*	*M*	*O*	*Total*
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN		0	0	1079	1079
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HS WEIGHT	0	37	993	1030
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HS SHARP	0	28	433	461
TRIP	REFUSE	REFUSE COLLECTN		0	0	390	390
STRUCK BY	REFUSE	REFUSE COLLECTN		0	0	345	345
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HANDLING/ SPRAINS	0	22	322	344
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HS AWKWARD	0	8	285	293
TRIP	REFUSE	REFUSE COLLECTN	TRIP SLIPPERY	0	45	191	236
TRIP	REFUSE	REFUSE COLLECTN	TRIP	0	47	185	232
TRIP	REFUSE	REFUSE COLLECTN	TRIP UNEVEN	0	40	184	224
HANDLING/ SPRAINS	REFUSE	GNRL HANDLING		0	0	164	164
TRIP	REFUSE	ON-SITE TRANSF		0	0	138	138
STRUCK BY	REFUSE	REFUSE COLLECTN	STRUCK BY	0	26	111	137
TRIP	REFUSE	REFUSE COLLECTN	TRIP OBSTRUCT	0	32	101	133
STRUCK BY	REFUSE	REFUSE COLLECTN	SB ARTICLE	0	28	87	115
STRUCK BY	REFUSE	REFUSE COLLECTN	SB LIFTED	0	21	94	115
HANDLING/ SPRAINS	REFUSE	GNRL HANDLING	HS WEIGHT	0	4	110	114
HANDLING/ SPRAINS	REFUSE	LOAD/UNLO ADING		0	0	107	107
TRANSPORT	REFUSE	REFUSE COLLECTN	VEH REFUSE	4	54	46	104
STRUCK BY	REFUSE	REFUSE COLLECTN	SB VEHICLE	0	19	77	96

Table 24 Most frequently occurring matches of fatal and major injury accidents – accident kind, occupation, work process and agent

Accident Kind	*Occupation*	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
TRANSPORT	REFUSE	REFUSE COLLECTN	VEH REFUSE	4	54	46	58
TRIP	REFUSE	REFUSE COLLECTN	TRIP	0	47	185	47
TRIP	REFUSE	REFUSE COLLECTN	TRIP SLIPPERY	0	45	191	45
TRIP	REFUSE	REFUSE COLLECTN	TRIP UNEVEN	0	40	184	40
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HS WEIGHT	0	37	993	37
TRIP	REFUSE	REFUSE COLLECTN	TRIP OBSTRUCT	0	32	101	32
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HS SHARP	0	28	433	28
STRUCK BY	REFUSE	REFUSE COLLECTN	SB ARTICLE	0	28	87	28
STRUCK BY	REFUSE	REFUSE COLLECTN	STRUCK BY	0	26	111	26
TRANSPORT	REFUSE	REFUSE COLLECTN	VEH PRIVATE CAR	1	23	34	24
HANDLING/ SPRAINS	REFUSE	REFUSE COLLECTN	HANDLING/ SPRAINS	0	22	322	22
LOW FALL	REFUSE	REFUSE COLLECTN	FALL VEHICLE	0	22	53	22
STRUCK BY	REFUSE	REFUSE COLLECTN	SB LIFTED	0	21	94	21
STRUCK BY	REFUSE	REFUSE COLLECTN	SB VEHICLE	0	19	77	19
STRUCK BY	REFUSE	REFUSE COLLECTN	SB FREE FALL OBJ	0	18	53	18
TRIP	REFUSE	ON-SITE TRANSF	TRIP UNEVEN	0	18	52	18
TRIP	REFUSE	ON-SITE TRANSF	TRIP SLIPPERY	0	17	45	17
TRIP	REFUSE	ON-SITE TRANSF	TRIP	0	13	47	13
LOW FALL	GOODS DRIVER	ON-SITE TRANSF	FALL VEHICLE	0	12	14	12
MACHINERY	REFUSE	REFUSE COLLECTN	MACHINERY	0	11	9	11

6.4 CONCLUSIONS

The following conclusions can be drawn from the analyses of the RIDDOR data:

1. The RIDDOR coding system does not give the level of information required to gain sufficient understanding of what accidents are occurring where. The codings are too generic, and combine several industries (both within and outside the waste industry) such that the majority of the accidents are concentrated in only a few categories. This causes problems in identifying in sufficient detail the areas to be targeted for intervention.

2. The overall number of accidents has been reducing over the last six years.

3. The accidents are primarily occurring in the sewage/refuse and general public services sectors, with the public sector accounting for around 55% of the overall number of accidents over the last six years.

4. The accidents predominantly occur during refuse collection, with significant numbers also occurring during loading / unloading and on-site transfer activities.

5. Over 3-day injury accidents account for around 85% of the total number of accidents. Handling and sprain injuries resulting from refuse workers handling refuse during collection account for the largest proportion of these over 3-day accidents.

6. The age profile of those involved in the accidents peaks in the 30 to 39 age group. Overall, the age profile of the accidents reported in the UK waste industry is similar to that for UK industry overall. The main differences are that the proportion of accidents reported involving younger workers (under 30 years old) is slightly lower for the waste industry, whilst the proportion involving older workers (over 30 years old) is slightly higher than that for UK industry.

7. Considering all injury severities, handling / sprain injuries are the most significant, with heavy weights being the most frequently involved in handling injuries followed by sharp objects and awkward loads.

8. When considering those accidents that result in fatal or major injuries, being struck by refuse collection vehicles, being struck by falling objects, trips and low falls are particularly significant.

7. WORKPLACE TRANSPORT ACCIDENTS IN THE UK WASTE INDUSTRY

7.1 INTRODUCTION

The following data sets are analysed in this section:

- **Global workplace transport data set** – this corresponds to those accidents that occur in the vicinity of vehicles regardless of the accident kind provided they meet the selection criteria.

- **Struck by moving vehicles data set** – this corresponds to those accidents where the accident kind involved the worker being hit by a moving vehicle.

It should be noted that these data sets do not include those accidents classified as road traffic accidents. These are dealt with separately by Police Authorities.

In this section, those waste industry accidents that involve workplace transport are analysed. The primary criteria (occupations, work processes and agents) used to define the workplace transport accident data set are presented in Table 14. In addition to these criteria, accidents have been selected for inclusion in the workplace transport data set on the basis of the accident kinds, considered to be relevant to work place transport, and agreed with the HSE Workplace Transport Priority Programme Board. These criteria are shown in Table 25 for both the pre-ICC (1996/97 to 2000/01) and ICC (2001/02) recording systems used for the relevant data sets.

Table 25 Accident kind categories selected in the definition of workplace transport

Reference	*Code*	*Description*
pre-ICC		
03	TRANSPORT	Struck by moving vehicle
ICC		
03.10	FORWARD	Hit by a vehicle moving forward. (Runaway not driven counted under 0340)
03.20	REVERSE	Hit by a reversing vehicle.
03.30	OVERTURN	Overturning vehicle where overturn is injury-causing factor.
03.40	RUNAWAY	Hit by a runaway vehicle not driven
03.90	UNKNOWN	Hit by a moving vehicle - unknown way.
04.20	VEHICLE	Hit against part of vehicle whilst travelling in it.

7.2 ANALYSIS OF THE GLOBAL WORKPLACE TRANSPORT RIDDOR ACCIDENT DATA SET

Using the criteria described above and in Section 5.2, 15,445 of the waste industry accidents have been classified as involving workplace transport in its broadest sense (i.e. in and around vehicles) over the last six years. The breakdown of fatal, major and 3-day injury accidents for each of the last six years is shown in Table 26.

Table 26 Fatal, major and over 3-day injury accidents in the waste industry global workplace transport data set

HSE Year	*Fatal*	*Major*	*Over 3-day*	*Total*	*% of waste accidents*
1996/97	7	336	2,430	2,773	63%
1997/98	8	362	2,259	2,629	62%
1998/99	13	327	2,255	2,595	63%
1999/2000	7	322	2,229	2,558	62%
2000/01	10	347	2,148	2,505	63%
2001/02	9	327	2,049	2,385	64%
Total	54	2,021	13,370	15,445	63%

Figure 42 shows the variation in the number of workplace transport accidents in the waste industry over the last six years. The overall number of accidents appears to have been relatively consistent between 1996/97 and 2001/02, showing a gradual year-on-year decline.

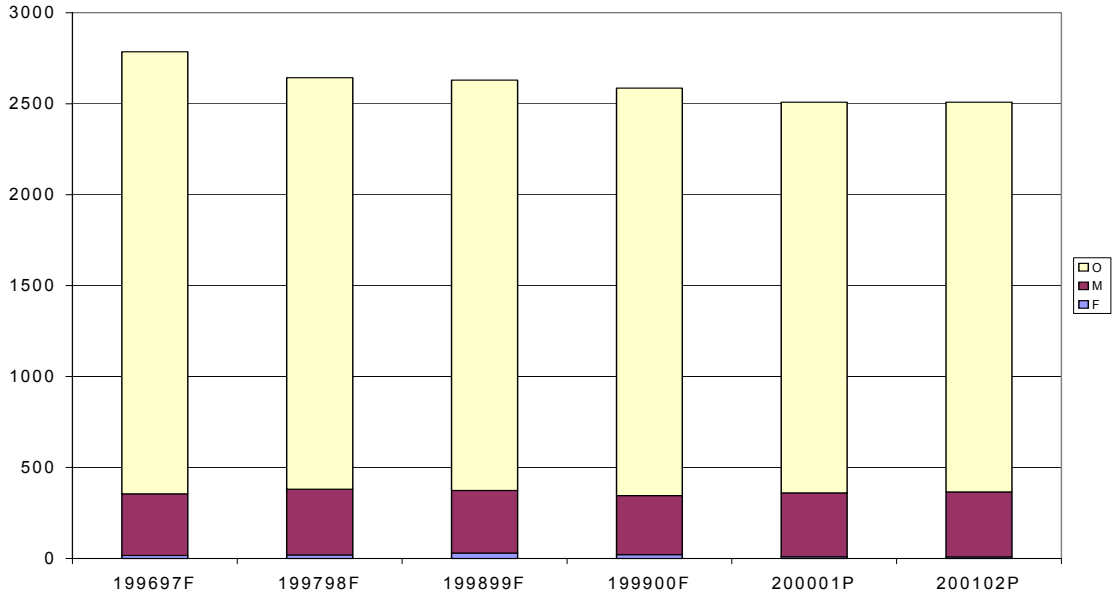


Figure 42 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by HSE year

Figure 43 shows the workplace transport accidents by HSE region. The only difference in the distribution of accidents from that for all accidents is that there is a smaller differential between the Midlands and the North West.

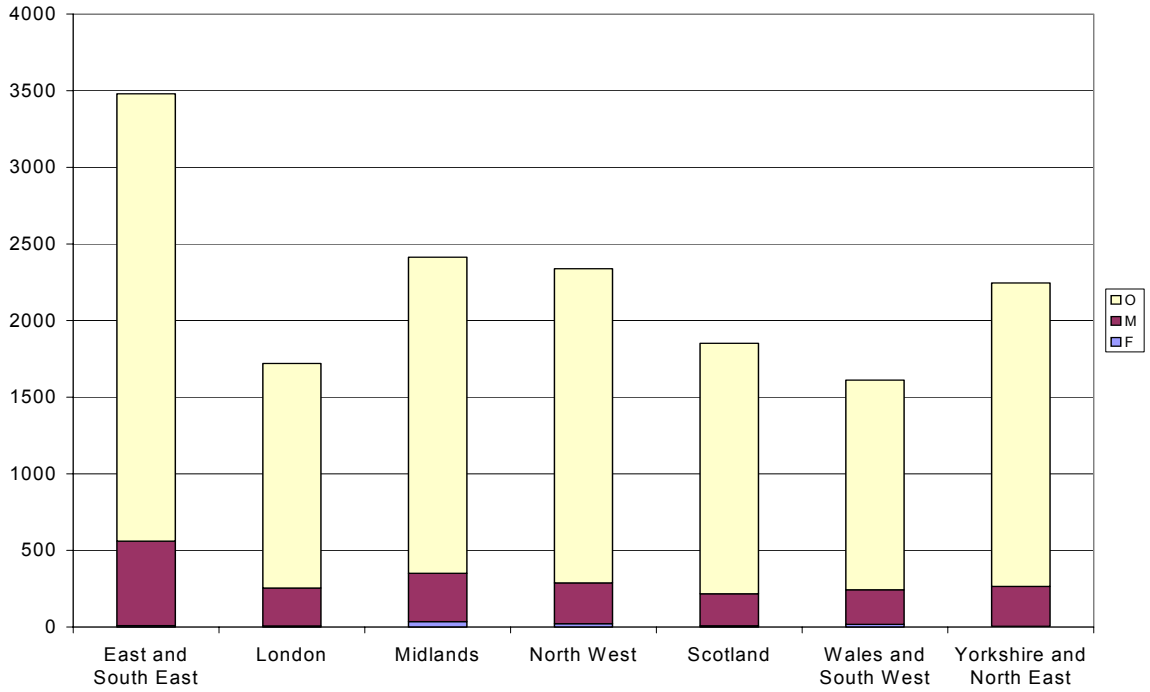


Figure 43 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by HSE region

Figure 44 shows that the largest number of workplace transport accidents occurs in the general public services and sewage / refuse disposal industries. In comparison to the overall number of accidents, general public services are involved in the largest number of accidents, perhaps reflecting the amount of refuse collection activity that takes place within the public sector. Unfortunately, workforce population data by SIC industry are not available for comparison of rates.

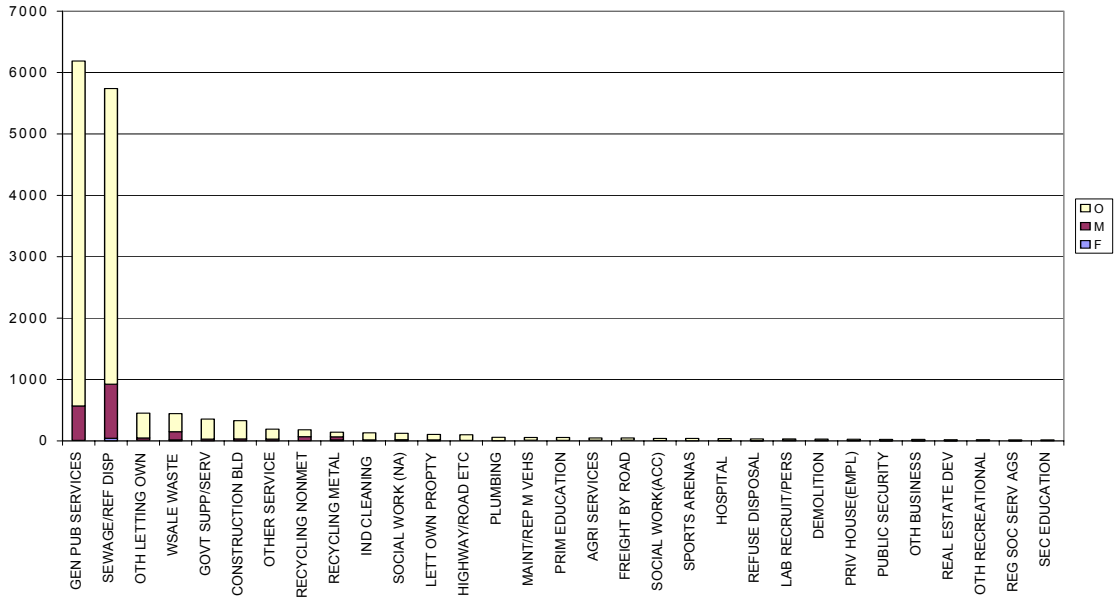
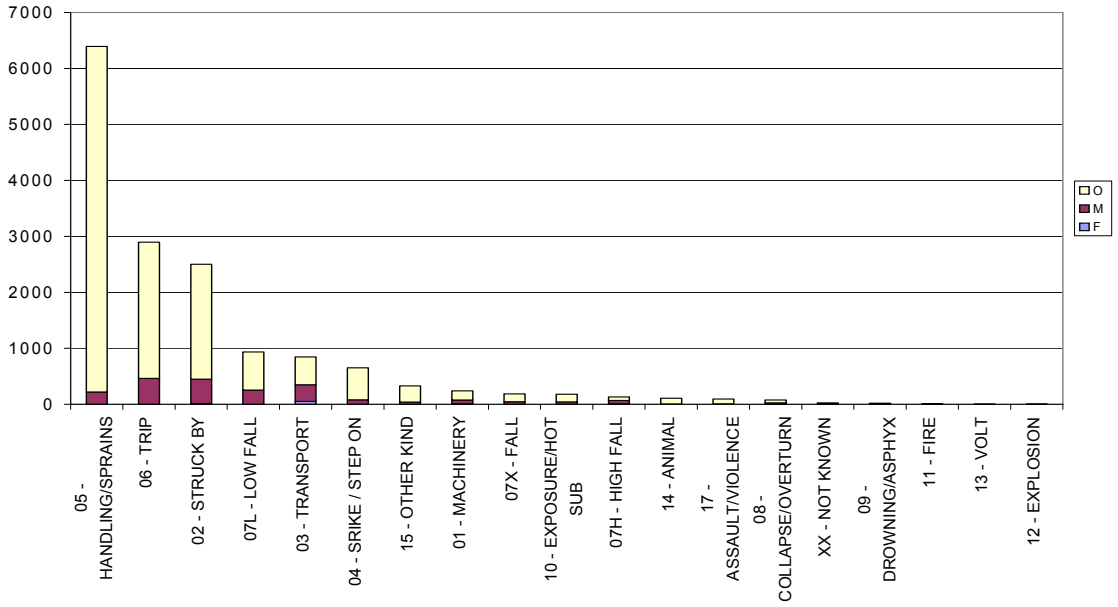
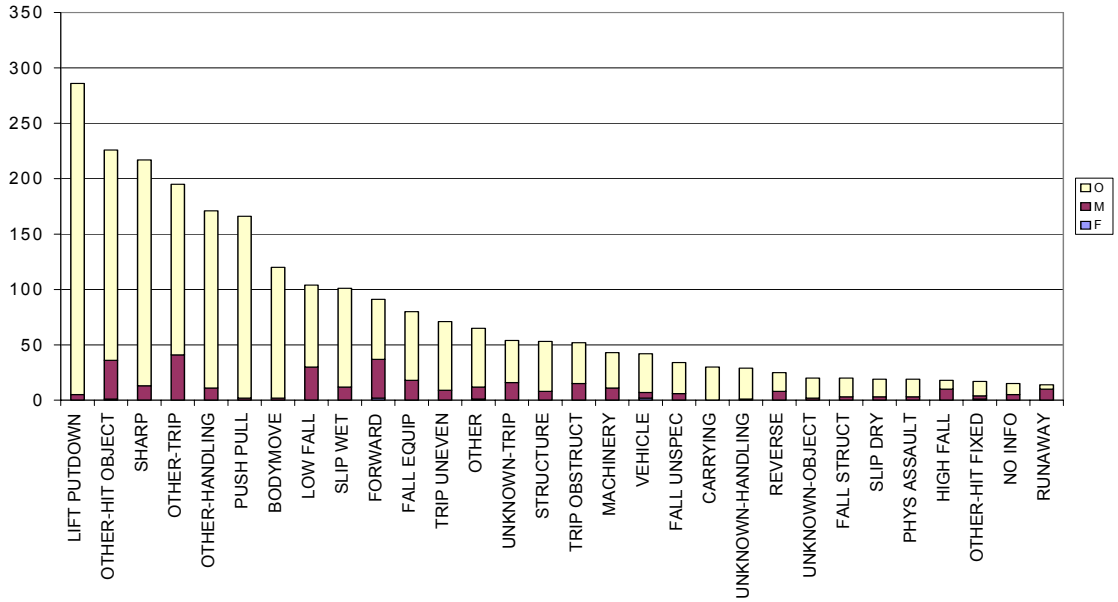


Figure 44 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by SIC industry

Figure 45 shows the kinds of workplace transport accidents that have occurred in the vicinity of workplace transport. The figure is split into two to reflect the change in coding system for accident kind in 2001/02. Between 1996/97 and 2000/01, the largest number of accidents involved handling and sprain injuries, with the majority of these accidents resulting in over 3-day injuries. In terms of fatal and major injury accidents, trips, struck by (objects), transport (struck by a moving vehicle) and low falls are the most significant. However, the accident profiles are somewhat different, in that around 40% of low falls and transport accidents result in fatal or major injuries. The pattern is similar in 2001/02, although more detail is provided as the accident kinds have been subdivided.



a) 1996/97 to 2000/01



b) 2001/02

Figure 45 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by accident kind

Figure 46 shows that the occupation predominantly involved in workplace transport accidents is the refuse worker, primarily involving accidents around refuse collection vehicles. Goods drivers and road sweepers were also involved in significant numbers of workplace transport accidents.

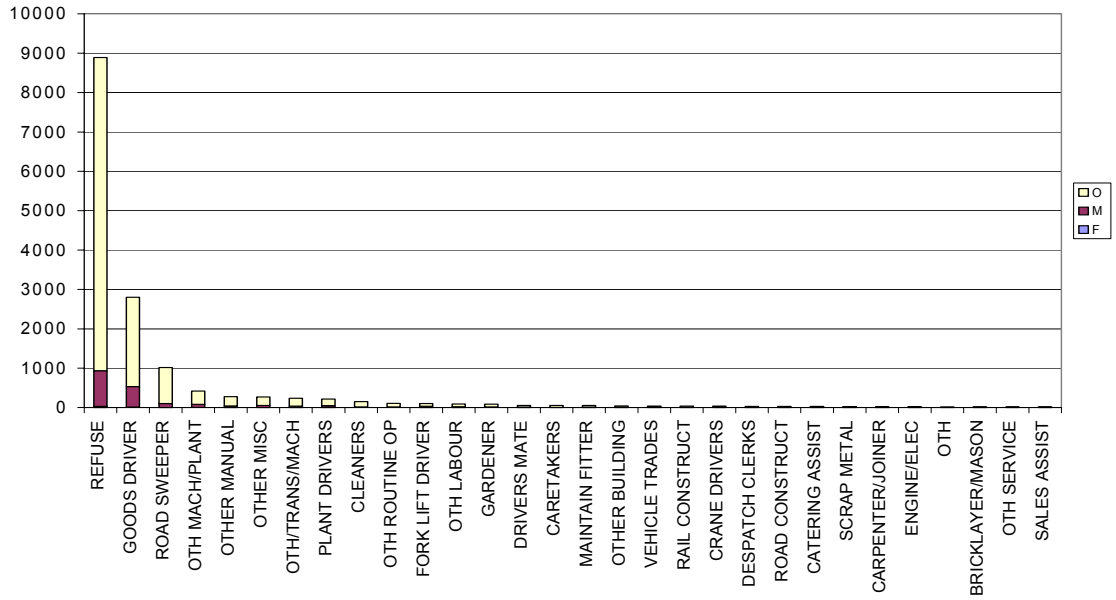
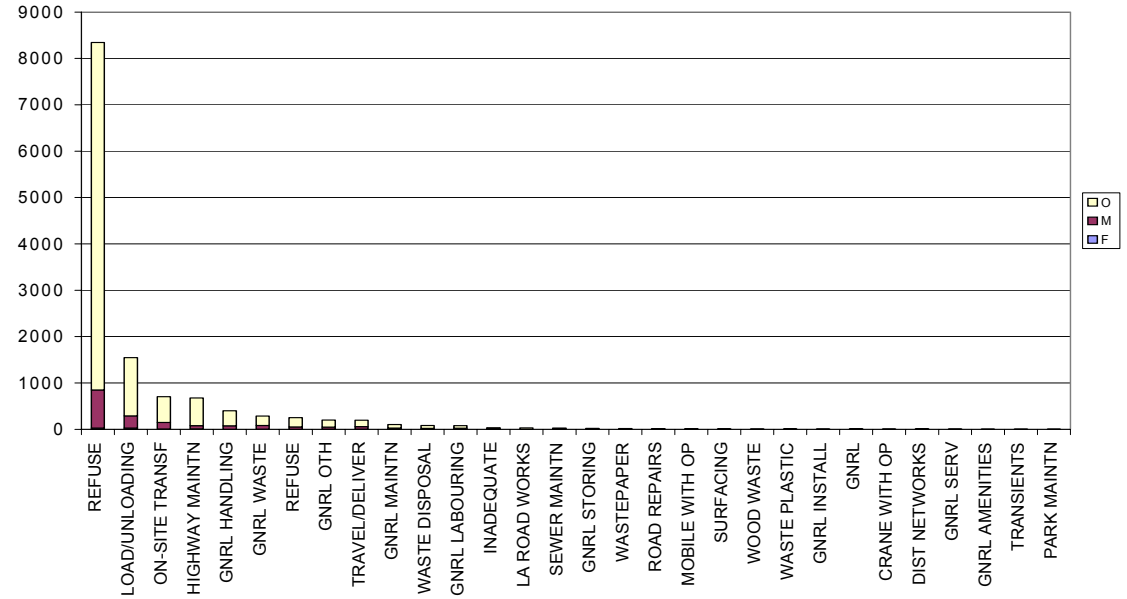
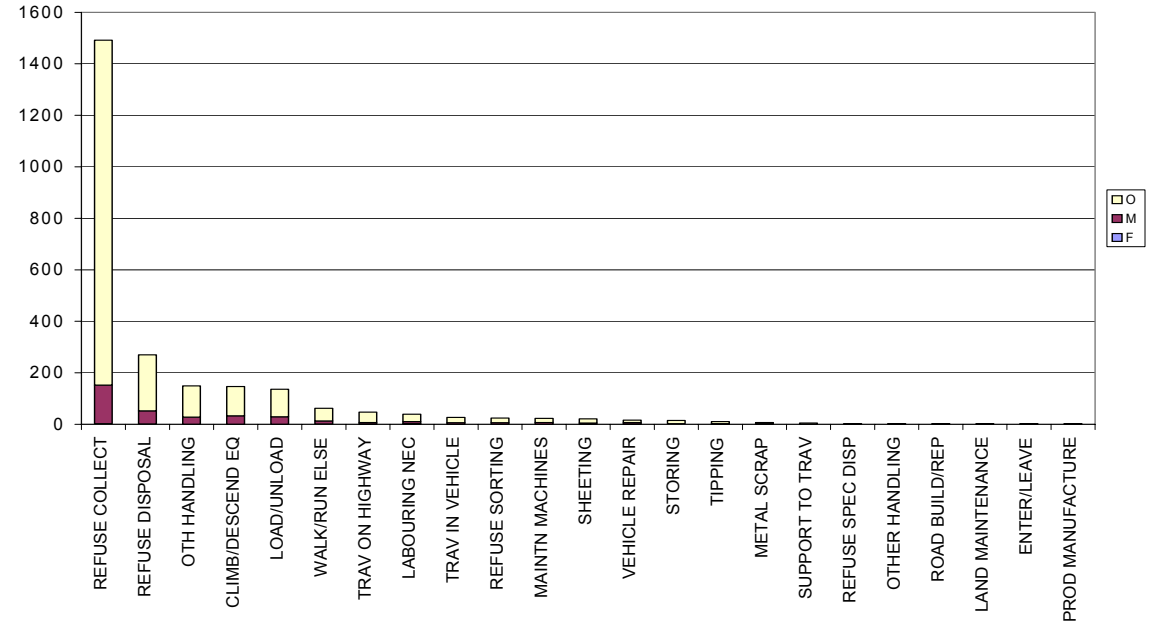


Figure 46 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by occupation

Figure 47 shows that refuse collection was the dominant work processes being undertaken at the time of the workplace transport accidents in both periods. The relative numbers of accidents involving loading / unloading has reduced in 2001/02, with refuse disposal being responsible for the second highest number of accidents.



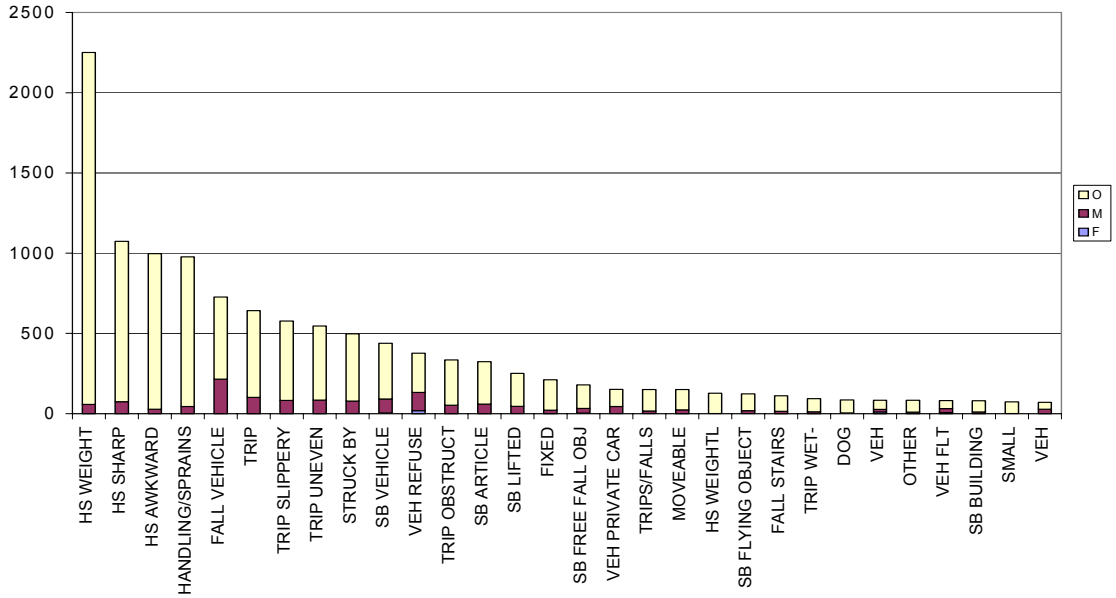
a) 1996/97 to 2000/01



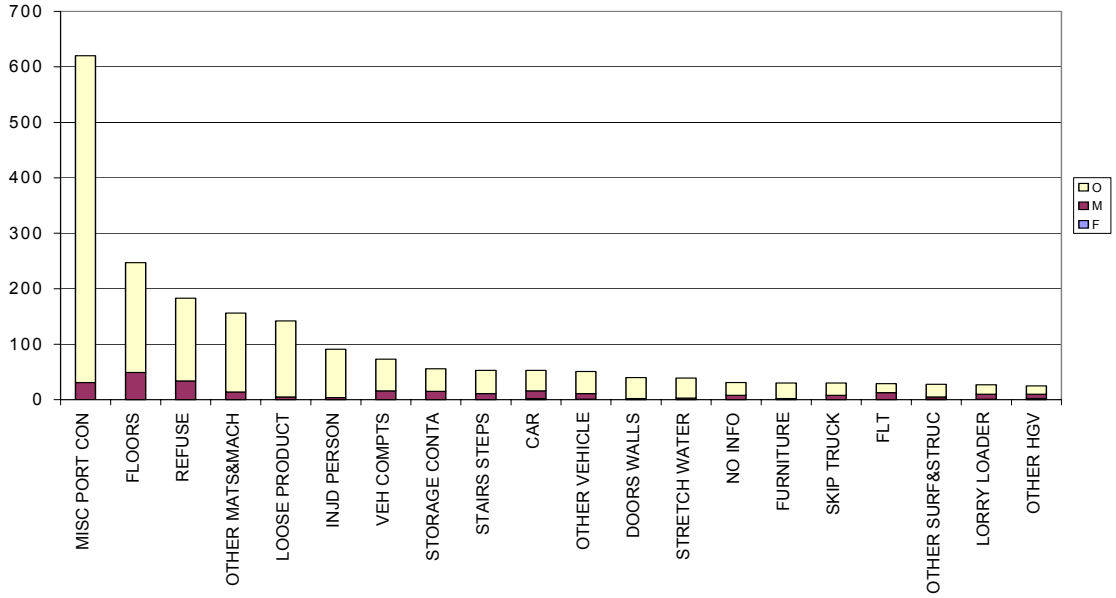
b) 2001/02

Figure 47 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by work process

The agents involved in workplace transport accidents are shown in Figure 48. Due to the predominance of over 3-day injuries, the most common agents in the first five years are weight (lifting or moving heavy weights), sharp and awkward (strains or sprains etc not involving handling or lifting e.g. awkward movement). In 2001/02, the agents were no longer linked to the accompanying accident kind. Portable refuse containers were involved in the largest number of workplace transport accidents in 2001/02. Other refuse related agents also featured highly, including refuse, loose product and storage containers. Of interest, is the number of cars involved in accidents.



a) 1996/97 to 2000/01



b) 2001/02

Figure 48 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by agent

Figure 49 shows the age distribution of those involved in workplace transport accidents in the waste industry. This is normally distributed with the number of accidents peaking in the 30 to 39 age range, similar to Figure 30 for the overall number of accidents.

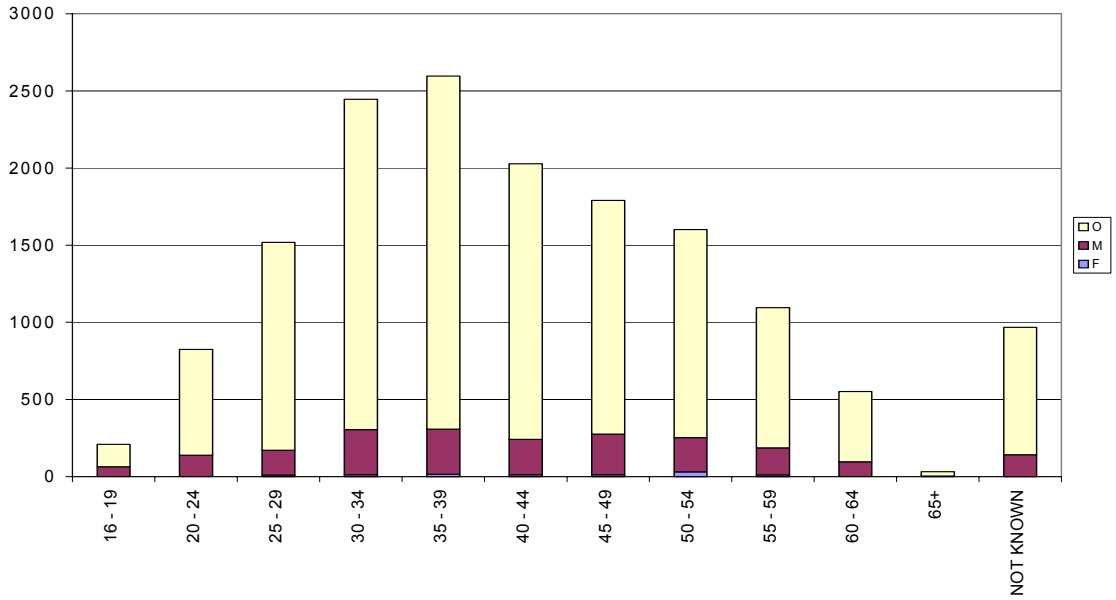


Figure 49 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by age

Figure 50 shows the number of workplace transport accidents by employment status. As with the overall number of accidents, employees are involved in the majority of the reported accidents.

Figure 50 Number of workplace transport accidents in the UK waste industry between 1996/97 and 2001/02 by employment status

7.3 ANALYSIS OF THE STRUCK BY VEHICLE RIDDOR ACCIDENT DATA SUBSET

In Section 7.2, analyses of the global workplace transport data set were described for those accidents either involving vehicles or taking place around vehicles. In this section, a subset of that data is considered for those accidents involving workers being struck by moving vehicles. This accident kind tends to result in the most severe injuries. Graphical analyses of the data are presented in Section 7.3.1, whilst discussions of the key factors are contained in Section 7.3.2. The information in this section is intended to provide an indication of the underlying issues surrounding accidents in order to inform potential risk controls and interventions.

7.3.1 Accident data

Figure 51 shows the variation in the number of accidents involving workers being struck by moving vehicles in the waste industry over the last six years. After a significant rise in 1996/97, the overall number of accidents has been reducing gradually between 1997/98 and 2001/02.

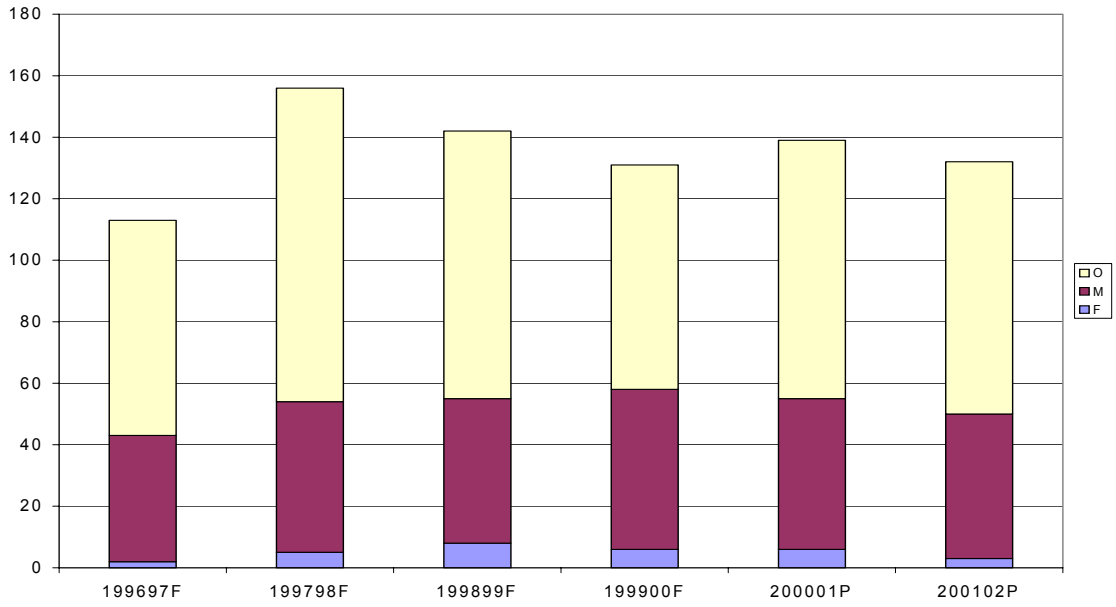


Figure 51 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by HSE year

Figure 52 shows the workplace transport accidents involving workers being struck by moving vehicles by HSE region. The largest overall number of accidents are reported in the East and South East, whilst the largest number of fatal injury accidents are reported in the Midlands and the North West. The lowest number of accidents is reported in Scotland, whilst the lowest number of fatal injury accidents is reported in Wales and the South West.

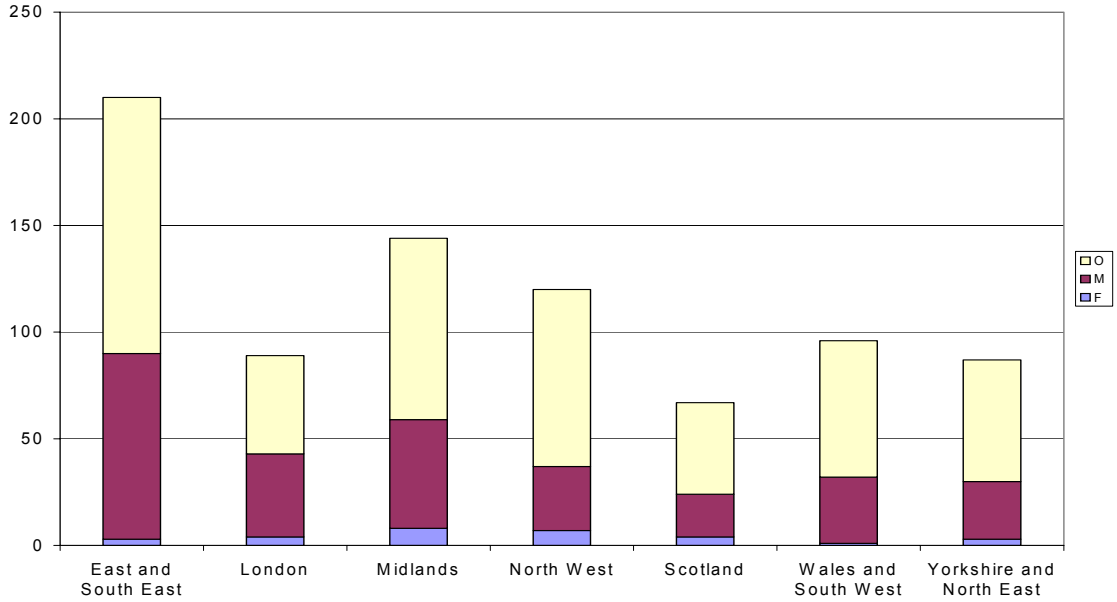


Figure 52 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by HSE region

Figure 53 shows that the largest number of accidents involving workers being struck by moving vehicles are reported in the sewage / refuse disposal industries and the general public services. However, the fatalities primarily occur in the refuse and wholesale waste industries.

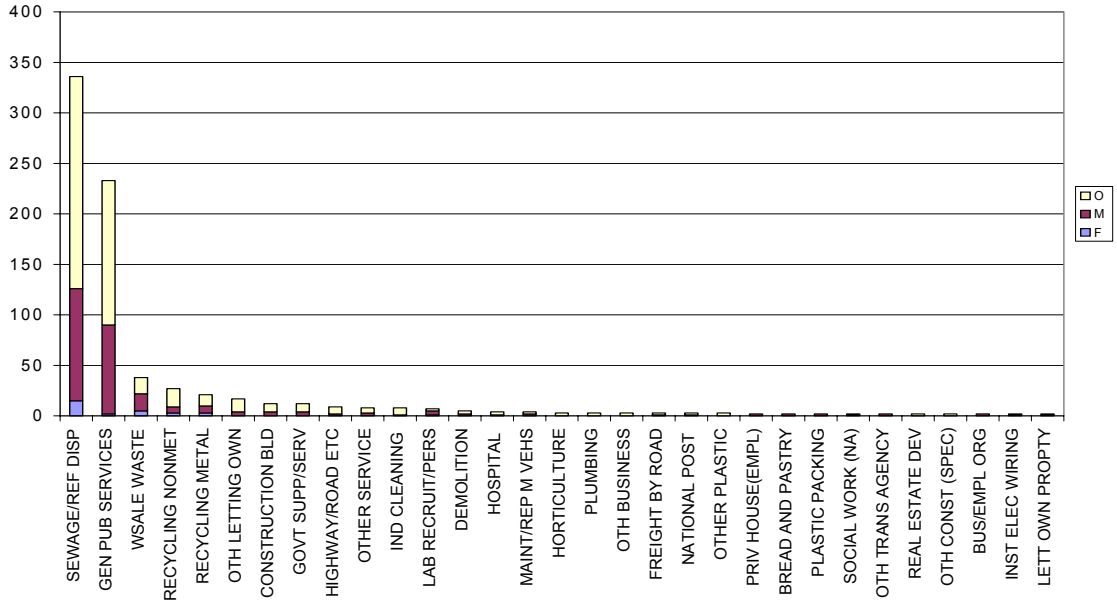


Figure 53 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by SIC industry

Figure 54 shows the details of the workplace transport accidents where workers have been struck by moving vehicles. This data is available for 2001/02, where the accident kinds reported under the ICC system have been subdivided to provide detail. This figure shows that the dominant accident kind involves workers being struck by a vehicle travelling forward. Reversing vehicles account for around a third of the number of accidents for vehicles travelling forward; no fatalities were involved. However, the absolute numbers of accidents involving vehicles travelling forward or in reverse should be considered in light of the relative amount of time that vehicles spend travelling forward as opposed to travelling in reverse. The accident rate per unit of time spent travelling is likely to be somewhat higher for accidents involving vehicles reversing. The number of reported accidents involving runaway or overturning vehicles were lower (six and three respectively).

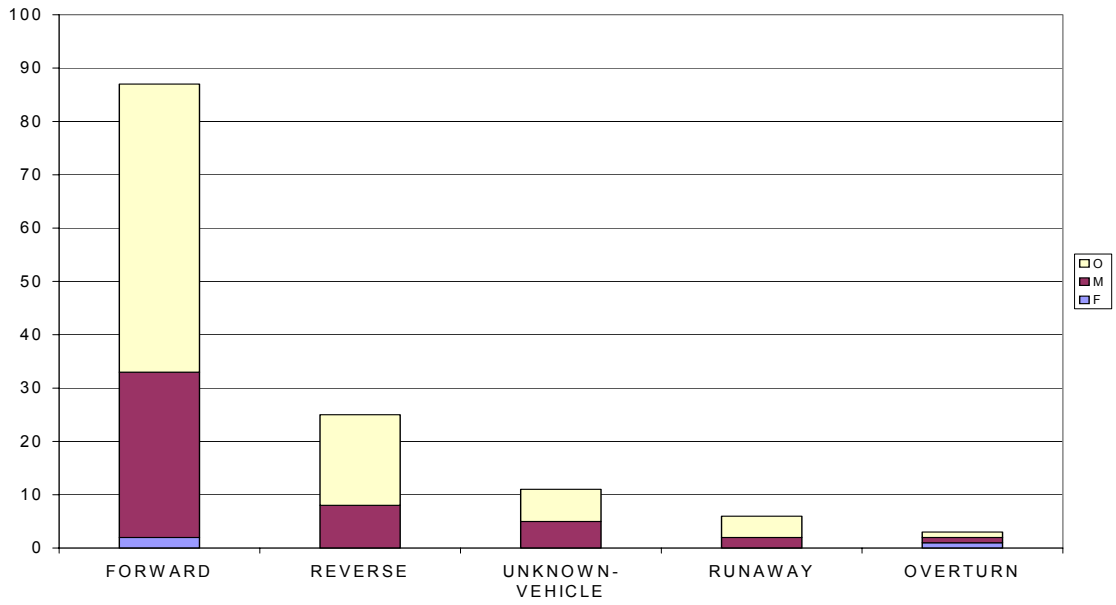


Figure 54 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry in 2001/02 by accident kind

Figure 55 shows that the occupation predominantly involved in the accidents where workers were struck by moving vehicles is the refuse worker; primarily involving accidents around refuse collection vehicles. Goods drivers and road sweepers were also involved in around seventy accidents where they were struck by moving vehicles.

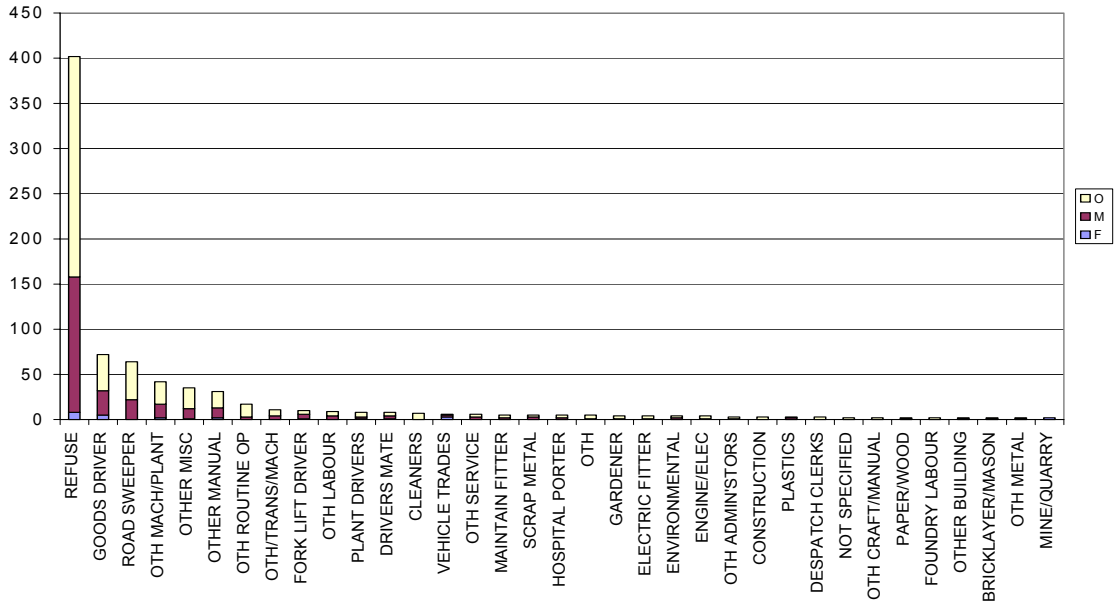
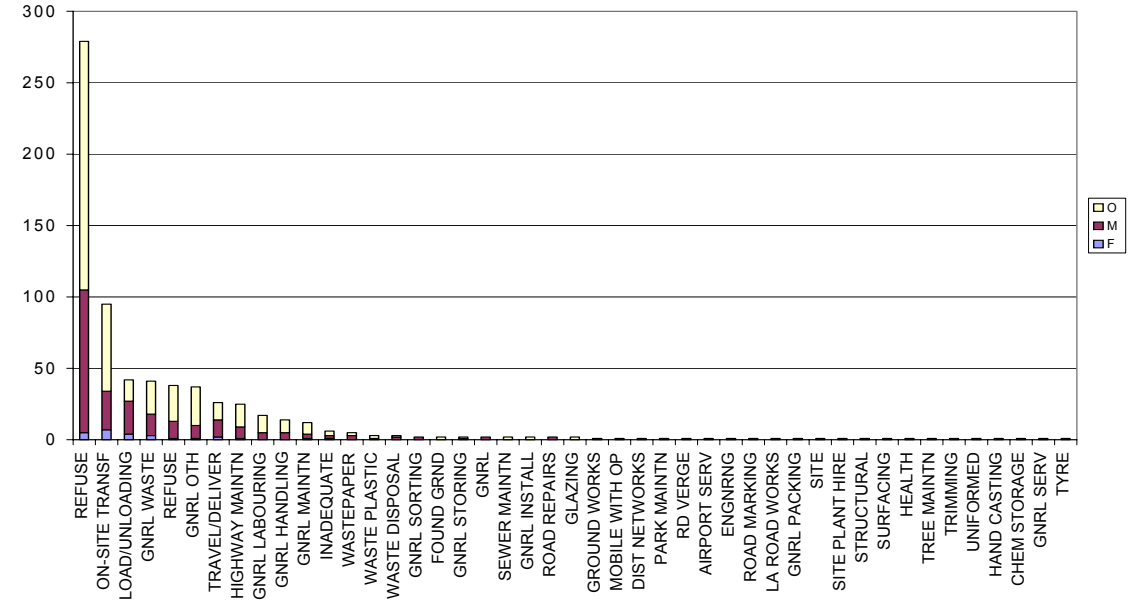
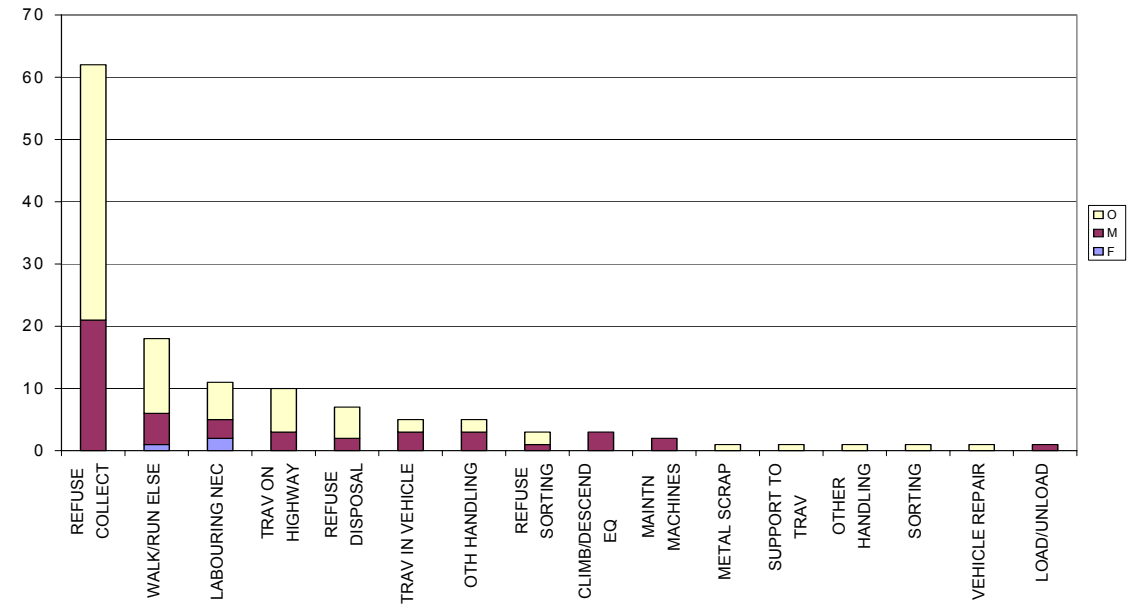


Figure 55 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by occupation

Figure 56 shows that refuse collection was the dominant work process being undertaken when a worker was struck by a moving vehicle. The relative number of accidents involving loading / unloading has reduced in 2001/02, whilst onsite transfer activities (walk / run else in 2001/02) remained the second largest source of struck by vehicle accidents. The 2001/02 data shows that around seven times more struck by vehicle accidents are reported in refuse collection than in refuse disposal.



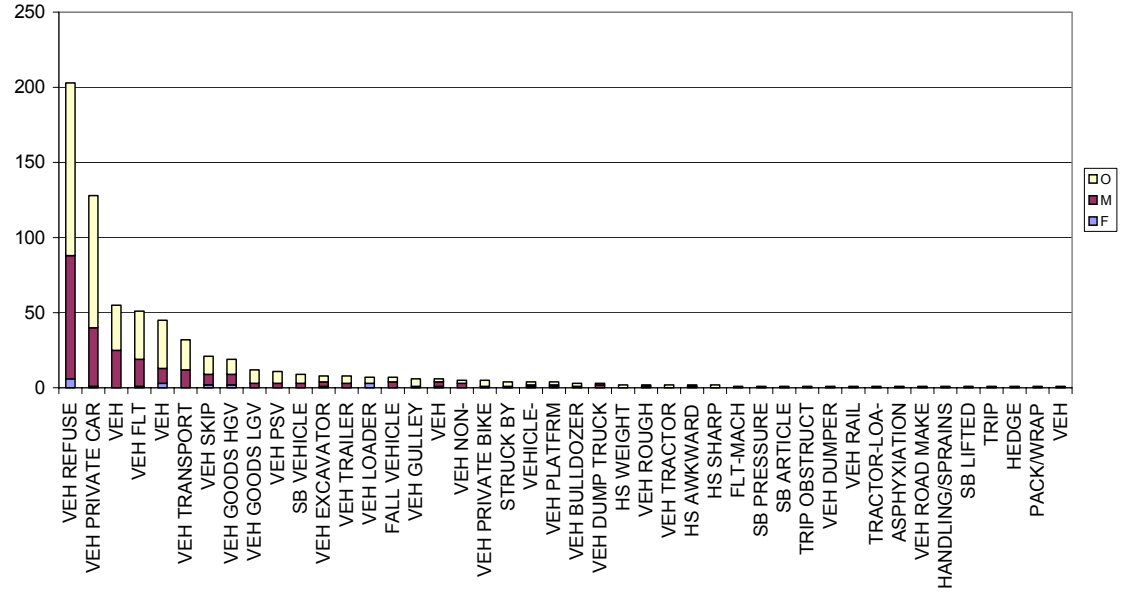
a) 1996/97 to 2000/01



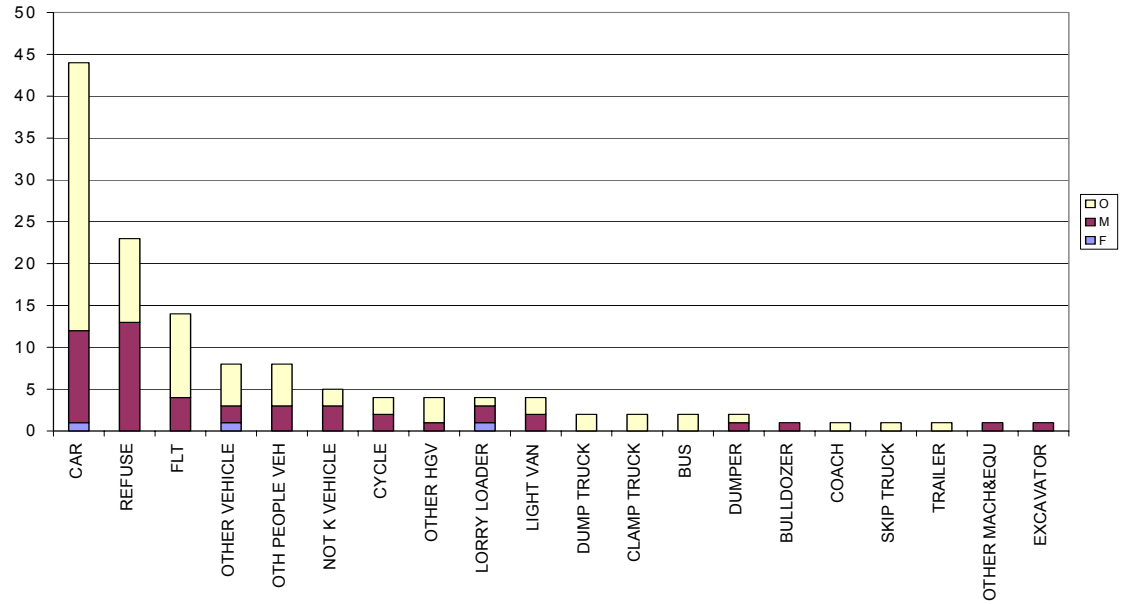
b) 2001/02

Figure 56 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by work process

The vehicle agents involved in striking workers are shown in Figure 57. Both refuse collection vehicles and private vehicles were involved in significant numbers of accident in the first five years, with refuse collection vehicles being involved in around 50% more accidents than private cars. The largest number of fatal injury accidents involved refuse collection vehicles. In 2001/02 cars were involved in twice as many struck by accidents as refuse vehicles. Whilst the average number of struck by accidents involving refuse collection vehicles was around 40 per year in the first five years, the figure was around 20 in 2001/02.



a) 1996/97 to 2000/01



b) 2001/02

Figure 57 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by agent

Figure 58 shows the age distribution of the workers struck by moving vehicles in the waste industry. This figure shows that the number of accidents peak in the 30 to 39 age range, similar to Figure 30 for the overall number of accidents. However, the distribution is a little flatter than that shown in Figure 30, and the number of fatal injury accidents is similar in most of the age groups between 25 and 59.

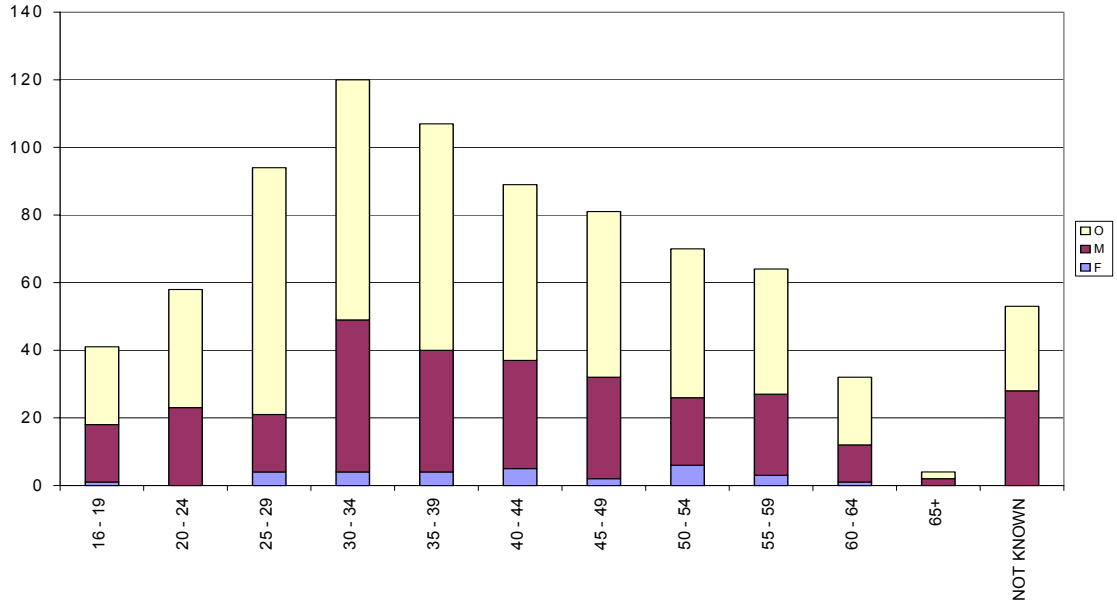


Figure 58 Number of workplace transport accidents involving workers being struck by moving vehicles in the UK waste industry between 1996/97 and 2001/02 by age

7.3.2 Key risks and underlying issues

When accidents are notified to HSE, the notifier typically includes a comment on the circumstances of the accident. From 2001/02, these notifier comments were included in the HSE electronic database and are thus available for use. All fatal injury accidents and a selection of the major injury accidents are investigated by HSE. The investigation summaries are included in the accident database for all six years (1996/97 to 2001/02). Together, the notifier comments and investigation summaries provide insight into the factors surrounding the accidents over and above that which can be gained from the quantitative data.

The notifier comments and investigation reports available for each of the accidents involving workers being struck by refuse collection vehicles are summarised in Table 27. These indicate that there are, essentially, five broad issues surrounding accidents where workers are struck by moving vehicles:

- Workers having their ankles and feet run over by forward-moving vehicles; either due to standing too close or due to slipping / tripping from kerbs whilst the vehicle is moving past.
- Workers being injured whilst trying to get onto or off moving vehicles.
- Reversing vehicles being guided by two 'banksmen' and striking one whilst the driver was watching the other for instructions.
- Banksmen failing to stop reversing vehicles with either verbal or hand signals and either themselves or others being struck.
- Workers not expecting vehicles to move, and being struck (i.e. the driver was not aware of the worker behind).

Table 27 Key issues identified from notifier comments and investigation reports for accidents involving workers being struck by refuse collection vehicles

Worker struck by	*Factors surrounding accidents*
Refuse collection vehicle moving forward	• The injured person stood on the step of the vehicle to confirm the route with the driver and subsequently fell off, falling under the wheel of the vehicle. • The vehicle ran over both ankles of the injured person as he tried to enter it whilst moving. • The injured person fell from the front mudguard of the moving RCV and was trapped under the rear wheels. • The injured person alighted from the RCV whilst it was still moving, leading to his leg being taken under the front wheel. • The injured person was trying to climb on the RCV as it drove off. The driver did not see him, and carried on, leading to him being run over. The injured person was an agency worker, and this was only his second day on

Worker struck by	*Factors surrounding accidents*
	this route. • The injured person (a temporary worker) slipped as he was trying to get into the cab whilst the driver pulled away, and fell under the front wheels. • The injured person left the RCV to help an elderly lady across the road. The injured person then crossed in front of the RCV, with the driver leaving time for him to get past. However, the injured person was either clipped by the RCV or tripped on the kerb thus falling onto the pavement and injuring himself. • The injured person was walking / running alongside the RCV when he slipped on a grass verge and went under the rear wheel. • The injured person tried to pass between the RCV and a hedge, but slipped on a grass bank and fell under the RCV. • The injured person had been standing on the footwell to talk to the driver. As he alighted, the vehicle moved and the wheel struck his ankle. • The driver pulled forward to straighten the RCV, and ran over the foot of the injured person who was standing next to the vehicle. • The injured person's leg came into contact with the wheel when he got out of the RCV. • The injured person slipped off the kerb and had his foot run over. • The injured person was walking by the RCV and had his foot run over. • The injured person slipped off the step as he tried to get into the cab and had his foot run over. • The injured person had alighted from the RCV and stepped to one side to steady himself as the vehicle began to move and had his foot run over. • The injured person had his foot run over as the RCV pulled away. He was unable to escape due to the adjacent pile of refuse sacks. • The injured person had his foot run over after jumping out of the vehicle to fetch a bin.
Refuse collection vehicle reversing	• The driver misheard the instruction to stop and carried on reversing thus trapping the injured person. • The driver looked away from the injured person to check on the other banksman and continued to reverse thus trapping the injured person. • The RCV was reversing down a cul-de-sac when the injured person stepped out in behind it. • The reversing RCV trapped the injured person against the kerb. The banksman could see the other loader watching the vehicle approach, but did not warn the driver as he assumed that the other loader would step out of the way. The other loader assumed that the vehicle would stop, and thus did not

Worker struck by	*Factors surrounding accidents*
	move. The RCV was a short-term hire fitted with reversing alarms but no camera. • The injured person was standing close to the reversing RCV when he slipped off the kerb. Seeing the incident, the driver was able to stop immediately, thus reducing the injury. • The driver ignored the banksman's instruction to stop reversing, judging from his side mirror that there was room to reverse nearer to the bins. By this time the banksman had moved to the rear of the RCV to begin loading and was struck. • The injured person (who was not wearing the high-visibility clothing provided) had signalled the driver to stop reversing. However, the driver was looking at another loader who was still signalling the vehicle back. • The injured person was struck after walking around the nearside rear of the reversing RCV. The driver was checking the offside at the time. • The injured person was struck by the reversing RCV (with working camera, audible signal and working lights). The accident appeared to be human error on the part of the injured person. • The RCV had been reversed into a narrow lane and began to experience problems with its air brakes. The driver may have exhausted the air supply by pumping the brakes as he reversed, thus causing the brakes to fail to the locked position. The injured person had stood in the passenger footwell to talk to the driver when the RCV moved backwards, thus trapping the injured person. With the air pressure restored, the handbrake may not have been on fully, thus allowing the RCV to move. • The RCV was parked on a hill (with the handbrake on) and rolled backwards down the hill striking the injured person. The handbrake was working and found to meet minimum standards. • The injured person was struck whilst guiding a RCV as it reversed down a B-road to pick up a missed bin. The driver lost sight of the injured person in his mirrors. The driver did not use the camera as he felt that it was inferior to his mirrors given the traffic speed and vehicle position. • The injured person was acting as a banksman guiding a RCV as it reversed up to a supermarket door. The injured person signalled the driver to stop, but the RCV carried on and trapped the injured person against a post. • The injured person was acting as a banksman guiding a RCV as it reversed in the yard. He was unable to tell the driver effectively to stop, and was trapped between the reversing vehicle and another parked at the rear. • The injured person was assisting the RCV in manoeuvring out of a cul-de-sac when it ran over his foot. • The injured person was trapped as he attempted to get into a transit tipper,

Worker struck by	*Factors surrounding accidents*
	and the adjacent tipper pulled out trapping him between the two. • The injured person stepped back to avoid an oncoming vehicle just as the RCV was reversing. The injured person was in the driver's blind spot. • The injured person was under the impression that the RCV had stopped reversing when, in fact, it was being guided back by a banksman thus trapping the injured person. • The injured person was pulling wheeled bins towards the reversing RCV, but his foot slipped off the kerb and was run over. • An agency worker was injured by a reversing vehicle when he tried to jump on the back of it. • The RCV rolled back slightly, knocking the loader over at the back of the vehicle.
Moving part of refuse vehicle	• As the injured person leant over to remove a protruding item from the bin, the bin hoist lifted and trapped his arm. The injured person had reported a problem with the bin mechanism earlier, but no subsequent fault was found. • The automatic bin clamps activated, trapping the injured person's fingers between the clamp and the bin. The injured person believed that the automatic mode on the hired RCV was not working and, as such, had been operating in manual mode. • The lift mechanism of a link tip truck operated whilst the injured person was standing and jumping on it to free a jam.

7.4 SUMMARY

The following conclusions can be drawn from the analyses of the RIDDOR data for workplace transport accidents in the UK waste industry:

1. Similar limitations in the data were found to those discussed in Section 6.3. However, the new coding system for agents introduced in 2001/02 does provide greater detail on the type of vehicle involved.

2. Analysis of the global workplace transport accidents shows a similar picture to that for the overall number of accidents. This is not surprising, as the overall accident profile is dominated by refuse collection in which refuse collection vehicles are heavily used. The reader is thus referred to Section 6.3 for the full set of conclusions.

3. More workplace transport accidents occur in the general public services sector than the sewage / refuse sector, perhaps reflecting the amount of refuse collection undertaken in the public sector.

4. Analysis of the workplace transport subset for accidents involving workers being struck by moving vehicles indicates that the majority of these occur in refuse collection in both the private and the public sectors, typically involving either refuse collection vehicles or private cars.

5. More accidents involve vehicles moving forwards than in reverse. However, less time is likely to be spent in reverse, thus making the accident rate per unit time higher than that for moving forward.

6. There are essentially five broad issues surrounding accidents where workers are struck by moving vehicles:

    - Workers having their ankles and feet run over by forward-moving vehicles either due to standing too close or due to slipping / tripping from kerbs whilst the vehicle is moving past.

    - Workers being injured whilst trying to get onto or off of moving vehicles.

    - Reversing vehicles being guided by two ‘banksmen’ and striking one whilst the driver was watching the other for instructions.

    - Banksmen failing to stop reversing vehicles with either verbal or hand signals and either themselves or others being struck.

    - Workers not expecting vehicles to move, and being struck (i.e. the driver was not aware of the worker behind).

8. INFLUENCE NETWORK MODEL

8.1 INTRODUCTION

The previous sections have provided some insight to the types of accidents occurring in relation to the waste industry overall, and in terms of workplace transport issues in particular. In order to put this data in context and get an indication of current practices and potential mechanisms for risk control, two Influence Network Workshops were held. The Influence Network technique, described in this section, brings together expert judgement and data in a structured manner to enable aspects of current performance to be rated and the interdependence of factors weighted in a quantitative way. This section details the background to the technique (Section 8.2), the underlying methodology (Section 8.3), the approach to analysing the workshops (Section 8.4), and the basis for providing an association with risk (Section 9.9), as well as the way this is used to help identify and weigh up alternative risk controls.

8.2 BACKGROUND

Most accidents are caused by a complex combination of events; they do not happen in isolation, but are part of a wider system of causal factors. This is shown in Figure 59 as a set of nested systems or domains that influence the performance of people and hardware in a hazardous situation. The effect of each domain on the others can be characterised by a set of influences, each having a potential effect on any influence within the enclosed domains. All of these influencing domains interact in the causes of accidents and ill health, and are also the areas where risk control measures can be introduced.

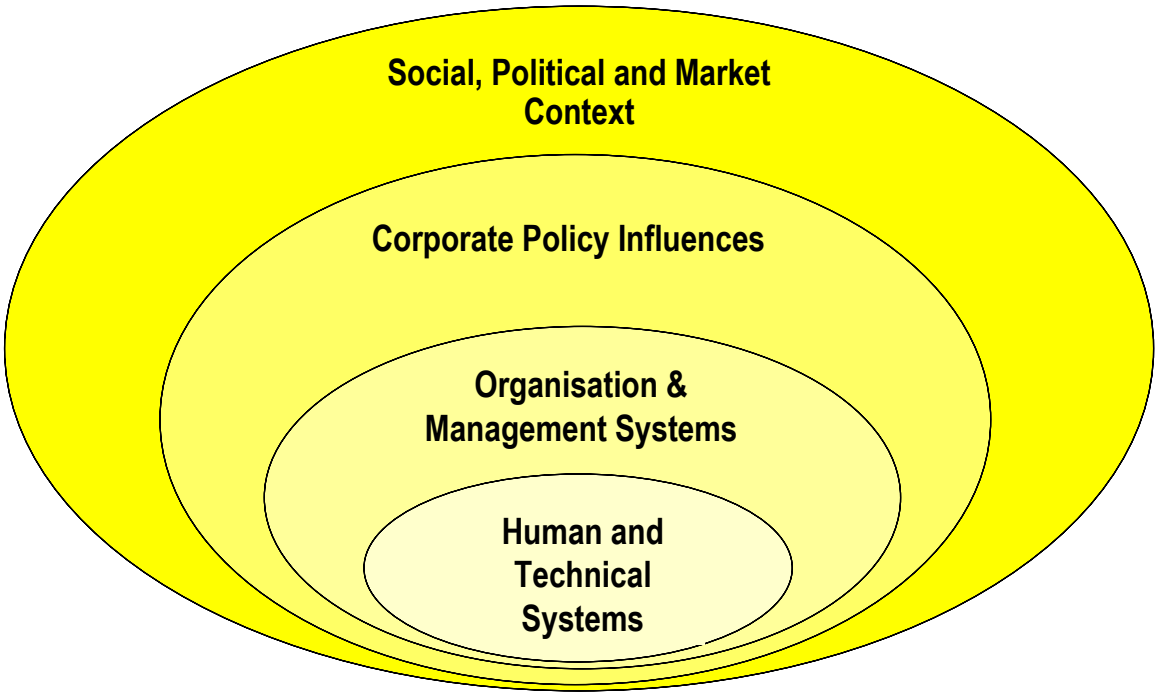


Figure 59 Nested hierarchy of influences

Effective health and safety management requires a clear understanding of the various technical, human and organisational factors that affect risk, and of the influence that each of these factors exerts. It is also essential to reflect the different mechanisms of influence within different industry sectors. Influence Networks have been developed to deal with this complexity of factors influencing an accident or ill health.

An Influence Network is a model representing the various factors that influence the occurrence of a particular event. The development of an Influence Network involves the definition of the event under consideration and the identification of the hierarchy of influences upon the event. The approach has been adopted as part of a comprehensive five step (hazard identification, risk assessment, risk control, cost benefit assessment and decision-making) Formal Safety Assessment methodology by the Maritime and Coastguard Agency (supported by the International Maritime Organization). This five-step methodology utilises the techniques to provide a direct evaluation of the effectiveness of regulatory changes in improving marine safety, and as a means of assessing the influences on safety across the maritime industry. The technique has also been used in previous studies for the HSE to examine a number of health and safety issues including falls from height (pan-industry), hand-arm vibration syndrome, goods delivery, construction plant and safety at road works.

Figure 60 illustrates the typical composition of an Influence Network. This diagram has been customised to reflect the particular issues and influences associated with health and safety in the waste industry. Within the workshop session, there was the opportunity to customise this diagram further to reflect the experience and judgment of the workshop participants about critical influences.

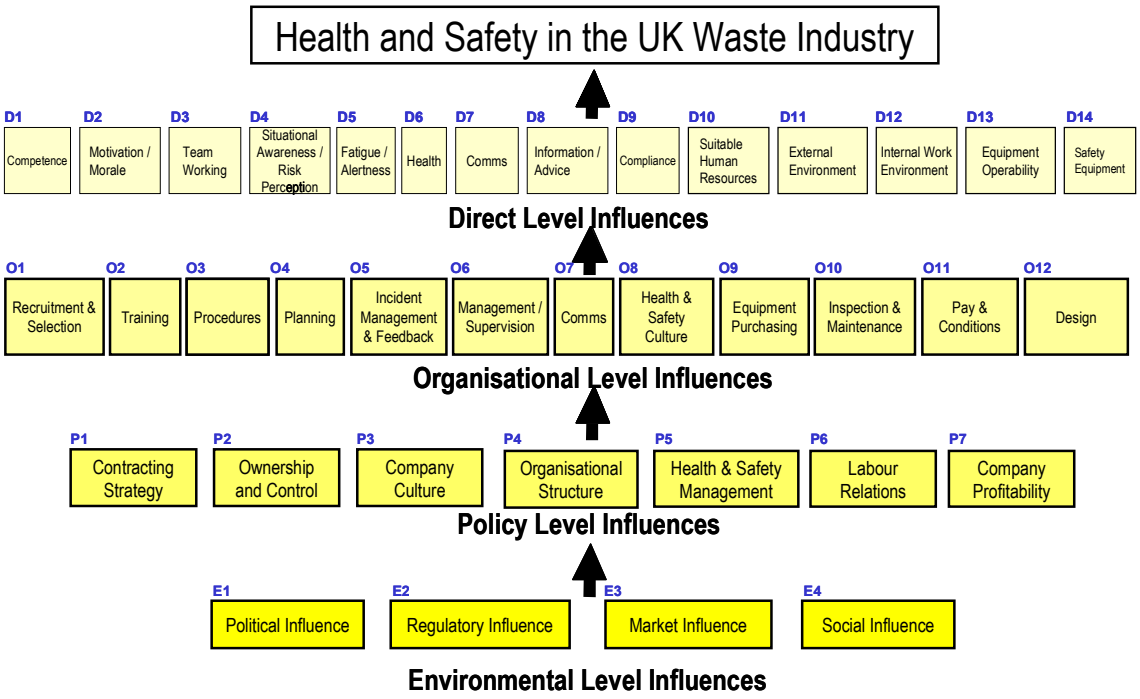


Figure 60 Influence Network for health and safety in the waste industry

Within Figure 60 there are four levels of influencing factors, reflecting the domains shown in Figure 59:

- **Direct level**, which refers to the immediate workplace factors that have a bearing on the human and technical conditions which can lead to unsafe acts and / or technical failures that are responsible for the accident or ill health.

- **Organisational level**, which refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human / technical failures.

- **Policy level**, which comprises the policy and corporate level factors that determine the organisational processes.

- **Environmental level**, which refers to the regulatory and wider external influences that determine corporate and organisational policies and processes.

8.3 CUSTOMISATION FOR THE WASTE INDUSTRY

The process of customising the Influence Network approach for application to a specific issue and / or industry consists of the following stages:

1. Define the problem in terms of the risks being considered, the parties involved (stakeholders), the physical situation and circumstances, the applicable laws, regulations and procedures, the equipment and materials being used, the failure modes being considered and the limits of measurement of both the frequency and consequence components of risk.

2. Collect and analyse all available data to establish a baseline of current and historic performance and the direct causes that can be established from this data.

3. Assemble a group of 'experts' in the topic being studied including those with direct experience at the operational level as well as those representing organisational functions, policy makers and the wider community of influence.

4. Use the experts in a structured workshop session to carry out the following steps:

5. Review the generic influence set and define each influence in more detail in relation to the 'top event' being considered.

6. For each influence define the scale from worst to best practice, 0 to 10, both in relation to practice in the industrial sector being considered, and in relation to the experts' wider experience in other sectors.

7. For each influence, agree, between the experts, its current rating on the best / worst practice scale.

8. For each influence above the *Environmental* level (i.e. at the *Policy* level) agree relative weightings of influence (totalling unity) from the level below. These are weighted as high (H), medium (M), low (L) or zero, with two intermediate classifications: HM and ML.

9. Repeat Step 8 for the influences above the *Policy* and *Organisational* levels.

10. Repeat Step 8 for the influences above the *Direct* level, considering the direct influence on the top event.

11. Quantify the Influence Network to obtain a Network Index that can be related directly to current risk level. In essence, this consists of summing the product of the ratings and weightings through the network. There is a mechanism of adjustment at each level if the experts' evaluations at that level are significantly at variance with the summation of the effects of the more remote influences.

12. Use the Influence Network and quantification model to identify critical influences and influence paths through the network in order to target risk controls on the most important influences. Define appropriate risk controls for the important influences.

13. Assess the effects of the risk controls defined in Step 12 on the existing influence ratings.

14. Re-evaluate the Influence Network Index for the revised ratings from Step 13 to assess the potential effect on overall risk level.

The risk quantification process in Steps 5 to 14 can be achieved in a one-day workshop. The ideal number of participants is around four to eight experts plus facilitator and recorders.

8.4 ANALYSIS OF INFLUENCE NETWORK RESULTS - OVERVIEW

A careful record of the workshops is kept, and the discussion synthesised to draw out key factors influencing performance and indicators of potential risk controls. In addition, some quantitative analysis is undertaken to help determine which controls have the potential for greatest impact.

The quantitative analysis of the Influence Network involves the following stages:

- Calculation of a 'risk index' using the rating and weighting values assigned in the workshops. The value is specific to the workshop topic being considered and is anchored in the views of the participants. This is then used to explore the influences bearing on the current risk level and to ascertain the potential for improvements.

- Increasing the ratings of factors in a systematic way (i.e. making hypotheses regarding improvements to a factor) in order to get an indication of the effects that these increases have on the overall risk index. This process is then used to highlight the critical factors that may have the greatest potential to reduce the overall risk and to

plot paths of influence through the network (see Section 9.10). Risk control measures can then be concentrated on these factors (based on the discussion factors emerging from the workshops).

8.5 RELATING THE NETWORK INDEX TO RISK

The index alone has little intrinsic meaning. However, were all the ratings of the influencing factors scored as 10 (i.e. representing best conceivable practice), the risk index would be 1.0. Were performance at its very worst, the index would be 0.0. In this context, a relationship with risk can be determined by postulating that the difference between overall best and worst possible practice is equivalent to three orders of magnitude of risk. Three orders of magnitude are selected on the basis that individual risks span 10^3 from the border of tolerability to the level where society currently places no demand for further risk reduction however low the cost.

The methodology is not intended to provide precise projections. However, it does provide a reasonable framework for estimating the potential for relative risk reduction offered by various risk control options.

9. WASTE INDUSTRY WORKSHOPS

9.1 INTRODUCTION

Given the complexity and nature of the UK waste industry, two separate workshops were held to address:

- Waste collection
- Landfill / treatment

In each of these workshops the intention was to address health and safety in terms of the typical activities that are undertaken in the two areas. Activities under consideration included those associated with operating the facilities (such as transfer stations, civic amenity sites, landfill sites etc.), their associated equipment and the range of vehicles and plant associated with collecting, transporting and processing waste.

Use of the Influence Network in the workshop (as described in Section 8.3) served to structure thinking on the potential influences on health and safety. A range of factors such as risk perception, teamwork, safety culture, contracting strategy and Regulatory influence were explored in order to get closer to why accidents happen and ill health occurs. The Influence Network was used to ensure that a wide range of risk control options for the waste industry were identified such that their potential impact could be assessed. The Network enabled behavioural factors to be captured alongside hardware considerations and external elements that all affect safe and healthy working.

9.2 ATTENDEES

The attendees at the two workshops are shown in Table 28.

Table 28 Attendees at the waste workshops

Name	*Company / organisation*
Waste collection workshop	
Paul Clapham	CIWM
Steve Doward	Cory
Paul Harvey	HSE
Tony Hicks	WAMITAB
Tim Guile	Cleanaway
Helen Bolt	BOMEL
Mike Webster	BOMEL
Waste landfill / treatment workshop	
Trevor Hay	HSE
Chris Jones	Cory
Dave Stephenson	Composting Association
Dan Oldroyd	Viridor
Alan Sergeant	Cleanaway
Lawrence Strong	WAMITAB
Helen Bolt	BOMEL
Mike Webster	BOMEL

The attendees at the workshop reflected the original aim of the project, which was primarily on private sector organisations. Invitations to the workshop were made to members of the Waste Industry Safety and Health Forum (WISH) and the Environmental Services Association. No local authorities were approached to attend these workshops given the initial private sector focus.

The groups were intended to represent a range of views. Nevertheless, the groups were necessarily small to allow detailed discussion. It should therefore be noted that the narrative in the following sections reflects the views of those in the workshops.

9.3 DIRECT LEVEL INFLUENCES

Ratings of current practice for each factor in the context of health and safety in the UK waste industry were assigned using the pre-defined scale (as per steps 6 and 7 in Section 8.3.). The salient points of the discussions leading to the influence ratings are summarised under each factor, firstly for waste collection, and then for landfill / treatment.

D1 Competence - The skills, knowledge and abilities required to perform particular tasks safely

Waste collection

This factor was thought to be variable between those who are interested, and those who are not. All workers have a base level of competence (around 4 to 5), and the best are beyond that. However, in a series of photographs taken by WAMITAB few workers were doing everything correctly. The exception was a team who had just passed their NVQs.

Competence was felt to be defined in terms of getting the job done i.e. making sure that workers' approach to lifting is appropriate. Most people are competent but not necessarily technically correct. The view was expressed that the safety performance in some companies was relatively good, indicating that the workforce was performing safely. However, competence was also felt to be influenced by staff turnover. The level of competence reached as a result of induction training is a minimum baseline from which competence then increases. The definition used for this factor really applies post induction.

Companies typically provide around 4 to 5 hours induction for permanent workers, and around 2 hours for agency workers. However, agency workers would not be used on the more complex jobs. Companies would prefer workers to enter the industry with a reasonable level of competence, as many of the requirements are for common sense.

There is little need to rely on individual competence as long as there are some competent workers in the team who can look after the others. Teams can effectively 'carry passengers' if necessary. Judgements are made on a daily basis, and management and supervision is particularly significant.

Some crews service 7,000 properties and, as such, there is a lot of pressure on those crews from the public. In addition, there is less spare capacity these days in terms of both people and equipment. However, competent people will be aware of the issues behind any problems.

Post induction	**3 to 4**
Rising to	**5 to 6**

Waste landfill and treatment

Plant drivers and the incineration plant workforce both contain pockets of excellence. However, there is a need to keep an eye on litter pickers in material recovery facilities (MRFs). Workers need to be self-reliant and responsible on landfill sites as there are few others around. Some workers can do their own job well, but when something goes wrong, they need others to help.

The key issue is that those who are not suitably competent should not be in charge of large expensive plant. Individual competences come together to provide an overall competence level, but companies need to reach the moderate level as there are not enough people around to compensate.

Rating	**5**

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

Waste collection

There is a broad spectrum of motivation and morale, varying with age profile.

Society has a stigma about waste, although it is more positive about recycling. Feedback from society is typically negative, and complaints are aimed directly at individuals rather than the office. There may also be a view among some of 'I'm only a dustman', but they are needed by society.

There may be little opportunity for career development. However, career development is available for the right (motivated) people. Workers have risen from the shop floor, and the best will become foremen.

Management and the strength of the team can act as motivators. 'Task and finish' is the last main motivator whereby workers can go home once they have finished their work for the day. Motivation is not so much about money; people like the work or they do not (for instance, there are examples of workers who are paid £200 a week for street collection but are a relatively happy workforce).

Weather is a motivator. There is a need for the right clothing e.g. waterproofs. Workers may want to wear shorts in the summer. However, shorts can be dangerous when handling sharp objects. Workers want to make themselves comfortable, but guidelines suggest clothing needs to be kept on for safety reasons. There is a need to be appropriate in interpretation and implementation of rules. This is very much down to how a manager puts the message over.

The reputations of some contractors can act as a de-motivator to workforces being transferred (under TUPE) to that contractor. Fixed term contracts can also be a de-motivator in the last year of the contract, with companies knowing that they can be undercut at the end of that period and removed from the contract.

Rating	**0 to 10**

Waste landfill and treatment

Getting the product out in composting gives a sense of satisfaction. There are high levels of motivation and morale on landfill sites. The perception in society is low, but motivation and morale are high and people tend to stay with their jobs on landfill sites.

MRFs rely more on short-term or agency workers as it is more difficult to motivate people for such a repetitive job on a permanent basis. There tend to be high proportions of migrant workers in MRFs. Staffing problems may be reduced by recent improvements in automating picking lines.

Drivers in MRFs have a different profile. They have been trained, and their worth is recognised. They have pride in their vehicle, and their job is more interesting and varied.

People tend to take to the work or they do not; there is not much in between. Those who like to work outside tend to have high motivation and morale. Those workers who start in the winter know that the weather can only get better; they tend to last longer than those who start in the summer. However, there is also a need to give people a clear career path and feeling of ownership in order to improve motivation and morale.

Landfill – employees	**7 to 8**
Landfill – agency	**5 to 6**
MRF picking lines – employees	**3 to 4**
MRF picking lines – agency	**1 to 2**

D3 Team working - The extent to which individuals work in teams and look out for each other's interests

Waste collection

Some workers are more aware, and would look out for each other. Team culture is important. New additions must be able to perform and fit in to the team. People do work in teams and are proud of their team. Some teams would prefer to go out a man short than go out with someone unsuitable. As teams have to work harder going out a man short, they will typically get extra pay in compensation. Bad influences in teams can cause problems. In typical teams, around 70% are core staff members.

Some teams will consider health and safety and use that to refuse to do some work. Others will think that they are being a good employee by just 'getting on with it'. Supervisors may end up taking the risks that others have ignored. Bravado can be a problem with the race to be first back to base.

If workers typically do not come into contact with anyone for 30 minutes as part of their work, they would have a lone worker assessment and be given a mobile phone. In one instance, WAMITAB discussed this issue with a worker working on his own some miles from city centre, but felt he that he was a member of a city centre team. However, it is more difficult to define what lone working is in terms of street cleaning. Supervisors are more likely to check on lone workers.

Being a franchise industry, team working is highly variable and is really down to local management. There is a need for good local managers devolving responsibility. The single most important point is the manager leading and getting information over to the workforce. If this fails then the system falls apart.

Workers must be able to understand and work on information given to them, otherwise they become totally reliant on 'old hands' and teamwork. There is a feeling that more accidents occur when 'old hands' are looking after others. The other issue relating to individuals is the ability of workers to communicate in English.

These views were felt to be applicable to both the public and private sectors.

Rating	**7 to 8**

Waste landfill and treatment

Day to day operations on landfill sites require team operations. Marshalling of customers (in refuse collection vehicles (RCVs), articulated trucks, tip and push out vehicles) requires a tip marshal. RCV drivers have to get out of the cab in order to access their controls, and are thus at risk due to landfill (and other) traffic. In contrast, push out drivers can empty their vehicles without leaving the cabs.

On landfill sites, workers are undertaking separate functions due to the nature of the job. However, landfill staff keep in radio contact and tend to warn their colleagues if a customer has not been on the landfill site before.

Customers tend to want to tip their waste and leave as quickly as possible. However, they are dependant on the landfill operator and the queue of vehicles in front of them. This is in contrast with refuse crews who are dependent on one another and thus affect each other's finishing time.

Articulated vehicles tip their container almost to the vertical. However, there is a risk that the load can get stuck at the top of the container, thus destabilising the container and leading to a potential overturn. In this case, the landfill staff and the customer's driver will work as a team, with the 360° excavator propping the tipping vehicle to stabilise it.

Landfill sites are licensed with working plans, which should set down where plant goes. However, at times, there will be the need to manage crises.

On larger landfill sites, workers will not see their colleagues in their line of sight. This is in contrast to MRFs where a team of people work on the line together. In MRFs, the aim is to get the product out, and the team needs to work together to achieve this.

Landfill (team work is not so much of an issue)	**5**
MRFs	**8**

D4 Situational awareness / Risk perception - The extent to which workers are aware of occupational hazards and risks.

Waste collection

There is a high awareness of risks due to transport and sharp objects in street collection, but not manual handling. Workers do know what to do in relation to manual handling. Often those who have knowledge and interest make the point known to others.

Significant hazards are thought of as something serious that can harm people. Handling and strains are almost viewed as occupational hazards. Workers are almost blasé about some of these issues. There is a need to stop workers thinking that this is acceptable, and reposition handling as a more significant hazard. Training was considered to have addressed this to an extent.

In high employment areas, there is a need for transient workers. Transient workforces tend to be less tolerant of the risks and hazards than full-time workers.

Key hazards	**6 to 7**
Others	**5**

Waste landfill and treatment

There are two extremes; landfill operators with heavy plant and those involved in the disposal of chemical waste have high perceptions of risk. However, on smaller landfill sites and MRF picking lines risk perception is low, and the issues are lost. Unguarded machines may not be spotted in MRFs but would be in chemical installations.

The worker guiding customers' vehicles is probably at most risk on landfill sites. Plant operators are protected to some extent by their vehicles. Plant operators are also competent and trained; they are part of a long-term workforce and plant is expensive. There tend to be few people walking around on landfill sites except for customers.

Standards vary both between and within sites.

Chemical waste	**7 to 8**
plant drivers	**7 to 8**
MRFs	**2 to 4**

D5 Fatigue / Alertness - The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol.

Waste collection

Early starts in the morning and the extensive manual element of the work can lead to tiredness. Social activities will impinge if workers are up late. Typically, about 5 hours are spent loading during the day, and the level of work is consistent. After a period, workers do get used to the amount of walking and manual work.

Different shift lengths are used. Ten-hour shifts are too long. Performance is worse on ten-hour shifts, with most errors occurring in the last two hours. There are also more hidden costs associated with longer shifts as workers take more days off.

There are no real meal breaks in refuse collection. The driver will drop off the crew while he is going to the tip, but is unlikely to have any opportunity to stop and eat himself, as the driver stopping holds up the others. Drivers will typically eat on the move. If they get home early, they will get their break then.

The public perception of workers sitting down and taking a meal break would be poor. Equally, going to toilet is also a problem; would members of the public allow refuse workers in to use their toilets?

The 'grey' economy where workers took afternoon jobs is less common now. Workers must be available for work to complete their allocated workload rather than going off to do a second job.

Skip hire is more oriented towards the 'grey' economy, and fatigue is more likely to be an issue among skip operators as the work tends to be 'cash in hand'. The amount of cash in skip hire is considerable. The operators are likely to 'get on and do it', and take whatever work is available.

Rating (skewed by skip operators)	**3 to 4**

Waste landfill and treatment

There are few real issues in comparison with waste collection. Workers will not be allowed to drive plant if they have alcohol on their breath. Plant drivers are likely to be aware that they should not risk the job or plant. In less skilled areas, this may be different.

Workers tend not to work long hours on landfill sites. Licensing hours tend to provide a limit. Similarly, people do not work long hours in hazardous chemical sites. However, incinerator plants do tend to operate 24 hours a day. Workers' motivation sometimes has detrimental effects as they miss rest breaks to fill in for absent workers to get the job done.

Key workers may need to work long hours in order to compensate for breakdowns, but this is not common. Occasional intense working may lead to fatigue. Landfill managers would soon

know about problems, and colleagues would stop the affected worker from causing danger to themselves or others. Customers are potentially the biggest problem on landfill sites; sites would turn away drivers with alcohol on their breath.

If a driver had an accident on a landfill site, then that site would report the accident. The site would also ask for copy of the 2508 form to make sure that the driver's company has reported the accident. This may lead to potential duplication of reports, but it does ensure that accidents are reported. Accident systems are driven by the need to manage claims, particularly as claims can arise later for drivers or agency workers.

Rating	**7**

D6 Health - The well being of body and mind of the workforce

Waste collection

Waste collection workers are likely to be relatively fit due to the amount of physical exercise required in the job. The unfit will be filtered out early on (typically within a week). However, it is difficult to judge someone's suitability by how fit or not they look. Attitude and the will to do the work are the key factors.

Those who take time off for no real reason distort the attendance figures. The system is open to abuse as claims of back injury are not easy to disprove. If someone genuinely has a back injury, there may be the opportunity for lighter work.

Rating	**8 to 9**

Waste landfill and treatment

This factor is a poor measure as the workforce is physically healthy. The workforce is essentially self-selecting, as those susceptible to musculoskeletal problems would not be working in the industry. Smoking is banned on landfill sites.

There is a perception that the health risks are higher for those working with compost than those for landfill workers. Information on days lost to diarrhoea etc. due to contact with landfill would be useful.

Rating	**7 to 8**

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work.

Waste collection

Communication is typically reasonable for imparting basic knowledge such as not walking in front of a car. Verbal communication is typically good between crews. However, in the South East immigrant workers (such as those from the Balkan states) have problems with communications.

There is a need to be able to deliver services quickly and safely, and companies have to be selective in whom they employ.

WAMITAB train in English and Welsh, but not other languages. The demand for other languages is not significant yet. In the 1990s, when Onyx first entered the UK market they used cartoon diagrams to get the message over. The backs of some refuse collection vehicles have pictures. Whilst pictures get the message over quickly, some companies are moving toward text.

Some skip leaflets have had Flesch readability scores corresponding to the education level of an 18-year old. This is too high. Messages need to be communicated in such a way that the key message can be understood whatever the format.

Some workers cannot read or write. This is the main reason why inductions take so long. Whilst stigmas may be perceived to be attached to illiteracy, it is not necessarily a barrier to getting a NVQ.

Rating	**7 to 8**

Waste landfill and treatment

Workers are provided with communication radios on landfill sites, as companies do not want plant drivers stopping to receive verbal instructions. Special signalling codes have been developed on landfill sites. Often individuals and organisations develop their own signals rather than use national or international signals. Thus moving from site to site may cause problems with communications.

Educational levels are becoming a major issue now in terms of basic skills, with literacy being low on landfill sites and MRF picking lines. One of the biggest problems is that workers will not own up that they cannot read. Instead, they develop excellent camouflage skills. Illiteracy should be identified during inductions. However, this requires inductions to test literacy. Language is also becoming an issue with migrant workers.

Companies have been moving towards picture-based communications for lower-level staff. However, between foreman and supervisor level there is a point where literacy is required and pictures are not enough.

Rating(the moderate description fits well, but things can go wrong on occasions)	**5**

D8 Information / Advice - The extent to which people can access information that is accurate, timely, relevant and usable

Waste collection

The issue of provision of information versus the ability of workers to absorb that information has to be considered. Information may be available in an organisation, but it is not always accessible, applicable or understandable. Crews will talk about information, and interpret it for themselves, but that information really needs to be understandable by individuals.

Health and safety minutes are difficult to communicate. Those who want the information will access it, but some are not overly interested. Aiming at the lowest level gives an impression of talking down and alienates some workers. It is a difficult balance to gain. Information only translates to those who want the knowledge.

Information needs to be made available to crews straight away. Risk assessments are discussed at inductions. They are also available with vehicles and reviewed annually thus providing an audit trail.

Skip drivers may have to look harder for the information due to their method of working (not being in close proximity to the rest of the team). Some companies tend to mail Health and safety newsletters to workers' homes.

The quality and availability of information are a function of the size of employer. Large employers tend to provide it, whilst 'one-man bands' do not. The 'one-man band' typically employs family and friends, with an element of transient labour.

See also D7 Communications.

Supply in big companies	**9 to 10**
Ease of understanding: lower and variable	**4 to 5**

Waste landfill and treatment

The industry was at a lower level until around 5 years ago. Since then, it has progressed from poor to beyond moderate on the rating scale. However, there is still long way to go to reach the level of the chemical wastes industries. The situation is variable depending on the size of the business.

Risk assessment forms part of the induction process on landfill sites. The manager takes newcomers through their job description and the risks involved. Staff often double-up for the first month or so.

Poster campaigns are not dependent on literacy. They can be used to target key accident areas relevant to a particular company, e.g. slips and trips, getting out of vehicle, reversing etc. Some sites have so many signs around that workers may suffer from information overload. There may

be occasions when the provision of information and advice can be perceived as not being important as people just want to get the job done.

The biggest benefit in achieving competence is in generating basic items like safety policies in smaller companies. There can be noticeable differences when small businesses are taken over by larger ones.

Rating	**5 to 6**

D9 Compliance - The extent to which people comply with rules, procedures or Regulations.

Waste collection

Workers are not inherently compliant, with compliance depending on the supervisor / team leader. Workers need to see why certain actions are required. Equally, these actions should not cause inconvenience. If something seems unreasonable, workers will try to 'buck the system'. For instance, with high visibility vests companies must set out their stall, then go out and reinforce the message. Once reinforced, the message becomes part of the culture. Gloves need to be available. If there is a hazard, gloves must be worn, and their wearing should be enforced. Policing was felt to be the key.

Unsupervised workplaces can lead to non-compliance. However, supervisors should not be part of a crew or else they may blend in too much. Safety infringement notices are put on files so that workers are less tempted to infringe the rules and get the supervisors into trouble as well. Once the supervisor has visited, and is out of the way, the work force know that that supervisor will not be around again and they can get on with their work unsupervised.

Compliance is likely to be variable between contracts. Large companies have structures that aid compliance, small ones do not. Skips may not be sheeted and look dilapidated. However, this will not be an issue in some cultures. Licensing was felt to be the key to raising standards.

Individuals left to their own devices	**0**
With a system present	**4 to 5**

Waste landfill and treatment

The factors D4 and D9 are inextricably linked.

With chemical wastes, workers will comply due to the potential severity of the hazards faced. Landfill plant operators will comply due to size of the plant and the accompanying risks. In MRFs, where protective clothing and gloves are required, this is not always the case.

The biggest problem was felt to be with customers on landfill sites, as they were felt to have little perception that it is important to comply. High visibility clothing is enforced strictly with drivers. Customer compliance is also required as high visibility is key to their safety.

Companies will remove those workers who do not comply. Companies will try to communicate the message appropriately to ensure compliance via perception, otherwise workers may well believe that it 'won't happen to me'.

Rating	**7 to 8**

D10 Suitable human resources - The relationship of supply to need for suitable human resources. Relates to the appropriate mix and number of workers in terms of experience, knowledge and qualifications

Waste collection

This is a localised issue. For instance, there is full employment in the Southeast.

The stigma of job does not help. There are plenty of easier jobs available at similar pay. Different cultural values may also cause problems with recruitment in some areas. The national shortage of drivers (around 20%) does not help either, and is amplified in the waste industry (around 40%). Recruiting and retaining staff is a key issue. This shortage induces other issues that exacerbate the problem; companies do not want to invest in those workers who will move on (possibly to their competitors). However, companies must deliver, and so they have to take on some drivers who will not have the full set of skills and train them to the required level. Workers do not like skip work as it involves constantly getting on and off the vehicle. They would prefer haulage work.

Agencies have control over the market as workers can get more money with agencies. Crews would rather not use agency drivers as they are perceived not to be willing to help with the work, but drag it out to be paid overtime (as lack of help slows the team). For some national employment agencies, supplying labour to the waste industry is considered to require too much effort, as companies' requirements vary from day to day. It was considered best to use local agencies. WAMITAB are working with agencies to provide training and qualifications for their workers.

Drivers	**2 to 3**
Operatives	**3 to 4**

Waste landfill and treatment

Landfill sites have been around for many years, but MRFs are relatively new (first appearing in last 2 to 3 years). In the North East, around 90% of the hazardous landfill sites will be closing by 2005. The North East has the lowest recycling of any area (4%), but the largest use of landfill, high unemployment and deprivation, along with an untrained workforce.

Six to ten people are employed at the average landfill site. Typically, the staff turnover is relatively low. When someone leaves, no obvious replacements are readily available and therefore someone has to be employed and trained extensively (at all levels). However, it is not always easy to find these people. Literacy is a problem, and needs to improve in industry as a whole, not just the waste industry.

The pace of change in processes and technologies means that waste companies need to change their skills base as future jobs will be different to current ones. However, the view is that landfill is in decline due to the legislative approach requiring more recycling and less landfill. As such, landfill is not a popular career choice within the waste industry. People leave the

waste industry and find jobs elsewhere once they have gained their Certificate of Technical Competence (COTC) qualification.

There is a driver shortage affecting UK industry as a whole. This is exacerbated in the waste industry as other driving jobs will appear more attractive. Drivers can lose their livelihoods very easily due to points on their licences picked up from problems with tyres etc. Unfortunately, this is risk to their livelihood is combined with relatively low reward.

The recruitment and retention situation in the waste industry needs to be rectified as the workforce was felt to be aging and leading to potential problems in 10 years time. New university graduates are interested in 'saving the planet', and may provide a resource. There is a need to focus this enthusiasm along with that of not for profit volunteers. It is anticipated that there will be a need for 40-50,000 extra workers in the industry over next few years. Given that it was thought that there are only around 100,000 workers in the industry now, this represents a substantial increase in the size of the workforce.

Rating	**2 to 3**

D11 External working environment - The conditions external to the work site which impact on work activity e.g. weather, public proximity, traffic, external distractions, muddy conditions etc.

Waste collection

The environment impacts on workers every day of the week. Weather and clothing are key issues, and there is a battle to get workers to wear trousers and high visibility clothing in high temperatures.

Dust, smells and broken glass are the occupational problems. The public tend to be really negative, and do not have anything good to say. In addition, there are violence, abuse and stress from the public. Irate motorists and violence at Civic Amenity sites affect workers. Street cleaners are easy targets as they are constantly amongst the public. Some workers have been attacked with baseball bats, whilst others have faced threats with guns. Needles have been deliberately put in knots of bags. The workforce was considered to be very restrained given level of abuse that they faced.

Rating	**1**

Waste landfill and treatment

There is a full range of standards in the waste industry, with some being site specific. Most of the definitions exist within the industry. The factor definitions do not due justice to the size of the issue and the difficulty of the working environment. However, the factor is likely to have a low influence on health and safety.

Weigh bridges and plant are air conditioned and reasonably 'pleasant'. Weather conditions can cause problems with moving vehicles on muddy un-compacted tips. However, there are a variety of procedures for dragging vehicles out. Landfill slopes that are too steep, or have been compacted insufficiently add to the risks, and may lead to accidents.

The bumpers on the front of refuse collection vehicles are being lowered for pedestrian protection, and the European standard for insulation and noise is being implemented. Tipping waste on the floor and re-handling in MRFs affects the environment, but is a way of getting waste distributed. There is a culture of tip and double handle rather than tip into a container or conveyor. This may be due to a lack of space or to provide the opportunity to recycle. To recycle waste, there is a need to split bags open; this makes the environment somewhat more unpleasant.

There is a move to try to get manufacturers to produce refuse collection vehicles that can be used on landfill sites site as well as collect waste.

Rating	**0 to 10**

D12 Internal (Vehicle/Plant) Work Environment - The level of noise, temperature, congestion, light and vibration within, on or around the vehicle / plant.

Waste collection

Equipment will have as many risks as possible engineered out e.g. noise and dust, but there will still be some residual risks due to the nature of the work. This factor is not as bad as the external working environment. In fact, it was considered much better than 15 years ago. Masks are available for landfill workers but they are still felt to be uncomfortable. One-man operators tend to have older, poorly-maintained equipment.

The increase in recycling has led to flat bed vehicles with multiple stillages, but often of poor design. There is still a way to go. Decibel information is given on refuse collection vehicles (RCVs), but few people understand what this actually means.

Regulation is needed for wheeled bins in order to move away from the manual handling of waste. It was felt that this issue needs legislation to take the decision-making away from local authorities. Local authorities were not felt to be making decisions on rational bases; they tend to want to stay with black bags as they are cheap. The decision on bags or bins needs to be taken away from competitive market place. Regulation was felt to be the only way to do this.

Rating	**3 to 4**

Waste landfill and treatment

Some of the plant in MRFs may be based on agricultural conveyors, and unguarded conveyors can occur in some MRFs. High technology has appeared very recently, but process engineering skills are not common in the waste industry. In the past, the waste industry did not buy equipment from process industries, relying instead on modifying equipment and making it work. There is still a legacy of this, but the situation has changed recently, such that plant is now being specified with process issues in mind.

Ergonomic considerations have also been missing in the past. Manufacturers were not aware of issues, and customers were not specifying ergonomic requirements. This is also changing now in the major waste companies.

Companies such as Schweppes have used this approach for years. There is nothing new, and the expertise is there in other industries. However, it is very difficult to attract process engineers from the oil and gas industries into the waste industry. There is an analogy with foundries, in that people do not own up to working in the waste industry. There is a need to tap into those who want to improve the environment.

There is a need for good house keeping. MRFs have typically been incorporated into old unsuitable buildings that are not high enough and may be enclosed on three sides. The roof form may dictate the location of plant. The size and shape of buildings were felt to be more important to planners than efficient waste handling.

Larger companies	**8 to 9**
Elsewhere	**4 to 5**

D13 Equipment (Vehicle / Plant) Operability - The extent to which the design of the equipment / vehicle / plant allows safe operation and the degree to which it is inspected and maintained to promote safe operation. This relates to inherent design features such as stability, access, visibility and physical protection.

Waste collection

Larger companies were felt to be responsible, but other operators were not felt to be as diligent. LOLER and PUWER have been a major influence on large companies. Older equipment is typically passed on to smaller operators where it may not be so well looked after (although it was suggested that this may be doing injustice to some smaller operations).

In terms of design, visibility is improving but getting in and out is still poor. For improved safety and operability the design of facilities needs to be compatible with the design of vehicles. Kerbside design was not felt to be keeping up with the fast moving industry. Drivers have commented that 'no one ever asks us', but manufacturers would comment that it is difficult to cater for everyone's needs within the timescale available.

Design is driven by manufacturers in order to give them competitive advantage. Chassis are often standard despite carrying reasonably high technology equipment. All the effort tends to go into the body rather than the chassis. This leads to difficulties with access due to problems with steps and low quality handles. With the growth in recycling, money is available for capital expenditure, but manufacturers do not have time to keep up with the waste industries' requirements.

Waste collection operators have no control over landfill sites owned by other companies, particularly in terms of access and egress. Landfill contracts are poorly defined, and delays on the landfill site are not penalised but can impact on the turnaround time of waste collection companies who will be penalised for delays on other services. Where there are no speed ramps or one-way systems in the mud on landfill sites collisions are more likely. In these circumstances, there is a need to educate drivers to slow down.

Bespoke equipment	**6**
Chassis (but this varies as one chassis can be good on landfill sites but no good for collection rounds).	**2 to 3**

Waste landfill and treatment

Major plant costs upwards of £250,000, and receives good maintenance.

Landfill plant is well maintained, with contracts with Finnings and other manufacturers for preventive maintenance. Planned maintenance systems are being put in place elsewhere (e.g. for MRFs), but there is still a need to educate directors of value of this. Newer expensive equipment is more likely to be maintained. However, the standard can be poor on some small landfill sites.

Major plant	**7 to 8**
Elsewhere	**1 to 2**

D14 The extent to which SAFETY equipment / PPE is available, conforms to best practice, meets the usability needs of the worker and is inspected and maintained. This includes features such as protective clothing, vehicle restraints, safety signs, warning devices and visibility aids.

Waste collection

The provision of equipment is excellent as good equipment is available. Use and maintenance is the issue. However, the use of equipment is still reasonable, somewhat better than it used to be. Larger companies tend to fair better.

Toetectors need to be worn in as they give blisters over long 10-mile day. Therefore, new boots are not popular. There is a need to give workers what suits them. It was felt that buyers do not understand the requirements of workers, and buy on cost alone. Boots can cost as little as £10 to £15 per pair, but some boots last longer than others and companies can end up replacing cheap boots more quickly. In addition, there is a turnover of boots with staff. Those who leave in a week take their boots with them.

Rating	**8**

Waste landfill and treatment

There are differences between the standards of employees and customers on landfill sites. Demanding standards are set for customers on landfill sites. Landfill sites will turn away or ban drivers if they do not comply with the site rules. Equipment is more of an issue in collection. The standards are relatively high on landfill sites as there are fewer people to manage. The waste industry has become more professional in recent years, and these higher standards are there for people see and adopt as the norm.

Rear view cameras started being fitted more than 5 years ago. Even smaller skip operators will have high visibility clothing. However, the standards seen on construction type sites are relatively low. There was felt to be a need to raise industry standards across the board, and raise standards together.

It has taken time to raise standards. The level 1 NVQ addresses PPE, but many workers have not been though this. People need to understand why they have to wear PPE, rather than just be told to wear it. Examples are needed to overcome the ‘it won’t happen to me’ attitude. Drivers are paid per load, and, as such, they have little incentive to stop for even short (2 minute) safety talks.

There is a resistance among site managers, with a perception that HSE is looking for big companies to regulate smaller ones. The Management of Health and Safety at Work Act does require coordination between companies though.

Sites	**8**
Customers	**5**

9.4 ORGANISATIONAL LEVEL INFLUENCES

O1 Recruitment and Selection - The system that facilitates the employment of people that are suited to the job demands

Waste collection

There is pressure on waste companies due to the limited availability of labour. Anyone can come in for an interview and sound enthusiastic, but they may not necessarily last long. Agencies can be used as a weeding out process, or workers can be taken on a 3-month trial. Competence level can be established as workers progress.

Recruitment policies are typically written down, but companies do need to recruit in difficult situations. The base criteria tend to consist of health questionnaires, interviews, references and intuition. Potential recruits will be excluded if they smell of drink.

Rating	**5**

Waste landfill and treatment

Plant operatives need to be trained up to the required level, and a clear vision of those requirements is necessary. For chemical wastes, the requirements are clear.

Operatives require COTC level 1 to obtain a job. The age profile of those in training is around 35-39, suggesting that people may have been in the industry for a while before seeking qualifications. The problem is getting less skilled workers up to the required level.

Recruitment systems are in place. Formal checks are undertaken when recruiting supervisors, and companies will check to see that people fulfil the recruitment criteria.

For MRFs, recruitment is based largely on whether workers turn up and stick with the job.

Rating	**4 to 6**

O2 Training - The system that ensures the skills of the workforce are matched to their job demands

Waste collection

The amount of training provided depends on the seniority level of the workforce. A larger proportion of the training effort is spent on senior staff (who probably need the training least). However, this is not always provided due to lack of staff time. Graduate trainees or those transferred under TUPE may well be provided with courses. NEBOSH courses may occasionally be available. Companies will invest in those qualifications that legislation requires their staff are legally required to possess in order to operate. Around 5,000 hold the COTC qualification.

Companies recognise the benefits of training and that it will affect the bottom line, but often do not have the money to invest. Cost and time are the main barriers to training. As there is no culture of training, budgets are typically not available. Local authorities have had more of a training culture in the past. Also, companies do not want to invest too much money in those workers who will move on.

There are numerous training options available, including NVQs. NVQs require assessments of competence, and there is a need for training to get that competence. Typically companies would want in-house training as they require relevance to their businesses. On the job training is key, but there is no need to train workers over and above basic operational requirements. Companies provide more on the job training than is actually realised or documented, i.e. toolbox talks, informal visits etc.

Structured training	**3 to 4**
Informal training	**6**

Waste landfill and treatment

The moderate description fits this factor well. Smaller businesses tend to do what is needed to comply, sometimes less. There is very poor investment in the workforce in some places. Training expenditure is generally low, although it will vary. Having the money available is a key issue.

In MRFs, there may be a tendency to do the minimum in terms of training, as companies are not sure whether workers will stay or not. Views may be expressed of why invest in workers when some only stay two weeks. Therefore only the minimum is provided for health and safety training. Companies will invest in people once they have established themselves and look likely to stay. However, this leads to a self-fulfilling prophecy. Workers are taken on, but there is perceived to be little point in training them, as they may move on. The trouble is workers move on, as they do not feel valued. If one company trains its workers and they subsequently move to a competitor, this disheartens the companies that have put in the effort, into providing training.

Rating	**4 to 5**

O3 Procedures - The system that ensures that the method of conducting tasks and/or operations is explicit and practical

Waste collection

This factor was felt to be good in large organisations where procedures were also quality assured. In addition, environmental issues are relevant. Operatives tend to be familiar with the relevant procedures. Whilst the framework is there, plain English is required. Delivery of the procedures is typically by induction and paper copies.

NVQ level 4 requires demonstration of the ability to implement procedures. Often NVQs will prompt reviews of the procedures leading to company-wide improvement. Unions need to be consulted for changes to operational procedures. However, it is sometimes perceived as being too much hard work to change the procedures. Takeovers also cause problems in merging different sets of procedures .

Rating	**7**

Waste landfill and treatment

In landfill operations, procedures are effectively job descriptions; for tip marshals they also provide a risk assessment for the job and site (e.g. with liquid waste different trench hazards are identified). A training matrix is provided and signed off when each item has been addressed. Workers would also be provide input into procedures nowadays.

Working procedures for placing and compacting plant have to be authorised by the Environment Agency. The level of detail covered in these approvals, will vary between regions as some Environment Agency regions consider that they also have a health and safety role.

As with other factors, there is the contrast between small and large companies, with large companies having procedures in place. There are few common industry standards. Company standards are not pooled together, unlike in other industries. However, this is also a function of the number of mergers and acquisitions within the waste industry. Larger companies also tend to have ISO 14001 systems, with smaller companies being increasingly left behind.

Ten years ago, the waste industry was very competitive, and there were no common standards. With the industry now maturing, there is more collaborative work through forums such as the Waste Industry Safety and Health forum (WISH) and the Environmental Services Association (ESA). However, it is not a ‘joined-up’ industry, and associations do not involve everyone in the waste industry.

It is detrimental to the industry as a whole if each company is asking for something slightly different from manufacturers. For instance, in the past, the plant used in the waste industry tended to be construction equipment. Now, plant is specifically designed for the waste industry, with JCB having a waste day and Finnings-Caterpillar having a waste industry catalogue.

Larger companies	**7+**
Elsewhere	**6**

O4 Planning - The system that designs and structures work activities

Waste collection

With licensed facilities, risk assessments are mandatory. They are typically produced as a function of the way of working, and reviewed yearly. With long-term contracts of around seven years in the municipal sector, planning would be required in order to complete the rounds. The only real question mark is whether risk assessments are always applied, particularly in smaller organisations.

Larger organisations	**7 to 8**
Smaller organisations	**5**

Waste landfill and treatment

Risk assessments are effectively built into procedures and working plans. However, planning is not joined-up in terms of health and safety risks. Sometimes existing problems are imposed on companies by local authorities and cause planning difficulties. For instance, LAs may hand MRFs over to waste companies with as little as forty-eight hours notice. Also, in relation to waste collection, LAs may insist on the use of large (difficult to handle) collection boxes.

Rating (unfair in some cases; Landfill sites would be well planned)	**5**

O5 Incident Management and Feedback - The system of incident management that ensures high quality information is available for decision-making when and where it is required, including the collection, analysis and feedback of incident and near-miss data.

Waste collection

Feedback tends to be provided informally. Companies are better at considering actual accidents than near misses. Near misses are almost considered as occupational hazards, and workers 'just get on with it'. Near misses require forms, statements etc. Systems may exist, but people need to use them. However, workers will modify their behaviour, and avoid schools at break time and tackle busy streets after rush hour.

The Environmental Services Association provides a forum to consolidate health and safety information; and a variety of forums exist within the waste companies. Monthly reports are typically reviewed in meetings and information and actions are fed back. Trends are also monitored.

Companies will break down the information as best as they can. However, categorisation of reported accident data was not considered to give very meaningful results. Some waste accidents will effectively be 'hidden' by being classified as road traffic accidents.

Rating	**6**

Waste landfill and treatment

On landfill sites, there are clear and precise accident recording procedures. All accidents are reported, no matter how small they may be (e.g. two vehicles 'touching' on a landfill site). Companies encourage incidents to be reported. The quantity of accidents is not necessarily seen as a 'black mark' against particular sites, but is used to identify trends.

Local authorities do require brief prequalification questionnaires to be filled in. They tend to ask for the number of RIDDOR reportable accidents and then try to score by numbers. This will be beneficial to those who under-report their accidents.

The worst area was felt to be those companies with around ten employees. The larger companies were felt to have reasonable standards, whilst smaller family businesses tended to be more altruistic.

The value of incident management doses not seem to getting over to smaller companies. They will sack workers instead of improving the system. Companies need to identify problems; for instance those involving drivers having minor accidents, and track down the reasons for this before they have any major accidents. A culture change required.

Customers tend to take accident reports personally rather than as helpful feedback. The difficulties are that smaller firms are customers, and often an individual driver is the problem rather than those who run the small companies. The questions was asked as to whether too

much is expected of SMEs. It is difficult for owners/entrepreneurs to admit that they have made a mistake, as the price of failure for SME owner is, potentially, the loss of personal assets such as their house etc. Hence, many take it personally. Loss control needs to be stressed. Interface and interdependence issues need to be tackled between smaller and larger companies.

Rating	**7 to 8**
Pockets of	**3 to 4**

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

Waste collection

It was felt difficult to generalise on this factor, as getting the right person is the key issue. People need to fit in. Management improvement has been by an 'old boy' network, with being known in the first place being the key criteria. People brought in from outside the industry tend to fail in many cases. Managers were thought to be promoted to their level of incompetence, - but this happens everywhere.

The key to success in the waste industry is to isolate the poor managers and bring up the average level. Managers need credibility, visibility and arrogance. A will to succeed is essential to 'get on with it' and support your team, but managers need to be firm as well (almost an 'iron fist in a velvet glove'). An understanding of the waste industry and the company are essential, as is the ability to motivate people to go out and do an unpleasant job with the accompanying abuse from the public. Whilst there may have been pressures to reduce the number of managers in the past, the industry was felt to be over that phase now.

At the smaller end of market, the management style tends to be more autocratic in order to get things done. It was felt that in some smaller companies potential employees may be handed documents and told if you want the job sign here.

It was felt that leadership should be a separate factor.

Rating	**0 to 10**

Waste landfill and treatment

Management and supervision are key issues, and are also linked to feedback.

There were felt to be two types of managers:

- Workers who have been in the industry for 20 years or so, starting as a driver and rising to landfill manager.
- Graduate trainees progressing to landfill manager.

The graduate managers were felt to be more receptive to health and safety messages, in general, than the older workers who have always 'done it that way in the past'.

There are significant barriers to graduates being 'accepted'. They need to get out there and do the job, get the certificates etc., as this earns them the respect of the workers and makes it easier to get the health and safety message over. Such an approach also avoids graduates thinking that they know it all, and developing an autocratic management style.

There was felt to be a need to get trainee managers out there on site to get the relevant experience, and to see if they will take to the work. The issues tend to be physical i.e. line of site and vehicles striking people rather than the more theoretical approach found in chemical sites where risk assessments are built in as a matter of course.

Overall, management and supervision were felt to be fairly good. It was suggested that if they were not, there would have been more accidents involving customers.

Rating	**6 to 7**

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

Waste collection

It was felt that this factor was slightly better than moderate. However, care was needed to avoid flooding people with information.

Rating	**6**

Waste landfill and treatment

Health and safety meetings tend to be held at least every 6 months. They are also held when something happens. Local council employees were not felt to be so keen to take part in safety committees. There is an 'us and them' culture, where employees are frightened to voice their opinion in case they get the sack.

Negative peer pressure is also an issue. Some companies will try to communicate, but receive no response. The question was raised of how this could be dealt with in order to get worker ownership.

Rating	**5**

O8 Safety Culture - Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to safety

Waste collection

In the larger companies this factor would be rated near the upper end of the scale.

The historical HSE focus was felt to be on construction, with industries such as waste thinking that the focus might move onto them next; hence, the improvement over the last 5 years.

There was felt to be a resistance to new ideas, but there are so many regulations now that compliance has to be achieved. Audits are now more common and there is less fear of them. Audits are now viewed as a health check to help improvement in areas of shortfall. In some cases, health and safety audit scores are linked to bonuses.

Workers are more safety conscious than they may let on. They do not see health and safety as a bolt on, just part of the day-to-day job.

Smaller companies bring the industry level down; this is disappointing for the industry as a whole. The corporate view might be that failing companies can be taken over and their problems rectified. However, it was considered difficult to reach organisations that do not have to have licenses. As legislation expands, these organisations should become more visible.

Larger companies	**8**
Elsewhere	**3**
Overall	**6**

Waste landfill and treatment

Local authorities were not felt to have been interested in the past, as such, and workers took the view that employers were not interested in them full stop. Aging workers have carried this view forward.

Workers think that health and safety is something for their company to deal with, not them. Workers do not always appreciate what their responsibilities are, and are surprised to find that health and safety is their responsibility as well. The prevailing claim culture has inflamed this view (i.e. the company is to blame). Companies need to be persistent to get the message over. It can be a bit harder to get the message over to loaders and pickers, as the response tends to be along the lines of 'why do you want to talk to me, it's the company's problem'.

There tend to be responsible corporate structures now in these times of rapid change. The waste industry was felt to be in the early stages of developing a culture. Such a safety culture will help workers feel valued. Simple things were felt to be important in establishing a culture. For instance, with mess rooms there is an expectation that they will be well-kept. As such, cleaners are employed, and this boosts the feeling that workers are valued. Unfortunately, mess rooms deteriorate quickly as a result of visiting drivers.

First aid kits in vehicles are another issue. There is a need to get the message over about the contents of the kits and their use. This requires communications and consultations.

Rating (there are pockets of hope, but the rating is low as the culture has only been developing recently)	**3**

O9 Equipment Purchasing - The system that ensures that the appropriate range of equipment is available

Waste collection

This factor was considered to be rated slightly above the moderate definition.

Companies can only purchase what equipment is available. Equipment that may meet requirements now may not do so in 3 years time, but the contract may be for 7 years. Equipment is typically specified as being the best value for money at the time of purchase.

Some contracts may stipulate that equipment should not be more than 12 months old at the time that the contract is signed. Local authorities (who may know little about equipment) can effectively end up specifying what equipment waste companies should purchase. For instance, large kerbside collection boxes may lead to manual handling injuries. In flats, glass boxes, wheeled bins and boxes all require manual handling over significant distances. These requirements are all contrary to good health and safety practice.

Rating	**6**

Waste landfill and treatment

There are, essentially, two categories of purchasers: waste companies who purchase their own equipment, and clients who provide the equipment for the waste companies.

The waste companies that purchase their own equipment are typically good at providing specifications. The landfill manager will also be involved, and will approve the specification as well. The equipment is then purchased by competitive tender through the procurement department. Companies tend to go for best value. In some companies, capital expenditure over £5,000 has to have health and safety approval before the equipment can be purchased.

Equipment provided by clients tends to be dominated by price. Waste companies are typically not consulted, and the purchasing can be a function of the concerns of particular local authority directors. Waste companies thus have to take what they get and make it safe.

There do tend to be problems with equipment supplied in its most basic form. Machinery guards may be obvious to deal with, but ergonomics issues are not so obvious or easy to deal with. European equipment typically does not have interlocks fitted. The fly wheel will keep going when the equipment is switched off and, with no interlocks, anyone can open the door and put their hand in.

Small companies are either choosy in the equipment that they purchase, or they will go for cheapest/simplest option. Trucks with no computers or restrictors provided on an old chassis cost around £5,000, compared with £50,000 for a new model.

Equipment purchased by waste companies	**7 to 8**
Equipment provided by clients	**2 to 3**

O10 Inspection + Maintenance - The system that ensures vehicles, plant and equipment are maintained in good working order.

Waste collection

The rating for this factor was considered to be near the higher end of the range.

Waste companies typically undertake their inspections beyond requirements of the regulations such as LOLER. Inspections tend to be every five weeks (rather than the stipulated six). Operational needs are paramount, as the costs are considerable if a vehicle breaks down. Health and safety benefits accordingly.

Companies need the requisite knowledge to identify problems. They might not have been so aware in the past. For instance, bin lifts can wear with time leading to the bins flying off the back of the refuse collection vehicle. In this case, in-house amendments were made and shims were introduced. This was then fed back to the manufacturer to correct in future vehicles. Feedback comes in all the time, with daily defect sheets being filled in by drivers and fed to workshops. For such a system to work, drivers need to be trained to look at vehicles at both the start and the end of the day.

In contrast, skip lorries were not always considered to be properly maintained and may be allowed to get into a bad condition. Skip lorries are relatively long lasting, and it is possible to install the skip lift on other chassis. Instances have been seen of skip lifters on chassis with insufficient braking specification.

There are DoT legal requirements for vehicles. Operating licences are required by larger companies, but skip companies do not need them.

larger companies	**9**
Skips	**0 to 2**

Waste landfill and treatment

See the discussion for factor D13 *equipment (vehicle / plant) operability*

O11 Pay and Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

Waste collection

In some waste companies, breakdown money is paid at the overtime rate. However, the conditions are typically discretionary. Workers are paid to complete their round, and in some companies they would not get paid for the breakdown time as they have to get the job done within the 8 hours that they are paid.

Conditions have improved in recent years, with refuse typically being in sacks now. However, there is still a stigma associated with job. Some people would rather be broke than work in the waste industry.

Rating	**5**

Waste landfill and treatment

Workers were felt to be well-paid in terms of the level of competence required. Incinerator operators in heavy industrialised area will need to pay wages comparable with other industries. MRF pickers tended to be agency workers. There is a relatively low turnover of workers on landfill sites, and it was suggested that if companies were not paying enough, then many of these worker would have moved on by now. In addition, some people just want to work in the open air. The perception among the public that pay in the waste industry is low was considered to be unfair.

The shortage of drivers is a problem for UK industry as a whole. However, logistics companies will tend to pay more, and the aspiration of many skip drivers is to be tanker drivers. This exacerbates the shortage in the waste industry where workers are required not just to drive, but operate the vehicle as well. Some drivers who are not familiar with operating waste vehicles will back the vehicles in and then have to ask how to operate hydraulics.

There was a feeling that linking bonuses to safety performance would not be a positive step, as such a move may well prompt under-reporting.

Rating	**6 to 7**

O12 Design – The extent to which design of facilities, plant and vehicles takes into account the work activities and how they can be carried out safely and without detriment to health.

Waste collection

Operational issues predominate. Manufacturers fit guards but not interlocks, and some safety features are difficult to use. Vehicle design and safety are reasonably good with cameras, beacons etc. provided. However, there is still some way to go. The vehicle industry is reactive not proactive. Defects in skip lorries have now been rectified after feedback from HSE.

The design of vehicles and facilities have typically not been coordinated. In the past bin lifts were not interchangeable, and companies were limited to purchasing from the same manufacturer of bins and vehicles. The situation has improved now, with standardisation of all bins on all vehicles.

It was felt that ten years or so of change are required before recycling contracts really hit the right level. The disposal and sorting facilities are not available yet, so companies have to 'make do' in the intervening period. The manufacturers were not felt to have kept pace so far.

It was felt that the RIDDOR accident data does not correspond with the delegates' perceptions of health and safety performance levels in the industry. Some companies have made major efforts to reduce accidents, and now typically have one RIDDOR reportable per month in 350 workers.

Rating	**6 to 7**

Waste landfill and treatment

See also the discussions for factors D12 and D13.

In the past, rolled hardcore would have sufficed. Now landfill operators are improving the road surface for customers by laying tarmac on hard road up to the tip face. When the tip face is no longer required, the tarmac is recovered and recycled for use elsewhere.

The rating for this factor was felt to be moving towards the moderate definition in MRFs.

Major vehicle manufacturers were not felt to have appreciated that vehicles on landfill sites suck paper into their engines. Manufacturers were thought to be more interested in providing an array of facilities on the back of refuse collection vehicles to impress local authority councillors. The performance of RCVs is reasonable on the road, but their off road performance is not so good. There was felt to be a need to adapt the technology.

When equipment is designed specifically for a purpose, that design is typically reasonable. However, some manufacturers were still felt to be repeating previous mistakes. Central drive controls can lead to drivers jumping out on the move and breaking their legs. In mainland Europe, there is a tendency for workers to hang on the back of RCVs. In the UK, this is

considered undesirable, and the steps are removed. Skips with remote door opening would improve safety, but designers felt that the waste industry would not pay an extra £400 to avoid doors flying open and injuring their workers.

Rating	**4**

9.5 POLICY LEVEL INFLUENCES

P1 Contracting Strategy - The extent to which health and safety is considered in contractual arrangements and the implications

Waste collection

There is typically not a large supply chain in the waste industry. Health and safety are addressed in prequalification for local authority contracts. However, it was suggested that some councils try to devolve all health and safety responsibilities to waste companies even though they are not allowed to do this legally.

Local authorities can set 'impossible' tasks and leave the waste contractors to get on with it. With recycling, they were felt to pay lip service to the health and safety paperwork submitted, but there was felt to be little evaluation of the information provided.

Awareness of health and safety among local authority clients was felt to be poor, leaving waste contractors to address the problems. Local authorities could end up requiring workers to lift heavy boxes of paper and glass into vehicles by specifying large capacity boxes. Often there is no choice in collection boxes.

On some occasions local authorities will specify health and safety requirements. Questions would include whether organisations had had prosecutions for health and safety. Local authorities will want a minimum standard to be met, but price was felt to be the primary issue.

Typically, local authorities will specify criteria such as wanting few vehicle movements. By using multi-collection vehicles with three compartments containing refuse, paper and glass waste companies can cut down the number of vehicle movements. However, the disposal sites need to be close to minimise the number of longer vehicle tips.

Skips tend to be from the construction industry for one-off uses with no real contract.

Rating	**4 to 5**

Waste landfill and treatment

Major contracts with the likes of BP etc were felt to be very good. However, some local authorities were felt to have tried to transfer their responsibilities to waste companies, including that for their duties under the Health and Safety at Work Act (which they obviously cannot do). This has been the case with compulsory competitive tendering (CCT) for ground maintenance.

In contract documents for work with stores or supermarkets, safety on their premises is not well defined. As such, there is a need to carry out risk assessments on the clients premises before submitting a tender for contract. In particular, interface areas can have significant risks associated with them. For instance, stores may well use large bins for their waste, but these have to be controlled manually on the way to the refuse collection vehicle. Clients do not always ask to see risk assessments.

The construction of MRFs is improving now that the CDM regulations are in place. Waste companies can now control their contractors to a greater extent. Compliance with the CDM regulations is also required for landfill sites. In some cases, landfill operators can end up fulfilling the client, contractor and designer duty holder roles under CDM. Some waste companies have had to train SME contractors in their CDM duties.

Collecting waste from double glazing companies was felt to contain significant risks. The question was raised as to how many small companies would assess the risks for collection, or whether they would just undercut their competitors. SMEs were felt to be losing work to major construction contractors, as the larger contractors have the resources for the CDM prequalification.

Large clients	**8 to 9**
Local authorities	**1**

P2 Ownership and Control - The extent to which ownership and control is taken over sustained health and safety performance.

Waste collection

Larger organisations	**9 to 10**
Smaller organisations	**0 to 2**

Waste landfill and treatment

Ownership and control was felt to have improved dramatically in the last ten years or so as the industry has matured. This improvement can now be seen in members of the board visiting sites to discuss safety (as a means of connecting the top to the bottom of the company).

Rating	**7 to 8**

P3 Company Culture - Culture within an organisation consists of assumptions about the way work should be performed; what is and what is not acceptable; what behaviour and actions should be encouraged and discouraged and which risks should be given most resources.

Waste collection

Waste companies have to take a reasonably long-term view as most waste contracts are typically long-term. Culture has been improving; companies have no option but to improve in the current corporate environment. The driver is a desire to get it right rather than a fear of litigation. Collectively, the industry was felt to be demonstrating a good culture. Companies are good at sharing experience. Movement of personnel between companies means helps people develop their networks.

Developing the appropriate culture requires the right managers (with integrity) to be in place. Typically more than one manager is responsible for health and safety. This provides a safety net, just in case some have lower standards.

The workforce is unionised in some companies, in which case workers will seek out their safety representatives. Poor was felt to be the norm with SMEs.

Rating	**7**

Waste landfill and treatment

It was felt to be difficult to provide definitive ratings for this factor as there were elements of each level (poor, moderate and excellent) evident in the industry.

There are still old style grandfather rights in some areas, combined with aggressive management styles.

Companies are now getting more involved, but do not necessarily want to spend money on people. A positive aspect is that riding on vehicles is no longer considered acceptable in the UK, although it still is in Germany.

There are territorial issues in some areas, and companies will go in at excessively low prices to 'protect' their territory. There is also a rush to fill up landfill sites before the full implications of the landfill directive are felt. This is forcing prices down. No one will invest when prices are falling. However, where companies have invested in NVQs, accident rates were stated to have reduced significantly; workers felt valued and there is a lower turnover of staff.

Culture can change rapidly, for good or bad, with takeovers. It was considered to be easier to change the culture of the management than the workforce in a takeover situation.

Rating (variations both with geography and within companies)	**1 to 10**

P4 Organisational Structure - The extent to which there is definition of safety responsibility within and between organisations

Waste collection

Site meetings are held on a regular basis at disposal sites; similarly with clients. Health and safety will be on the agenda. There was a feeling that clients are typically only interested if something has gone seriously wrong. Clients do not tend to monitor health and safety performance, they assume that it is done internally.

Waste companies typically have a health and safety director or compliance officer answerable to the chief executive. Health and safety never had a corporate voice in past (or a budget).

Trained safety representatives are provided on each waste contract. Typically, they would have had two days training. Issues raised by the safety representatives are fed up to managers, then to the area manager and on to regional and national managers. The process is well structured. The safety representatives are the voice of the workers, but are not responsible for the workers' safety; that responsibility remains with managers.

Major companies	**7**

Waste landfill and treatment

Companies that are accredited to ISO 14000 have clearly defined structures. Some companies are also seeking OHSAS 16000 and 18000 accreditation.

Many local authorities were felt to be confrontational in an old-fashioned way, although some were considered to be more reasonable - largely due to individuals. Some local authorities have been directed towards compulsory competitive tendering, and have felt compelled to award contracts to companies that they would rather have not awarded work to. As such, the companies just get on with it

The Environmental Services Association (ESA) has a health and safety committee constituted from ESA member companies. This forum is used to discus concerns about health and safety. Smaller companies were perceived to view ESA as a 'big boys club', when the reality is that the smaller companies are missing out, and end up either reinventing the wheel or just not doing anything at all. The larger companies want to raise the level of industry as a whole and achieve a professional image.

Rating	**5 to 7**

P5 Safety Management - The management system which encompasses health and safety policies, the definition of roles and responsibilities for health and safety, the implementation of measures to promote health and safety and the evaluation of health and safety performance.

Waste collection

Procedures are reviewed, and the larger companies are striving to go beyond the minimum levels.

large companies	**8**
smaller companies	**1**

Waste landfill and treatment

Health and safety management systems are in place in larger organisations. They tend to be incorporated into quality systems where responsibilities are defined and policies are in place. Smaller companies may not even have a policy. COTC has greatest benefit for smaller businesses as they are starting from a lower level. Some were felt to be unaware that they had gaps to fill. Uniformity was felt to be an issue

Some WAMITAB assessors will not enter a site if they do not feel safe; for instance, if the site does not tell them about protective equipment. Environment Agency inspectors were not always considered to be knowledgeable about health and safety. With the introduction of new legislation, HSE has been asked if it should be a statutory consultee for licensing; but is not taking up the option.

Environment Agency legislation requires working plan to be defined, but health and safety is not included. The question was raised as to whether those who issue licences have the ability to identify health and safety issues. A holistic approach was felt to be required, but concerns were expressed as to whether the Environment Agency has the requisite skill set. In addition, exempted items under Environment Agency legislation would still have health and safety issues.

Rating	**7 to 8**

P6 Labour Relations - The quality of the relationship between managers / directors and the workforce. It also concerns the extent to which there is the opportunity for workers to affiliate with associations active in defending and promoting their welfare, and the extent to which there is a system in place for pay negotiation

Waste collection

This was felt to be excellent in some of the larger waste companies. Workers take their concerns to safety representatives as they may feel uncomfortable taking such concerns to management. However, it was felt that organisations were more open now, such that workers could take their concerns to management. An example was raised of a non-union depot having a worse accident record than a unionised one. Safety representatives are the driver in unionised workplaces, whilst workforce meetings serve that role in non-unionised workplaces. London workplaces are more likely to be unionised.

Rating	**7**

Waste landfill and treatment

It was stressed that pay negotiations and safety should be separated out in the definitions for this factor. Relationships and levels of unionisation were felt to be variable. In addition, different unions were present in different locations.

River staff lighter-men presented problems for original and follow-on contractors who won the contract. Twenty years ago all waste workers were employed by local authorities, and therefore all workers were union members. Some local authorities have been taken over by waste companies, but some of these companies have since lost those contracts, and, as such, there is no easy answer to the labour relations issue.

In some locations, companies cannot get workers to take on the safety representative roles; although this varies from site to site with local factors dominating.

Rating	**1 to 10**

P7 Company Profitability - The extent to which companies are subject to competition over market share and constrained as to the price that they can charge.

Waste collection

This factor was felt to be nearer the poor end of the scale except that companies are investing money. There is a growing market share, but margins are low (around 2 to 3%). Some waste companies were felt to be offering loss leaders to win work.

There is a good steady income flow with local authority contracts. Profitability is reasonable (within industry expectations). Smaller companies do not have the overheads of their larger competitors.

Rating	**6**

Waste landfill and treatment

Geography has an element to play. In Manchester sites are close. In the North East and West Midlands there is intense competition. The market in the South West was felt to be less competitive. Regional competition pinches the smaller operators as larger companies can subsidise one region from another. Companies that only operate in one region do not have this option. At one point market share was considered to be a key issue, but not now. With landfill licences expiring in a year or two prices are going down. Landfill had been considered a profitable part of the waste business, but now there is reducing demand due to the landfill directive. MRFs produce low margins from a high capital outlay. However, they are a growth area.

Profits were felt to be better 10 years ago. In recent years, the stock market has been getting hesitant over waste company profits. There is concern now as to where the money will be coming from to make the substantial investments required. It was felt that the public need to pay more to help solve the waste problem; at the moment they only pay around £1 a week for waste management as part of their council tax.

Larger companies	**4 to 5**

9.6 ENVIRONMENTAL LEVEL INFLUENCES

E1 Political Influence - The profile of, and practices within, Government related to safety in the industry

Waste collection

There was felt to be plenty of money available for recycling; in particular, within DEFRA. However, government was felt to be looking to increase recycling without giving too much thought to wider issues. Government thinking was not thought to be joined up, with the key driver being to meet recycling targets rather than the health and safety of the workforce. Waste companies need economies of scale in joined-up collection, recycling and disposal.

Government is planning to append £140m on recycling. It was estimated that it would only cost £5m to train the workforce, but this funding is not available within this recycling budget. Government provides funding for training in high-technology industries, but not in labour intensive industries. This policy results in people being excluded from work as they do not have sufficient (basic) skills that are transferable to other industries (i.e. manual handling etc).

Local authority issues were suggested to be determined by political considerations among those who want to be re-elected (i.e. councillors jumping on the recycling band wagon).

Overall, government was felt to be influencing the waste industry, but in a negative way.

Rating	**2 to 3**

Waste landfill and treatment

As a rule, local authorities were typically not felt to be interested in the health and safety of waste industry workers, just their electorate. Central government was not felt to be much better.

Michael Meacher's resignation was felt to have caused problems in DEFRA. The responsibility for waste has moved around government departments, as has the responsibility for HSE.

The government was felt to be interested in recycling targets, but they were felt to be relying on everyone else to deliver on their targets. The grand strategy was felt to be there, but the implementation was felt to be lacking. Devolution and fragmentation were also felt to have a negative impact.

There was felt to be a political will for the introduction of the landfill tax, given that no one else wanted it. Disposal of fridges is a political issue. At the moment, the solution is just to get them into warehouses.

Rating	**<3**

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator(s).

Waste collection

HSE's past communication with the waste industry through guidance was not felt to be effective, but there was a feeling that the situation is getting better. In particular, the WISH forum is positive, and improving the situation. There was a feeling from industry that HSE are pushing improvements in culture, and will provide good advice when asked. HSE needs to be viewed as an industry ally rather than an fearing to pick up the phone to speak to them

The Environment Agency is the other regulator covering the waste industry, and there was a perception that some of their requirements were potentially detrimental to health and safety. There was felt to be a need to consider global risk and the implications of an individual regulation on others.

Rating (improving for HSE)	**6 to 7**

Waste landfill and treatment

The road transport regulators were perceived to be looking for 'tick box' solutions. They were felt to be looking for failures rather than trying to get improvements.

The waste industry used to find it difficult to find someone to talk to in HSE until 3 years or so ago. With the appointment of dedicated inspectors, then the WISH forum giving more cohesion, the waste industry was now felt to be on HSE's radar.

The Environment Agency and HSE need to speak with one voice. Whilst the Environment Agency has significant resources, few health and safety issues were felt to be on its agenda. However, the Environment Agency is still issuing OPRA (Operator and Pollution Risk Appraisal) points for roadwork issues when this was felt to be a health and safety issue, and not really an issue for them. There was felt to be the need for a high level meeting between HSE and the Environment Agency to discuss what their respective inspectors will address. The results of this need to be communicated to the waste industry so that they know where they stand in relation to the regulators. Perhaps Trading Standards departments also have a role to play.

The perception was of HSE changing and improving. In the past, HSE would visit, and the inspection would be followed by a letter. Now HSE are visiting to offer advice and develop working relationships. However, whilst trade association members would like answers, they still feel frightened to ask in case they are 'noticed'. Direct guidance for the waste industry was felt to be required, not information adapted from other industries that is difficult to interpret.

Rating (but improving)	**4**

E3 Market Influence - The commercial and economic context affecting the industry

Waste collection

This factor was felt to be moving towards the excellent end of the scale as companies will now turn away unsuitable work. Waste companies feel that they have shareholders to support now.

Local authorities have effectively received subsidised collections in the past. However, low margins mean that is difficult to difficult to subsidise contracts now, and companies will look at contracts more realistically. However, there were felt to be circumstances where local Authorities would award contracts to small regional companies who would have no other waste contracts. These contracts would be at a small margin below the budget line; possibly a 'friend of the councillor' being awarded the project at a minimal rate.

Rating (as control is being taken over the market)	**7 to 8**

Waste landfill and treatment

The public may well be willing to pay £1 a week extra for waste management services. However, there were felt to be no votes in making the public pay more for waste.

The waste industry offers the potential to create a new economy and jobs. Unfortunately, recycled products are viewed as inferior to new ones. The Waste and Resources Action Programme (WRAP) was thought to be a positive step forward.

Whilst shareholders have a desire for more socially responsible companies, they were thought to be interested in health and safety only in terms of the environment. For instance, annual reports were more likely to contain information on whether trees are being planted to replace the source of pallet wood than a statement on health and safety performance. There was felt to be a neutral view, almost an antipathy towards health and safety.

Rating	**5**

E4 Societal Influence - Aspects of the community and society at large, which bear upon organisations and workers

Waste collection

Environmental products were felt to be valued by society, but waste management is not seen as part of this. There was felt to be peer pressure against taking jobs in the waste industry. Public perception needs to be tackled, as they do not recognise collection workers, except on a bad news day. Improved perception would help recruitment and retention. For instance, in France waste workers are much more highly thought of (a documentary featuring Onyx operating at the Champs Elysés spent 20 minutes of a 60 minute documentary focusing on the workers). Cleanaway has introduced 'Sweeper of the year' as a means of boosting the profile of sweepers.

Rating	**3**

Waste landfill and treatment

People were felt to be interested in environmental issues, but not waste. In particular, society was concerned that the waste industry should 'build absolutely nothing anywhere near anybody' (BANANA). Even if someone does not mind a waste site being built next door, the person who is going to buy that house may well do. The public was not felt to realise that solutions are being provided to the waste that they create. Some sites now provide viewing platforms in order to raise awareness.

The landfill directive is a short-term measure, but education of future generations is long-term. The government was perceived not to want to discuss the issues as there are no votes in it.

Society's indifference to the health and safety of workers in the waste industry was felt to be in stark contrast to its views on the environment; the main difference being that if something goes wrong with the environment, it affects everyone. Workers are perceived to have entered into a work contract, and any problems are thus an occupational hazard. Why is there this difference in values?

Rating	**0 to 2**

9.7 COMPARISON OF RATINGS

Figure 61 shows the comparison of the *Direct* level ratings between collection, landfill and MRFs. Overall, the ratings are similar between the three processes with a few fundamental process-specific differences.

Whilst *competence* is considered to be similar across all three processes, *motivation / morale* and *risk perception* were rated as being somewhat lower for MRFs. *Fatigue* rates lower in collection as do *compliance* and *external working environment* due to the nature of the work. *Equipment operability* rates much higher in landfill sites, which is not surprising given the size and value of typical plant.

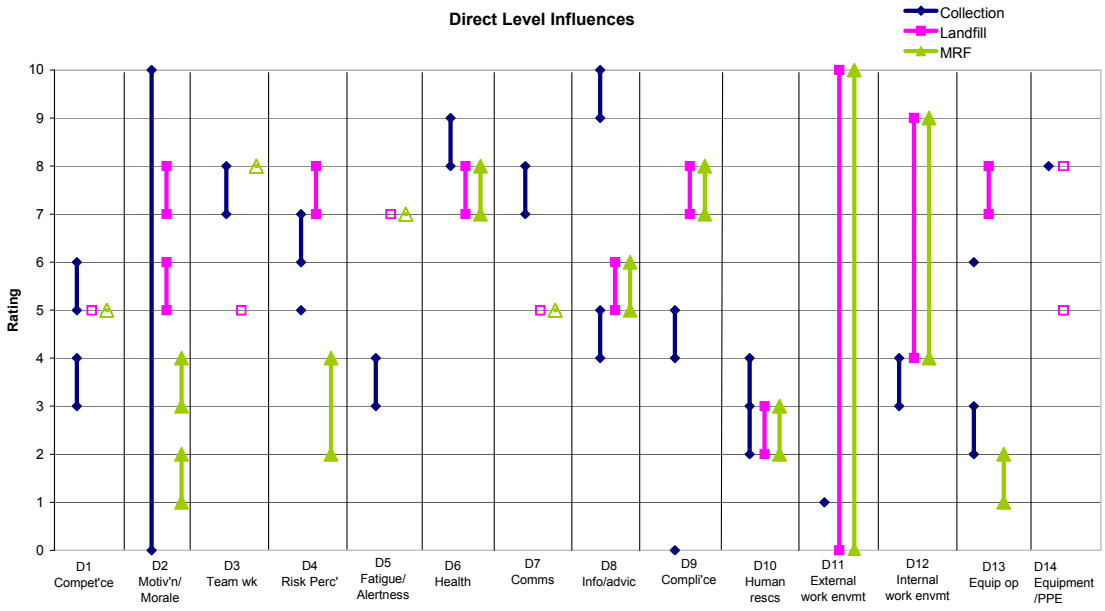


Figure 61 Direct level ratings for the UK waste industry waste

Figure 62 shows the comparison of the *Organisational* level ratings between collection, landfill and MRFs. As with the *Direct* level, there is broad agreement between the ratings, with two exceptions. *Management and supervision* covered the full range of ratings in collection, whilst *design* was rated more highly for collection.

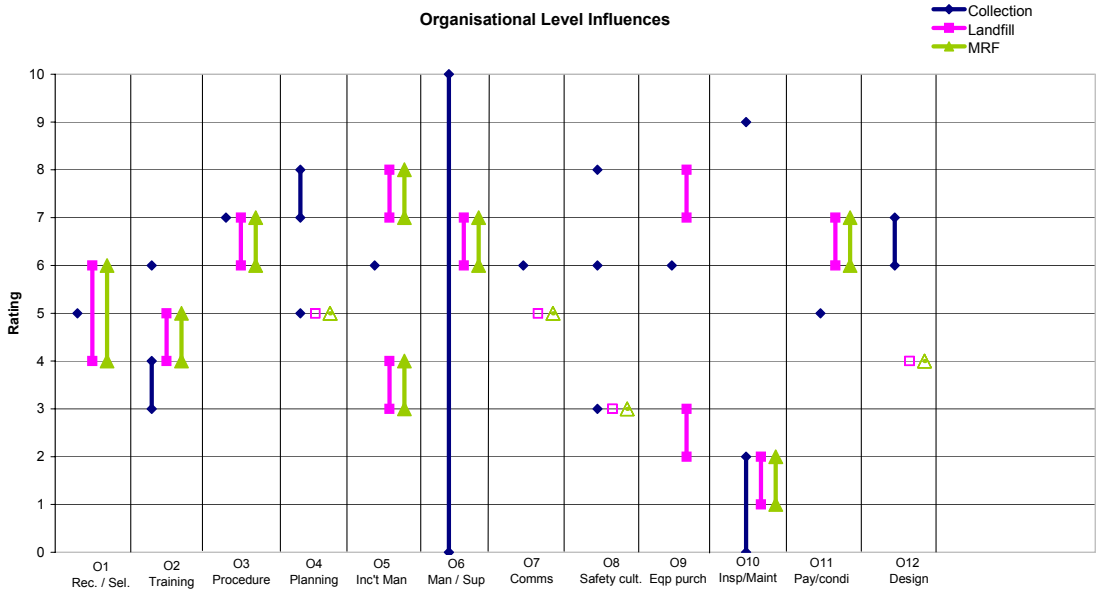


Figure 62 Organisational level ratings for the UK waste industry waste

Figure 63 shows the comparison of the *Policy* and *Environmental* level ratings between collection and landfill. The influences of the *Policy* and *Environmental* level factors on landfill and MRFs were considered to be sufficiently similar that different ratings were not considered necessary. The primary differences at the *Policy* level are due to the large ranges given for both collection and landfill. At the *Environmental* level, the *regulatory* and *market* influences were rated more highly than for the collection processes. This perhaps reflected the *regulatory* impact on landfill sites leading to worsening *market* conditions.

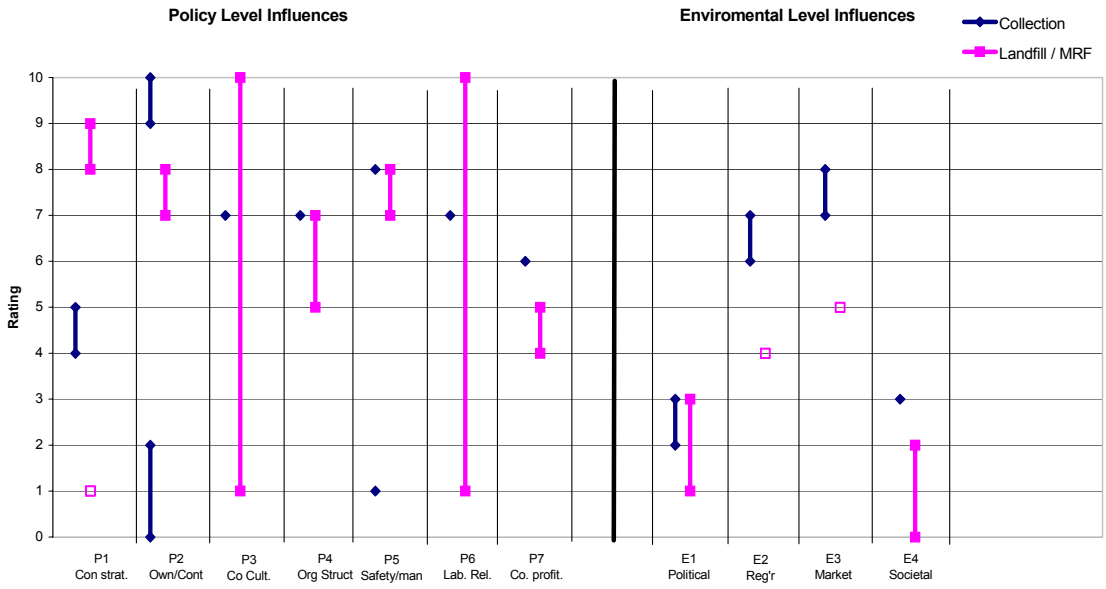


Figure 63 Policy and Environmental level ratings for the UK waste industry waste

9.8 WEIGHTINGS

The weightings for each of the factors on those factors at the level above are shown for both workshops together as follows:

- Figure 64 - Influence of the *Direct* level factors on health and safety in the waste industry.
- Figure 65 - Influence of the *Organisational* level factors on the *Direct* level.
- Figure 66 - Influence of the *Policy* level factors on the *Organisational* level.
- Figure 67 - Influence of the *Environmental* level factors on the *Policy* level.

9.8.1 Influence of Direct level factors on health and safety

The weightings from the two workshops were very similar in terms of the influences of most of the factors; the primary differences resulted from the different nature of the processes. Whilst *motivation and morale* and *teamwork* were felt to be fundamental to waste collection where workers operated in teams, they were not felt to be significant for landfill and MRFs.

For waste collection, *competence*, *team working*, *communications* and *compliance* are considered to be the most significant factors followed by *motivation / morale*, *suitable human resources*, *internal (vehicle / plant) work environment* and *equipment (vehicle / plant) operability*. As such, eight of the fourteen factors were considered to be of high or high-medium significance.

For landfill / treatment, *competence*, *communications* and *compliance* are considered to be the most significant factors followed by *situational awareness / risk perception*, *internal (vehicle / plant) work environment* and *equipment (vehicle / plant) operability*. As such, six of the fourteen factors were considered to be of high or high-medium significance.

9.8.2 Influence of Organisational level factors on the Direct level

Those factors at the *Organisational* level that were judged to have the greatest influence on the most significant factors at the *Direct* level for waste collection, are:

- *Training*, *management / supervision* and *communications* for their influence on *competence* at the *Direct* level.
- *Management / supervision* and *communications* for their influence on *team working* at the *Direct* level.

- *Training*, *management / supervision* and *communications* for their influence on *communications* at the *Direct* level.

- *Training*, *procedures, management / supervision* and *health and safety culture* for their influence on *compliance* at the *Direct* level.

Those factors at the *Organisational* level that were judged to have the greatest influence on the most significant factors at the *Direct* level for landfill / treatment, are:

- *Training* and *management / supervision* for their influence on *competence* at the *Direct* level.

- *Training*, *management / supervision*, *communications* and *health and safety culture* for their influence on *communications* at the *Direct* level.

- *Training* and *procedures* for their influence on *compliance* at the *Direct* level.

9.8.3 Influence of Policy level factors on the Direct level

Those factors at the *Policy* level that were judged to have the greatest influence on the most significant factors at the *Organisational* level for waste collection, are:

- *Company culture, health and safety management* and *company profitability* for their influence on *training* at the *Organisational* level.

- *Organisational structure* and *health and safety management* for their influence on *management / supervision* at the *Organisational* level.

- *Company culture*, *organisational structure* and *labour relations* for their influence on *communications* at the *Organisational* level.

Those factors at the *Policy* level that were judged to have the greatest influence on the most significant factors at the *Organisational* level for landfill / treatment, are:

- *Company culture* and *company profitability* for their influence on *training* at the *Organisational* level.

- *Ownership and control* and *company culture* for their influence on *health and safety culture* at the *Organisational* level.

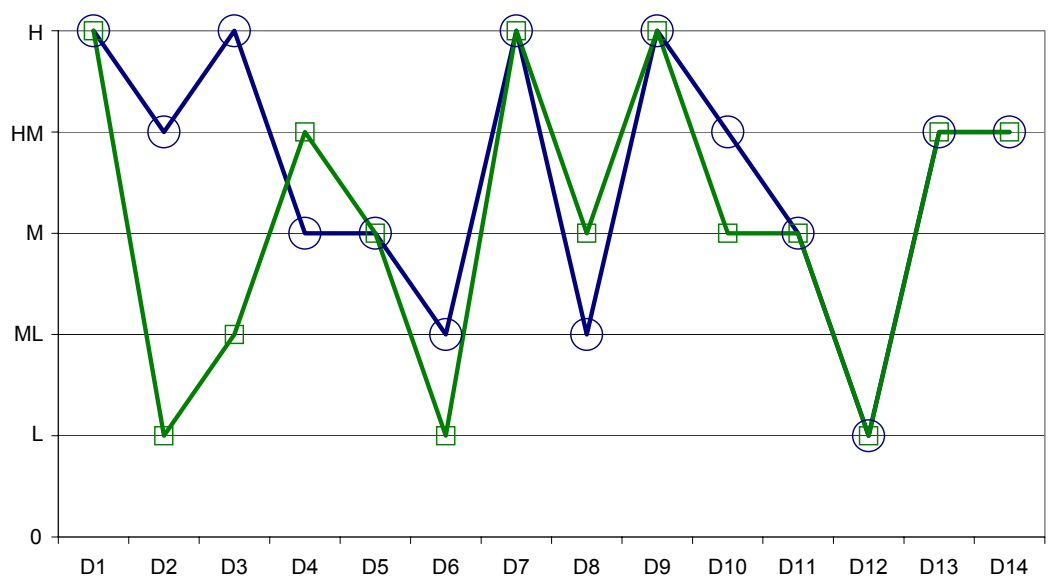
9.8.4 Influence of Environmental level factors on the Policy level

Those factors at the *Environmental* level that were judged to have the greatest influence on the most significant factors at the *Policy* level for waste collection, are:

- The *market* for its influence on *company culture* at the *Policy* level.
- The *regulator* for its influence on *organisational structure* at the *Policy* level.
- The *regulator* for its influence on *health and safety management* at the *Policy* level.

Those factors at the *Environmental* level that were judged to have the greatest influence on the most significant factors at the *Policy* level for landfill / treatment, are:

- The *market* for its influence on *company culture* at the *Policy* level.

Direct influences on health and safety in the waste industry		

D1 Individual Competence	D2 Motivation / Morale	D3 Team working	D4 Situational Awareness / Risk Perception
D5 Fatigue / Alertness	D6 Health	D7 Communications	D8 Information / Advice
D9 Compliance	D10 Suitable Resources	D11 External Working Environment	D12 Internal (vehicle/plant) Work Environment
D13 Equipment Operability	D14 Safety Equipment / PPE		

Figure 64 Variation in the weightings of the Direct level on health and safety in the waste industry

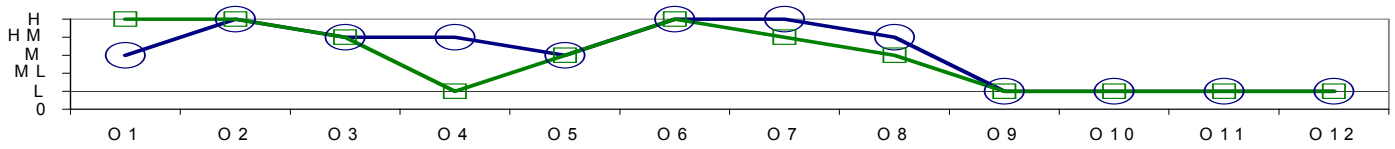
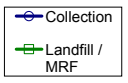
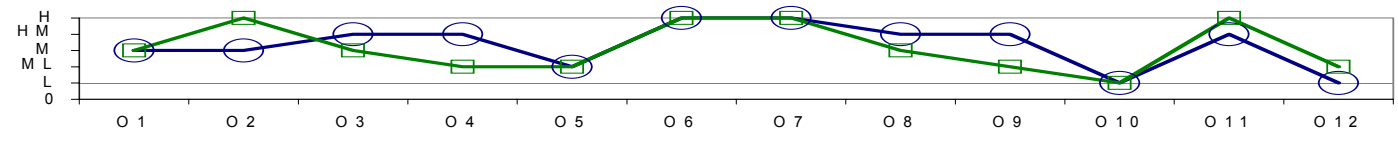
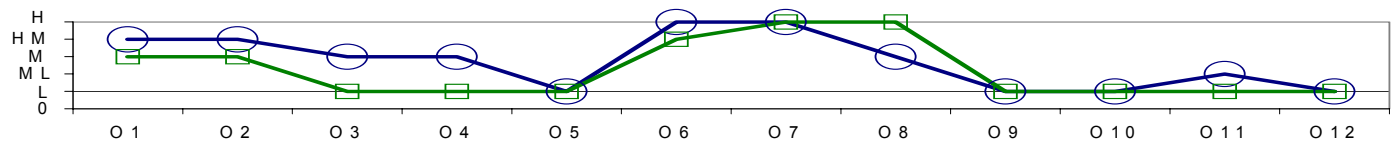
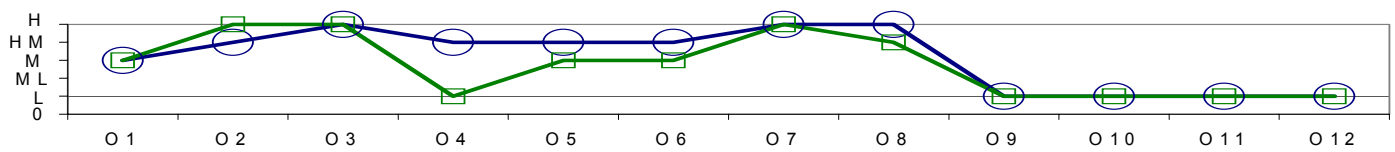
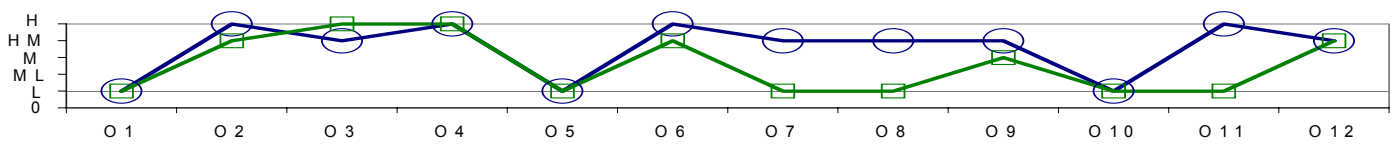
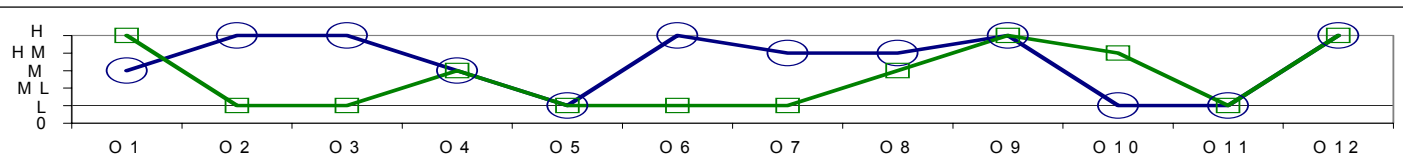
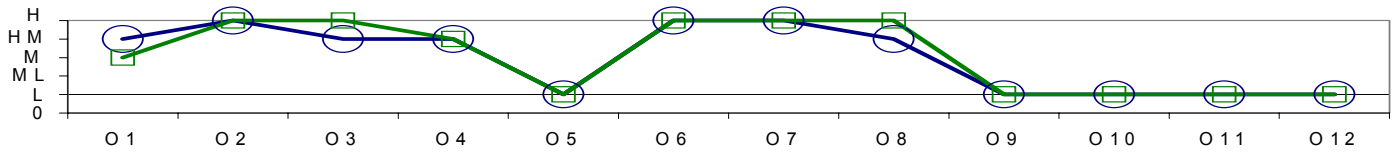
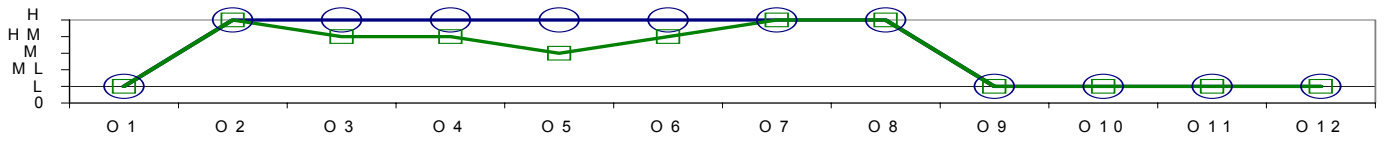
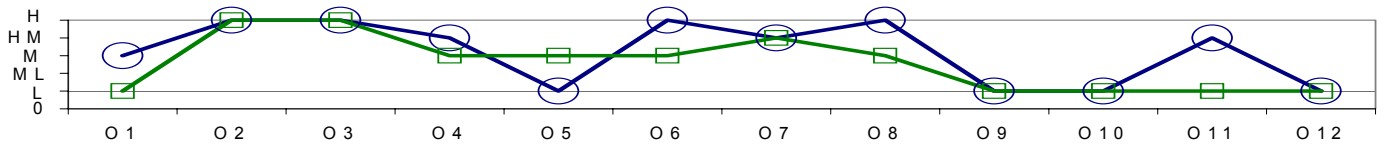
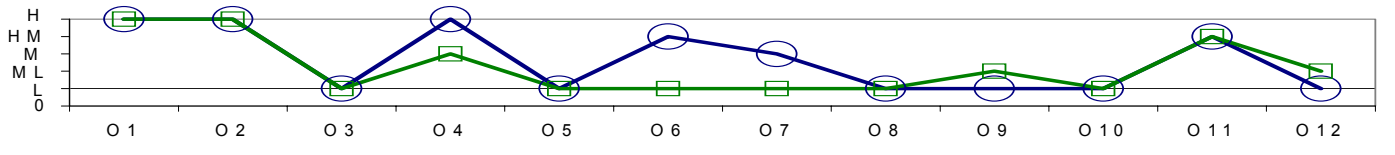
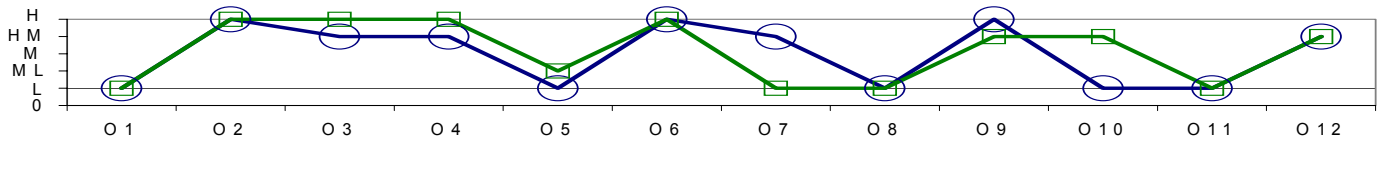
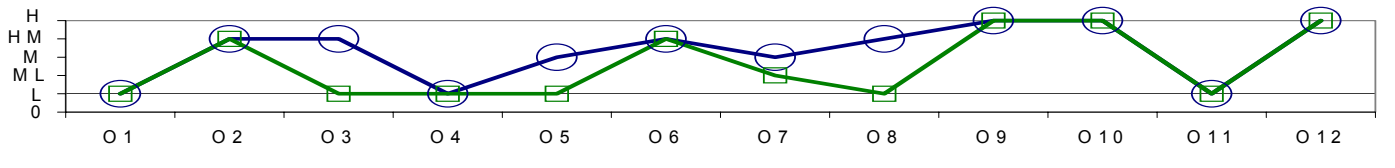
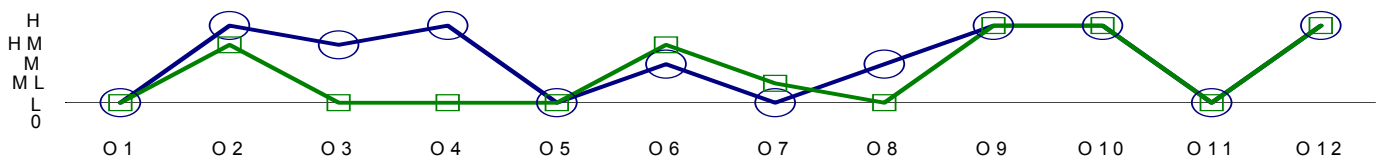
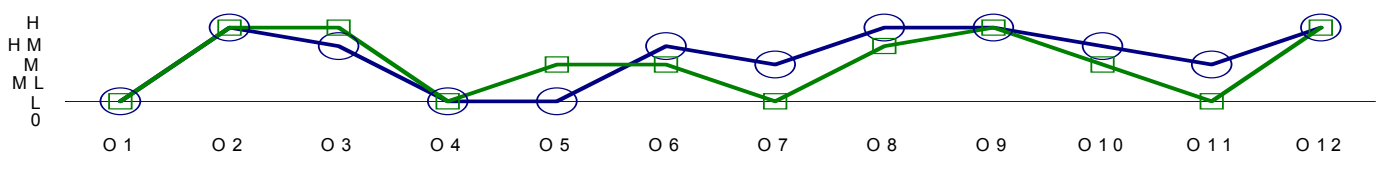
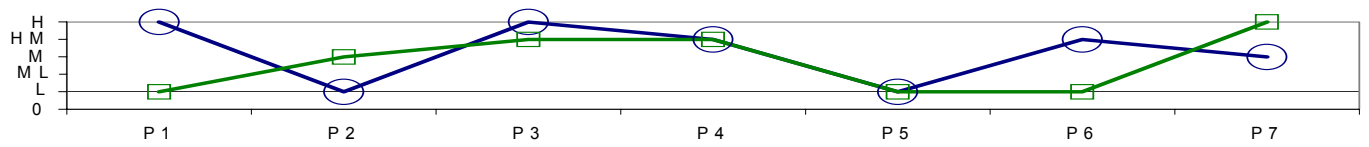
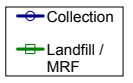
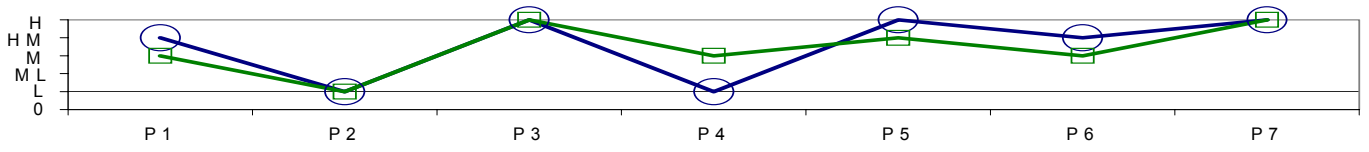
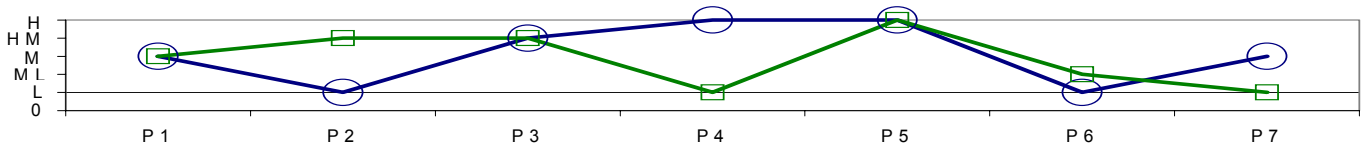
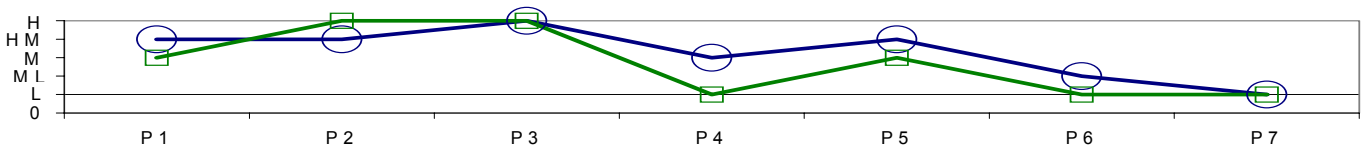
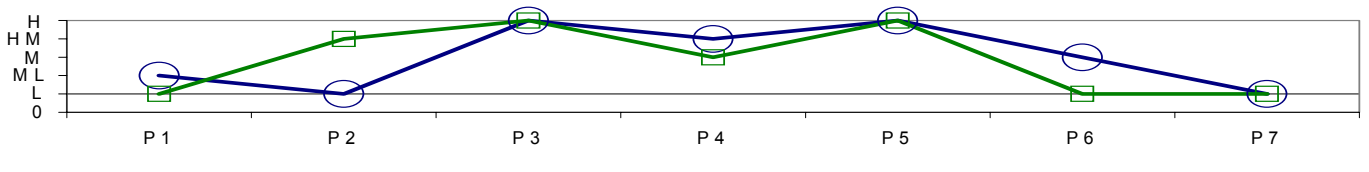
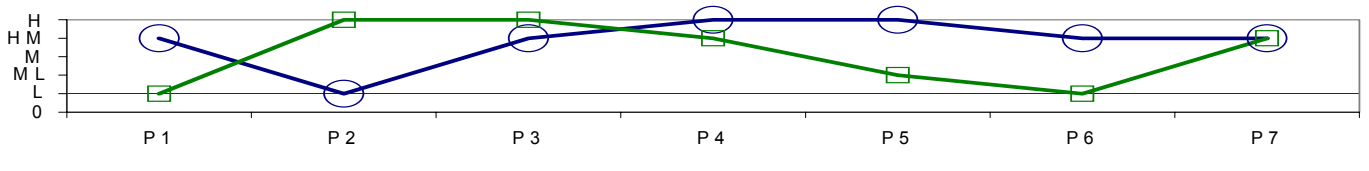
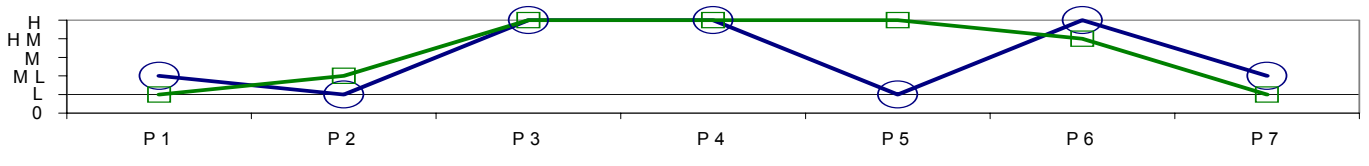
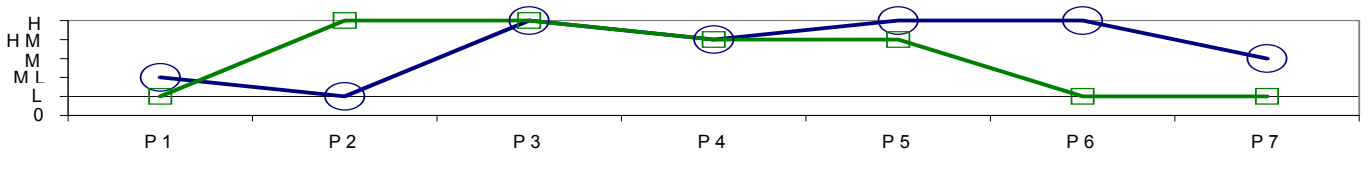
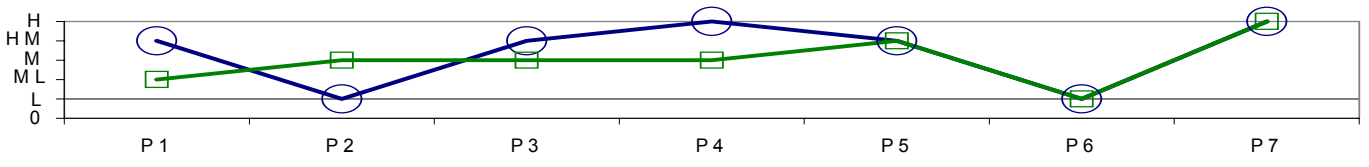
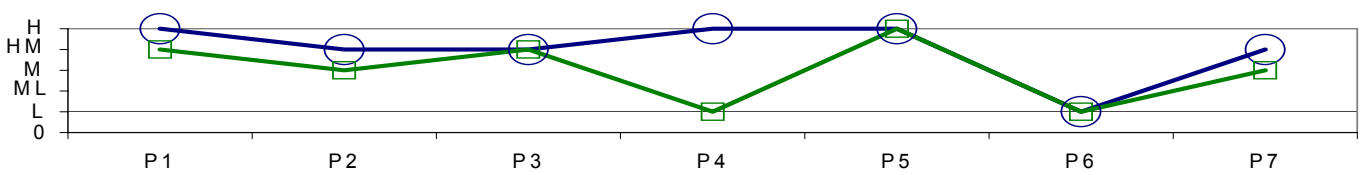
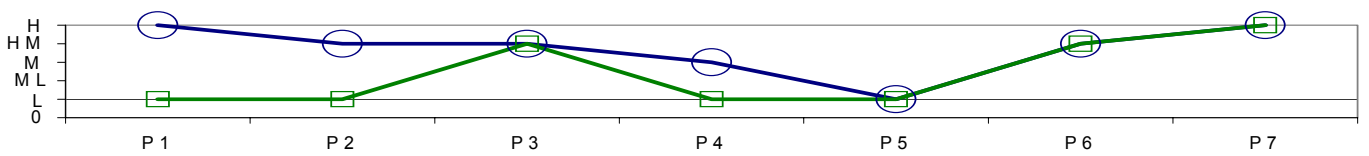
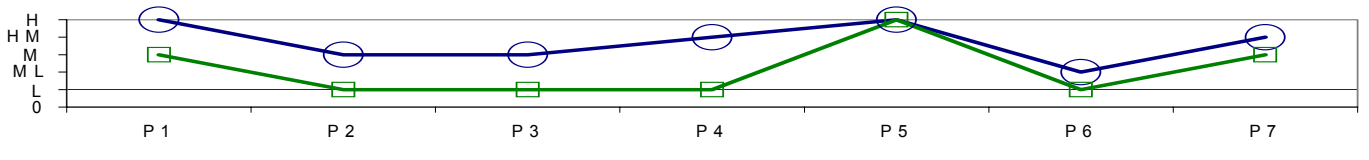
Organisational Influence on D1 (Competence)		
Organisational Influence on D2 (Motivation / Morale)		
Organisational Influence on D3 (Team working)		
Organisational Influence on D4 (Situational Awareness / Risk Perception)		
Organisational Influence on D5 (Fatigue / Alertness)		
Organisational Influence on D6 (Health)		
Organisational Influence on D7 (Communications)		
Organisational Influence on D8 (Information / Advice)		
Organisational Influence on D9 (Compliance)		
Organisational Influence on D10 (Suitable Human Resources)		
Organisational Influence on D11 (External Work Environment)		
Organisational Influence on D12 (Internal (plant/veh) Work Environment)		
Organisational Influence on D13 (Equipment (plant/veh) Operability)		
Organisational Influence on D14 (Safety Equipment / PPE)		
O1 – Recruitment & Selection, O2 – Training, O3 – Procedures, O4 – Planning, O5 – Incident Management & Feedback, O6 – Management / Supervision, O7 – Communications, O8 – Health and Safety Culture, O9 – Equipment Purchasing, O10 – Inspection & Maintenance, O11 – Pay & Conditions, O12 – Design		

Figure 65 Variation in the weightings of the Organisational level on the Direct level

Policy Influence on O1 (Recruitment & Selection)		
Policy Influence on O2 (Training)		
Policy Influence on O3 (Procedures)		
Policy Influence on O4 (Planning)		
Policy Influence on O5 (Incident Management & Feedback)		
Policy Influence on O6 (Management / Supervision)		
Policy Influence on O7 (Communications)		
Policy Influence on O8 (Health and Safety Culture)		
Policy Influence on O9 (Equipment Purchasing)		
Policy Influence on O10 (Inspection & Maintenance)		
Policy Influence on O11 (Pay and Conditions)		
Policy Influence on O12 (Design)		

P1 – Contracting Strategy, P2 – Ownership & Control, P3 – Company Culture, P4 – Organisational Structure, P5 – Health & Safety Management, P6 – Labour Relations, P7 – Company Profitability

Figure 66 Variation in the weightings of the Policy level on the Organisational level

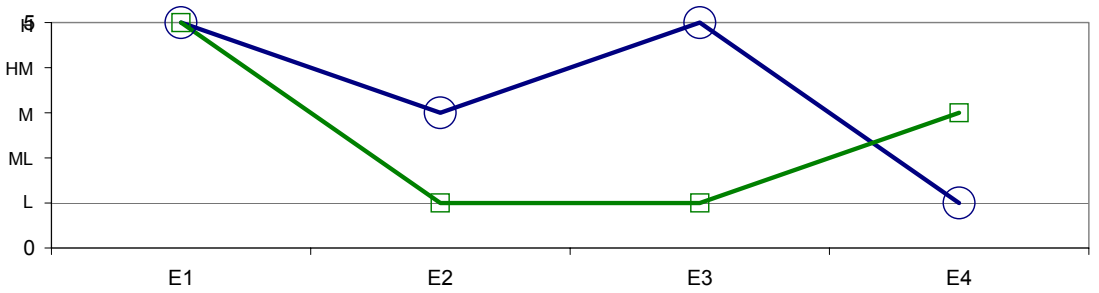
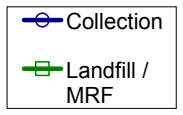
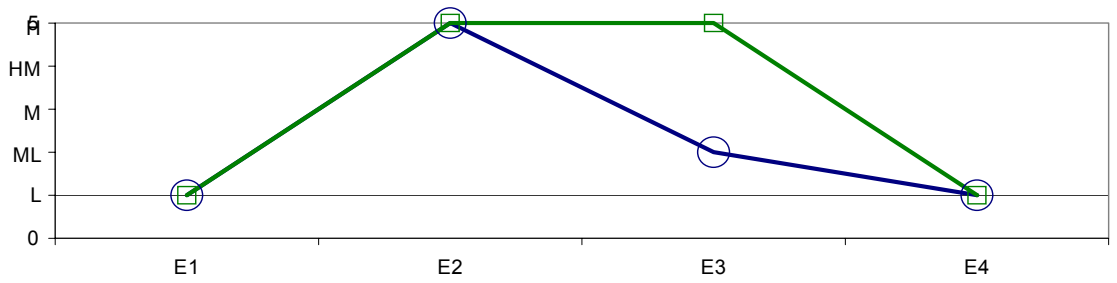
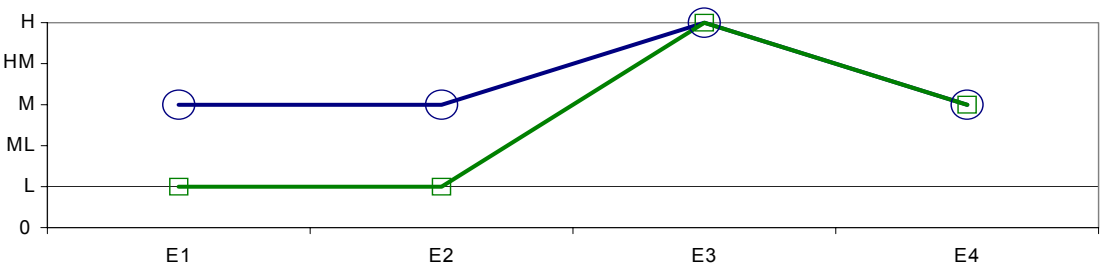
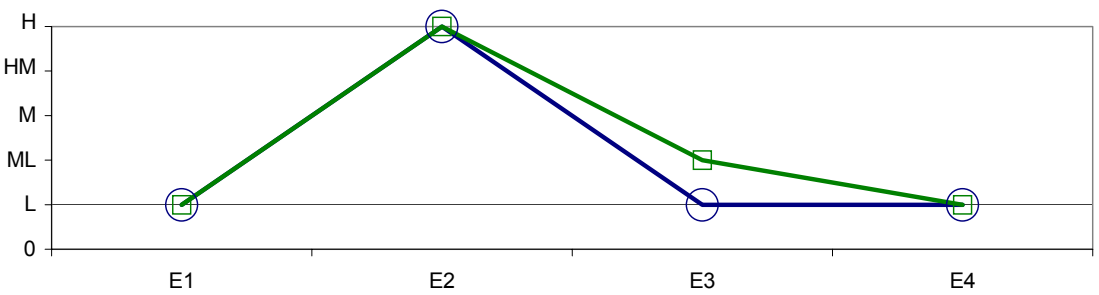
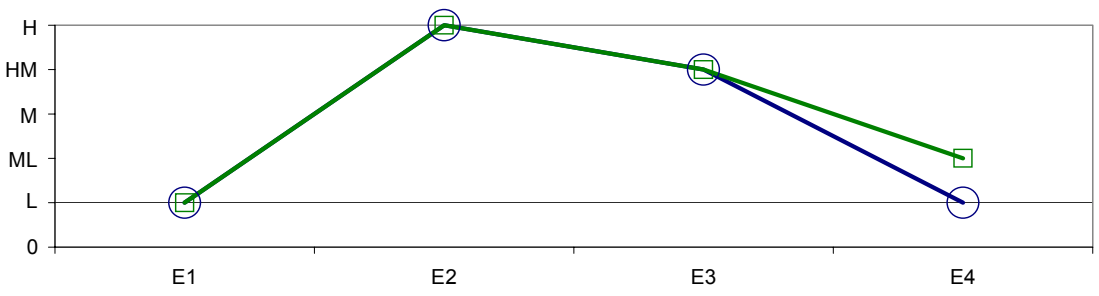
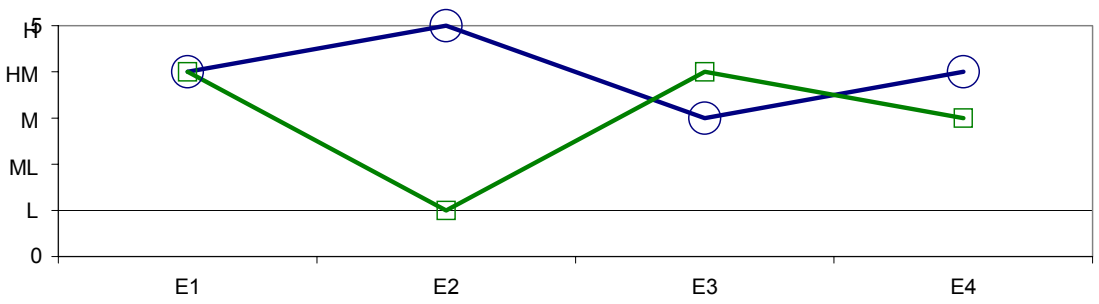
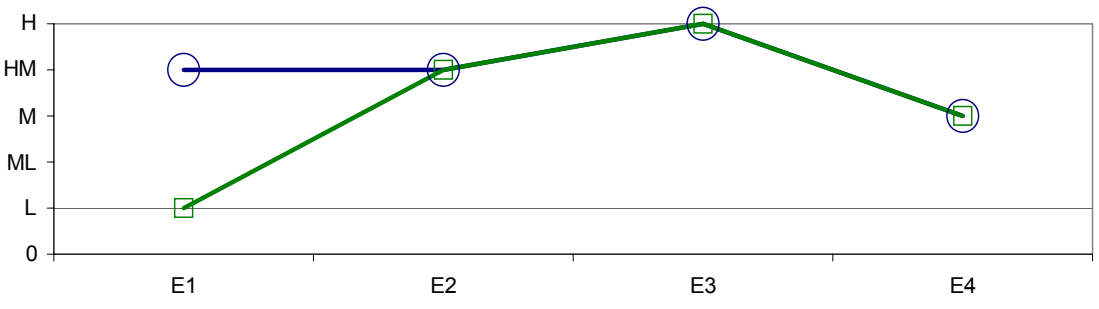
Environmental Influence on P1 (Contracting Strategy)		
Environmental Influence on P2 (Ownership & Control)		
Environmental Influence on P3 (Company Culture)		
Environmental Influence on P4 (Organisational Structure)		
Environmental Influence on P5 (Health & Safety Management)		
Environmental Influence on P6 (Labour Relations)		
Environmental Influence on P7 (Company Profitability)		
E1 – Political, E2 – Regulatory, E3 – Market, E4 – Societal		

Figure 67 Variation in the weightings of the Environmental level on the Policy level

9.9 CALCULATION OF THE RISK INDEX

Risk indices were calculated for the two workshops, and are summarised in Table 29. Some of the factors were rated as ranges in the workshops or associated with subsidiary areas of activity. In order to provide an indication of the resulting range of risk indices, analyses were undertaken for the range of ratings, as appropriate. The highest ratings and resulting indices actually serve to provide an indication of where better practices are currently being achieved and thus highlight the potential for others to achieve those rating levels. Both the lowest and highest ratings for the two workshops are very close, despite the workshops containing different delegates and addressing different aspects of the waste industry.

The base index is that for the lowest ratings, whilst the highest index is taken as that for higher ratings. In cases where there is a large range in the ratings, and the workshop delegates specifically note that the range is due to differences in practice, the highest ratings give an indication of what could be achieved if all stakeholders raised their standards to that of current better practice. In other cases, a small range in ratings merely indicates uncertainty about the exact rating.

Table 29 Range of risk indices obtained from the Influence Network workshops

Workshop	***Risk index***
Waste collection	0.43 to 0.66
Landfill / treatment	0.45 to 0.63

9.10 KEY FACTORS AND CRITICAL PATHS

9.10.1 Approach

A set of improvements is postulated whereby the rating for one factor at each level is increased by 1.0, and the risk index is recalculated. This is undertaken for every combination of factors and gives an indication of the potential impact of each combination of factors, thus indicating critical paths of influence through the network. The analysis also assumes that only one factor in each layer is influenced by the factor below. However, the key objective of the analysis is to determine which factors when 'improved' in conjunction with other factors have the greatest impact on increasing the risk index (reducing risk).

The sensitivity analysis described above has been carried out for the two workshops to identify critical factors and paths of influence through the network where risk controls are likely to be most effective in improving health and safety can be identified. When the critical path analysis is carried out, (i.e. one factor rating improved by one at each level) a ranking can be produced based on how many times a particular factor appears within a particular range or series of ranges. This ranking can then be used as a guide to the relative significance of that factor.

The critical factor / path analysis for each workshop was carried out assuming a linear rating scale with the ratio L:ML:M:HM:H being 1:2:3:4:5.

The approach described is adopted to investigate areas where improvements may be targeted to improve health and safety in the waste industry. It is to be expected that changes at the *Direct* level will have the greatest impact as the effects of changes in more remote influences are dissipated by the repeated weighting and averaging through the network. However, the cumulative impact of the remote influences is likely to be stronger. For example, the *company culture* emanating from the client at the *Policy* level may be expected to have an influence over many aspects of work, whereas the benefits of improved inspection and maintenance of equipment and facilities would be much more limited.

9.10.2 Waste collection

The key factors for waste collection have been identified using the techniques described in Section 9.10.1, and are shown in Figure 68.

At the *Direct* level, *competence*, *team working*, *communications* and *compliance* stand out as the key issues with the highest impact on improving the network index. No factors at the *Direct* level are deemed to be of high-medium influence, thus reinforcing the significance of the four primary factors. This reflects the workshop discussions where the importance of *team working* was stressed and even judged to provide a means of compensating for low *competence* among the team members, provided there were some other team members with sufficiently high *competence*.

At the *Organisational* level, six factors stand out. *Training*, *management / supervision* and *communications* are judged to be of the highest significance, whilst *procedures*, *planning* and *health and safety culture* are judged to be of high-medium significance. These factors are

significant as they influence the key factors at the *Direct* level, with *management / supervision* being essential to motivate workers to undertake relatively unpleasant jobs in waste collection.

Company culture and *organisational structure* have the most significant impact at the *Policy* level, followed by *health and safety management*. At the *Environmental* level, the *regulatory* influence is the most significant followed by the *market* influence.

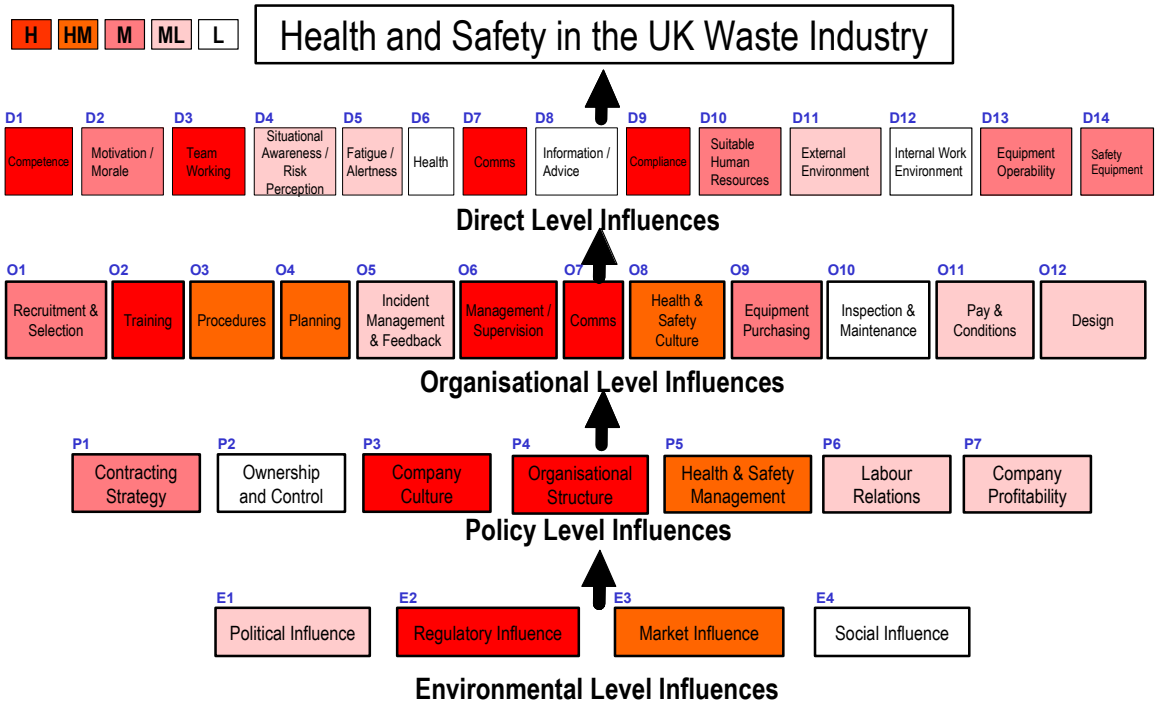


Figure 68 Key factors identified in the analyses of the waste collection workshop

The critical paths emerging from the workshop analysis that have the greatest potential to influence health and safety in waste collection are shown in Figure 69. These paths give an indication of where influence needs to come from, and where it needs to be aimed at for maximum impact. The critical paths shown in Figure 69 indicate that the *regulator* needs to influence *company culture*, *organisational structure* and *health and safety management* in relation to companies' head offices. These head offices then need to influence *training* and *management / supervision* in order to impact on *competence*, *team working*, *communications* and *compliance* and the health and safety.

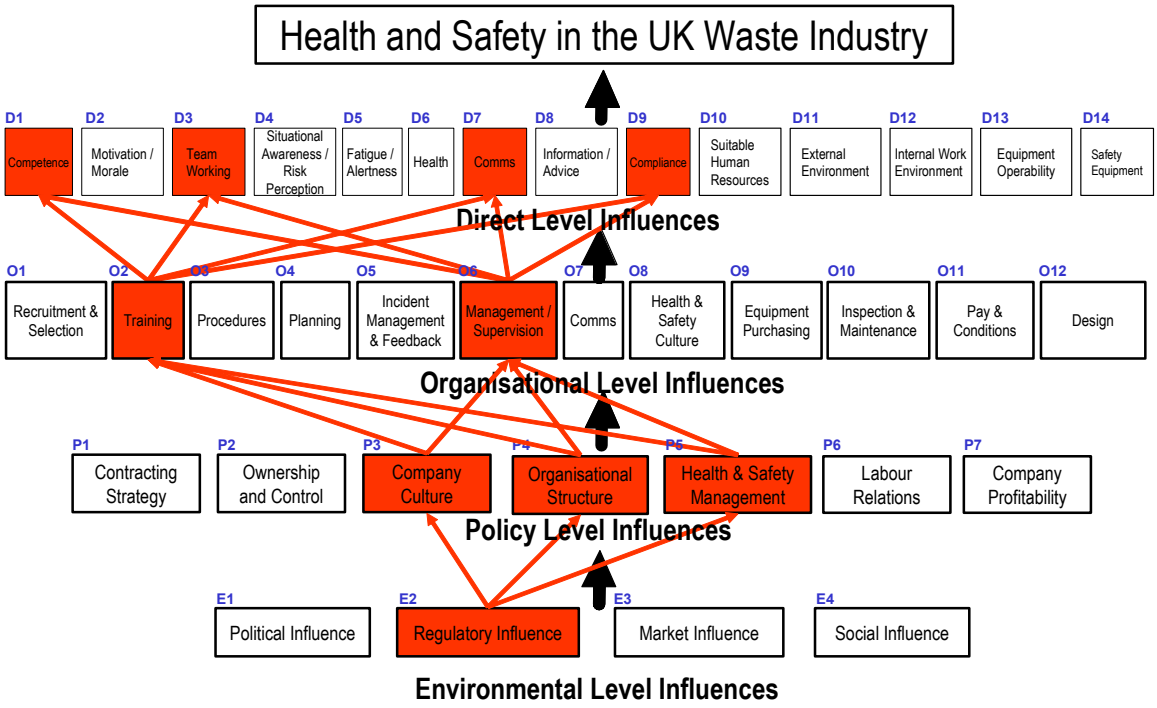


Figure 69 Critical paths identified in the analyses of the waste collection workshop

9.10.3 Waste landfill and treatment

The key factors for waste landfill and treatment are shown in Figure 70. At the *Direct* level, the primary difference with waste collection is the reduced significance of *team working*. This reflects the working patterns in landfill sites, where workers are typically operating on their own. The other three key factors at the *Direct* level (*competence*, *communications* and *compliance*) are the same. However, reflecting the significant use of plant and mechanical equipment in landfill sites and MRFs, *equipment operability* and *safety equipment* have high-medium influences. *Situational awareness* also has a high-medium influence for two different reasons; there is high awareness of the risks on landfill sites, whilst there needs to be high awareness of the risks on MRF picking lines.

Training, *procedures* and *management / supervision* all have high influence at the *Organisational* level. *Planning*, *communications* and *health and safety culture* all have medium-high influences, leading to the six key factors being the same for waste landfill and treatment as for waste collection.

At the *Policy* level, *company culture* and *health and safety management* have high influences (in common with waste collection). However, *organisational structure* is seen to be less important than in waste collection; *ownership and control* has medium-high influence perhaps reflecting greater board level interest.

At the *Environmental* level, the *market influence* is seen to be greater than that of the *regulator*. This reflects the reductions in the profitability of landfill sites as they are not seen as a long-term proposition due to the landfill directive. Whilst there is a growing demand for MRFs, they require extensive capital expenditure and return relatively low margins.

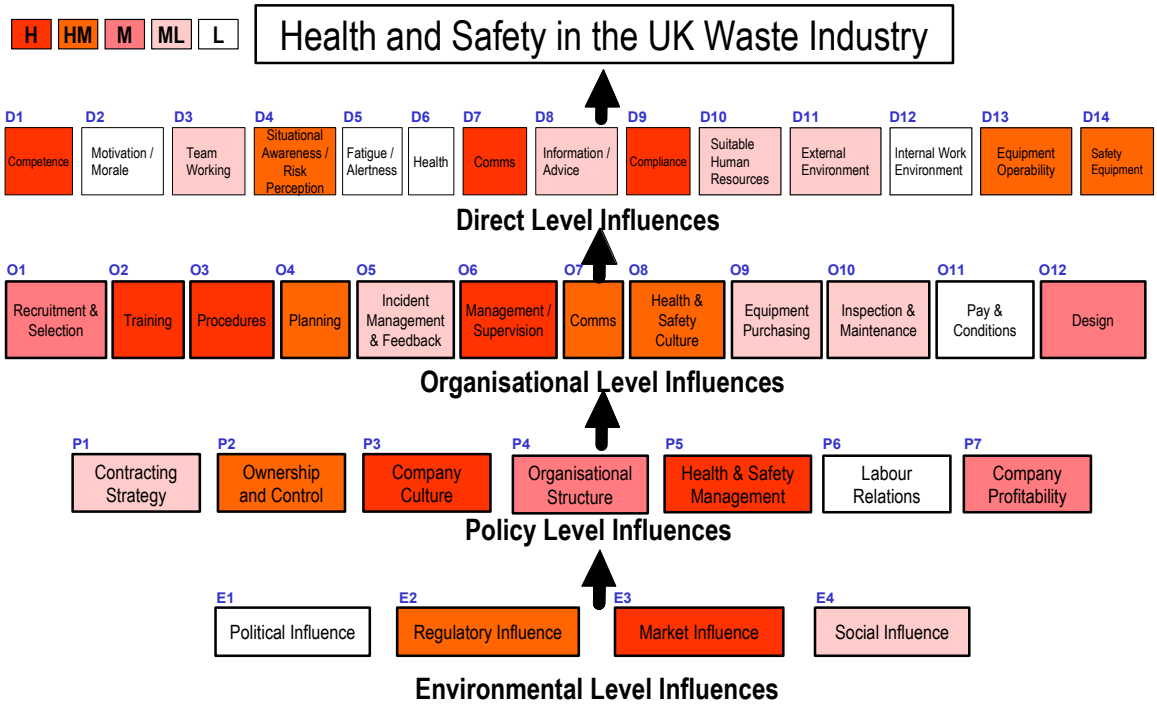


Figure 70 Key factors identified in the analyses of the waste landfill and treatment workshop

The critical paths that have the greatest potential to influence health and safety in waste landfill and treatment are shown in Figure 71. These paths give an indication of where influence needs to come from, and where it needs to be aimed at for maximum impact. The critical paths shown in Figure 71 indicate that the *regulator* needs to influence *ownership and control*, *company culture* and *health and safety management* in relation to companies' head offices. These head offices then need to influence *training*, *procedures* and *management / supervision* in order to influence *competence*, *communications* and *compliance*.

The path through *company profitability* indicates the negative effects that the landfill directive and other regulations have had on the landfill sector and the impact this has on training.

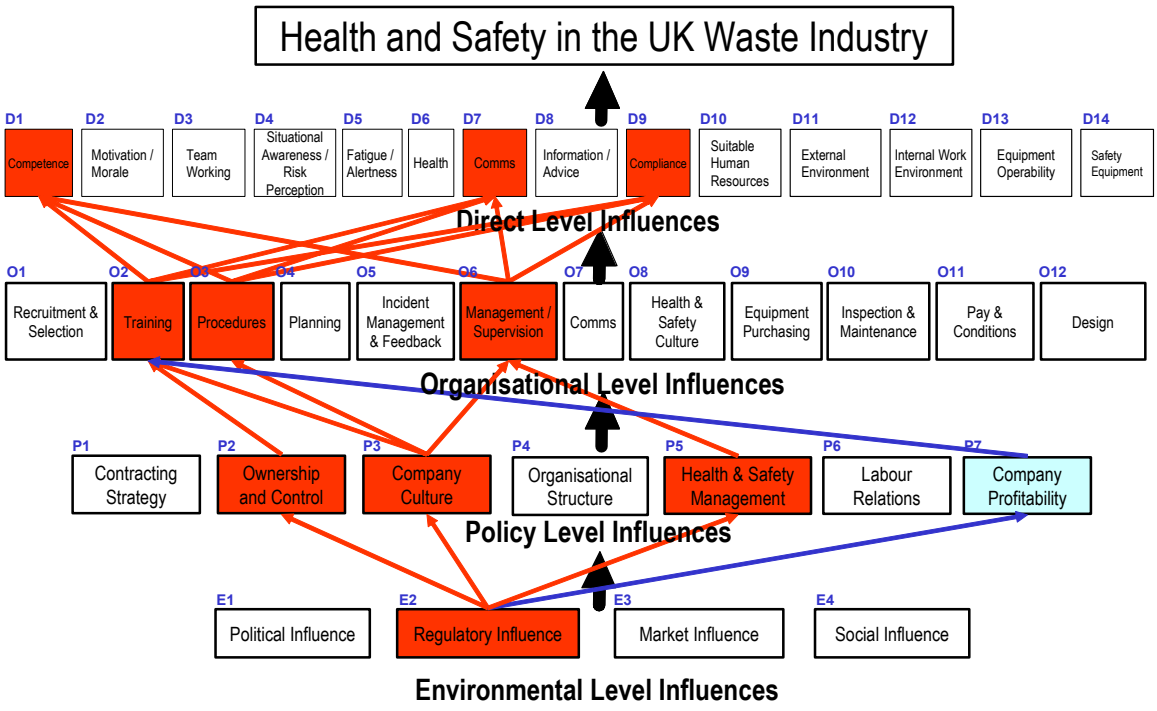


Figure 71 Critical paths identified in the analyses of the waste landfill and treatment workshop

9.11 WORKSHOP CONCLUSIONS

9.11.1 Waste collection

The following conclusions can be drawn from the waste collection workshop to reflect the views of the small focus group:

Direct level

1. The level of *competence* is variable, with the level reached as a result of induction training being the minimum from which *competence* increases. However, there is less need to rely on individual competence in teams where there are some competent workers to 'carry' the others.

2. There is a broad spectrum of *motivation and morale*, varying with age. 'Task and finish' *motivates* workers to finish the job so that they can go home. Both the weather and the reputations of some contractors can have negative effects.

3. Team culture is important. New personnel must be able to perform and fit in with the team. Some teams would prefer to go out a man short than go out with someone who is not suitable.

4. Whilst there is high *awareness* of the risk associated with hazards such as transport and sharp objects, the *perception of risks* associated with manual handling is much lower.

5. Whilst early starts and manual work can lead to *fatigue*, workers do get used to the amount of walking and manual work. With no real meal breaks, shift lengths need to be managed carefully. There tends to be less control in skip hire.

6. Workers tend to be relatively *healthy* due to the physical nature of the work. The unfit (and unwilling) are filtered out early on.

7. *Communication* is typically reasonable for imparting basic knowledge (such as not walking in front of a car). Verbal communication is typically good between crews. However, in the South East migrant workers may have problems with communications.

8. *Information* may be available in an organisation, but it is not always accessible, applicable or understandable. The quality and availability of information tend to be a function of the size of employer. Large employers tend to provide it, whilst 'one-man bands' do not.

9. Workers are not inherently *compliant*, with *compliance* depending on the supervision / team leader. Large companies have structures that aid *compliance*; small ones do not.

10. The availability of *suitable human resources* is a localised issue. For instance, there is full employment in the South East. Agencies exert control over the market as workers can earn more money with agencies.

11. Dust, smells and broken glass are all encountered in the *external working environment*. In addition, there are violence, abuse and stress from the public. It can be difficult to get workers to wear trousers (instead of shorts) and high visibility clothing in high temperatures.

12. Equipment will have as many risks as possible engineered out e.g. noise and dust, but there will still be some residual risks due to the nature of the work. However, the *internal work environment* is much better than it was 15 years ago. Regulation is required to take the decision on sizes of bags or bins away from the competitive market place.

13. Larger companies are more responsible. Older *equipment* is typically passed on to smaller operators where it may not be so well looked after. Design is driven by manufacturers, largely to give them competitive advantage. Their effort tends to be put into the body rather than the chassis, which may lead to difficulties with access due to steps, low quality handles etc.

14. The provision of *safety equipment* is excellent as good equipment is available. Correct use and maintenance are the issues. However, the use of equipment is still reasonable, and better than it used to be. Large companies tend to fare better. However, buyers do not always understand the requirements and needs of workers.

Organisational level

15. *Recruitment and selection* can prove difficult due to the limited availability of labour.

16. On the job *training* is the key. However, cost, time and not wanting to train someone who will leave to join a competitor are the main barriers to training.

17. *Procedures* are good in large organisations. However, mergers and acquisitions can cause problems in integrating different procedures.

18. Within licensed facilities, *risk assessments* are mandatory. The question was raised as to whether or not they would always be applied.

19. *Incident management and feedback* were considered to be better for actual accidents than near misses.

20. Employing the right person was felt to be the key to getting appropriate *management and supervision*. An understanding of the waste industry and the company were felt to be essential, as was the ability to motivate people to do an unpleasant job. Those recruited from within the waste industry were felt to be more likely to succeed.

21. *Safety culture* was felt to be good in the larger companies, but less so in some smaller companies.

22. *Equipment purchasing* is limited by what is available on the market. Local authorities can specify within their contracts what equipment companies should buy. However, this may include large kerbside boxes capable of containing heavy loads.

23. *Inspection and maintenance* tend to go beyond the regulatory requirements. Operational needs are paramount, as the costs are considerable if a vehicle breaks down. Health and safety benefits accordingly. This is not necessarily the case for skip trucks.

24. Operational issues predominate in *design*, with the vehicle industry being reactive rather than proactive. The situation has improved in recent years, with bins being interchangeable between different vehicles. However, the design of vehicles and facilities are rarely co-ordinated.

Policy level

25. Local authority *contracting strategy* will require a minimum health and safety standard to be met but, beyond this, price was considered likely to be the primary criterion.

26. *Company culture* has been improving, and companies are good at sharing information. Waste companies do take a long-term view as most contracts are typically for long terms.

27. Companies' *organisational structures* typically include a health and safety director or compliance officer answerable to the chief executive.

28. *Labour relations* were felt to be good in some of the larger companies.

29. *Company profitability* was felt to be reasonable within the expectations of the waste industry. However, margins are low.

Environmental level

30. *Government* was felt to be pushing ahead to increase recycling to meet its targets without giving sufficient thought to the wider issues.

31. The two main *regulators*, HSE and the Environment Agency, were viewed differently. HSE were now considered to be promoting improvements in culture and providing good advice. However, the perception was that some of the requirements of the Environment Agency were potentially detrimental to health and safety.

32. The *market* influence was felt to be good, with companies now turning away unsuitable work. However, there were felt to be some circumstances where local

authorities awarded single contracts to small companies who had no other waste contracts.

33. Environmental products are valued by *society*, but waste management is not seen as part of this.

9.11.2 Landfill / treatment

The following conclusions can be drawn from the waste landfill / collection workshop to reflect the views of the small focus group:

Direct level

1. Plant drivers and the incineration plant workforce both contain pockets of excellent *competence*. However, there was felt to be a need to monitor line pickers in material recovery facilities (MRFs) without relying on individual competence. The key issue is that those who are not suitably competent should not be in charge of large expensive plant.

2. *Motivation and morale* are high on landfill sites and people tend to stay with their jobs. MRFs rely more on short-term or agency workers as it is more difficult to motivate people for such a repetitive job on a permanent basis.

3. Day to day operations on landfill sites require *teamwork* between landfill staff and customers. In particular, directing customers requires a tip marshal. On landfill sites, workers undertake separate functions due to the nature of the job. In MRFs, the aim is to get the product out, and the team needs to work together to achieve this.

4. There are two extremes; landfill operators with heavy plant have high *perceptions of risk*. On smaller landfill sites and MRF picking lines *risk perception* is low.

5. There are few *fatigue* issues in comparison with waste collection. Key workers may need to work long hours in order to compensate for breakdowns, but this is not common.

6. The workforce is essentially self-selecting, as those susceptible to musculoskeletal and other *health* problems would not be working in the industry. There is little occupational health testing.

7. Workers are provided with communications radios on landfill sites, as companies do not want plant drivers stopping to receive verbal instructions. Special signalling codes have been developed for *communications* on landfill sites. Educational levels are becoming a major issue now in terms of basic skills, with literacy being thought to be low on landfill sites and MRF picking lines.

8. The industry was at a lower level for *information and advice* until around 5 years ago. Since then, it has progressed from poor to beyond moderate on the rating scale. Risk assessment forms part of the induction process on landfill sites.

9. Landfill plant operators will *comply* due to the size of the plant and the accompanying risks. In MRFs, where protective clothing and gloves are required, this is not always the case. The biggest problem was felt to be with customers on landfill sites, as they have little perception that it is important to *comply* with health and safety legislation.

10. Finding *suitable human resources* is difficult. The legislative approach requires more recycling and less landfill and, as such, landfill is not a popular career choice within the waste industry. There is a driver shortage affecting UK industry as a whole. This is exacerbated in the waste industry as driving jobs in other industries may appear more attractive. The recruitment and retention situation in the waste industry needs to be rectified as the workforce is aging and there may well be problems in 10 years time as a result of demography and increased demand.

11. The *external working environment* is likely to have a low influence on health and safety. However, weather conditions can cause problems with moving vehicles on muddy un-compacted tips.

12. Standards of *internal work environment* are relatively good in expensive plant. However, MRFs have traditionally been adapted from equipment produced for other industries. Ergonomic considerations have also been lacking in the past. MRFs have typically been incorporated into old (sometimes unsuitable) buildings that are not high enough and may be enclosed on three sides. The situation is improving in MRFs with the introduction of process engineering skills.

13. Newer expensive *equipment* is more likely to be maintained. However, the standard is poor on some small landfill sites.

14. There are differences between the standards of *safety equipment* for employees and customers on landfill sites. Rear view cameras started being fitted more than 5 years ago. Even smaller skip operators will have high visibility clothing. People need to understand why they have to wear PPE rather than just be told to wear it.

Organisational level

15. For plant operative recruitment, a clear vision of what is needed is required. For MRFs, *recruitment and selection* is based largely on whether workers turn up and stick with the job.

16. Training expenditure is generally low, although this will vary. Having the money available is a key issue. In MRFs, there may be a tendency to do the minimum in terms of training, as companies do not know whether workers will stay or not. Companies will invest in people once they have established themselves and look likely to stay.

17. As with other factors, there is a contrast between small and large companies, with large companies having *procedures* in place. In landfill operations, *procedures* are effectively job descriptions. There are few common industry standards. With the industry now maturing, there is more collaborative work through forums such as WISH and the ESA.

18. Risk assessments are effectively built into procedures and working plans. However, *planning* is not joined up in terms of health and safety risks. On occasions, existing facilities can be transferred to companies by local authorities at short notice.

19. On landfill sites, there are clear and precise accident recording procedures with accidents reported, no matter how small. The value of *incident management and feedback* does not seem to be getting over to smaller companies. They may let workers go instead of improving the system.

20. Graduate *managers and supervisors* were felt to be more receptive to health and safety messages in general than the older workers (who have always done it that way in the past). There are significant barriers to graduates being 'accepted'. They need to get out there and do the job, get the certificates etc.

21. Local authorities were not felt to be interested in worker welfare in the past, and workers retain the view that employers are not interested in them. Nevertheless, workers think that health and safety is something for their company to deal with, not them. However, there tend to be responsible corporate structures now, and a more positive *safety culture* is developing.

22. Waste companies that purchase their own equipment are typically good at providing specifications and *purchasing equipment* on best value. The landfill manager will also be involved, and will approve the specification. Capital expenditure over certain values has to have health and safety approval before equipment can be purchased.

23. *Equipment purchased* by clients was felt to be dominated by price. Waste companies are typically not consulted, and the purchasing is often a function of the particular local authority. The waste companies then have to make this equipment safe.

24. Workers were felt to be well-*paid* in terms of the level of competence required. The shortage of drivers is a problem for UK industry as a whole. Logistics companies tend to *pay* more, and the aspiration of many skip drivers is to be tanker drivers.

25. Landfill operators are improving the road surface for customers by laying tarmac up to the tip face. However, vehicle manufacturers do not seem to have appreciated that vehicles on landfill sites suck paper into their engines. Manufacturers were thought to be more interested in providing *designs* with an array of facilities on the back of refuse collection vehicles aimed at impressing local authority councillors.

Policy level

26. As part of their *contracting strategy*, some local authorities were felt to try to hand over their responsibilities to waste companies, including that for their duties under the Health and Safety at Work Act (which they obviously cannot do). In contract documents for work with stores or supermarkets, safety on their premises was not felt to be well defined. As such, there is a need to carry out risk assessments on the clients

premises before submitting a tender. The construction of MRFs is improving now that the CDM regulations are in place.

27. Improvements in *ownership and control* can be seen in members of the board visiting sites to discuss safety (as a means of connecting the top to the bottom of the company).

28. There are still old style grandfather rights for drivers in some areas. Outdated aggressive management styles also still exist. Companies are now getting more involved, but may be reluctant to invest money in people. *Company culture* can change rapidly, for good or bad, with takeovers. It was considered to be easier to change the culture of the management than the workforce in a takeover situation.

29. Companies that are accredited to ISO 14000 have clearly defined *organisational structures*.

30. *Health and safety management systems* are in place in larger organisations. They tend to be incorporated into quality systems, where responsibilities are defined and policies are in place. Some smaller companies may not even have a policy. Environment Agency legislation requires the working plan to be defined, but health and safety is not included.

31. In some locations, companies cannot get workers to take on safety representative roles, although this varies from site to site with local factors dominating.

32. Landfill has been considered a *profitable* part of the waste business, but now demand is reducing due to the landfill directive. MRFs produce low margins from a high capital outlay; however, they are a growth area.

Environmental level

33. The government was felt to be interested in recycling targets, but wanting others to deliver against these targets. The grand strategy was felt to be there, but the implementation needs strengthening.

34. The Environment Agency and HSE need to speak with one voice. Whilst the Environment Agency have substantial resources, few health and safety issues were felt to be on their agenda. The perception was of HSE changing and improving.

35. The waste industry offers the creation of new economies and jobs. Unfortunately, recycled products are viewed as inferior to new ones. Whilst shareholders have a desire for more socially responsible companies, views expressed in the workshops indicated that environmental issues might attract investors more than health and safety.

36. Society's apparent indifference to the health and safety of workers in the waste industry was felt to be in stark contrast to their views on the environment.

10. ANALYSIS OF THE MAJOR ORGANISATIONS WITHIN THE UK WASTE INDUSTRY

10.1 INTRODUCTION

This section contains an overview of the health and safety, and market performance of the major organisations within the UK waste industry. Where information is available for private sector companies, it is possible to identify their relative positions in the market in terms of turnover, employees, operations and regional spread. When viewed in conjunction with the accident statistics, it is possible to identify where interventions are best targeted. Such detailed market information is not available for the public sector organisations. However, their accident performance is presented in order to identify where most accidents are occurring.

Due to the commercial nature of the material contained in Section 10, this section has not been included in the version of this report published in the public domain as an HSE Research Report. The version of the report containing Section 10 has been issued only to the HSE Project Officer.

11. CONCLUSIONS

In relation to the initial objectives, the following conclusions can be drawn from the work undertaken in this project:

Objective 1: To scope the waste industry form source to sink in terms of process, size and employment.

1. The UK generates around 430 million tonnes of waste each year from agriculture, mining and quarrying, construction and demolition, industry, commerce and households.

2. Agriculture, mining and quarrying, and construction and demolition wastes are integral parts of those industry sectors. The collection, disposal and recycling of industrial, commercial and municipal (household) waste form the focus of this report in relation to the UK waste industry.

3. Around 50 million tonnes of commercial waste are generated in the UK each year along with 30 million tonnes of industrial waste, and around 30 million tonnes of municipal waste. Municipal waste is increasing by around 3% per year.

4. Almost 60% of waste in the UK ends up in landfill sites.

5. Landfill has been considered a *profitable* part of the waste business, but demand is now reducing as a result of the landfill directive. MRFs produce low margins from a high capital outlay. However, they are a growth area.

6. There are estimated to be around 163,000 workers employed in the major parts of the UK waste industry, around 120,000 of which are employed in the private sector.

7. The sewage / refuse disposal industry classification includes around 137,000 workers, whilst recycling includes around 15,000 workers and wholesale waste around 11,000 workers.

8. Data for workers employed in waste management activities in the public sector are not available. Employment surveys are required to rectify this. However, extrapolation of accident data indicates that there may be 40,000 to 45,000 waste workers in the public sector.

9. Whilst the largest employers in the waste industry are a small number of large integrated waste management companies, the waste industry is composed primarily of SMEs.

10. There are around 2,000 skip hire companies in the UK. They seem likely to employ at least 4,000 workers.

11. The availability of workers is a localised issue. For instance, there is relatively full employment in the South East.

Objective 2: To identify the health and safety performance of the industry

In terms of the accident data:

12. The UK waste industry typically reports around 4,100 to 4,300 accidents per year; the figure reduced to around 3,800 in 2001/02.

13. Private companies typically report around 1,700 to 2,000 accidents per year, with the majority of the residual being reported by local authorities.

14. The number of accidents reported by local authorities has been decreasing over the six-year period considered in this report, whilst the number of accidents reported by the private sector has been increasing (but to a smaller extent). This may be as a result of waste operations and workers transferring from the public to the private sector following mergers and acquisitions.

15. The number of reported accidents is higher in those organisations that concentrate on waste collection and lower in those that concentrate on waste treatment and disposal.

16. The overall accident rate for the waste industry in 2001/02 is estimated to be around 2,500 per 100,000 workers. This is around four times the national rate (559 per 100,000 workers as reported by HSE).

17. The fatal injury accident rate for the waste industry in 2001/02 is estimated to be around 10 per 100,000 workers. This is ten times the national rate (0.9 per 100,000 workers).

18. The major injury accident rate for the waste industry in 2001/02 is estimated to be around 330 per 100,000 workers. This is more than three times the national rate (101 per 100,000 workers).

19. The RIDDOR coding system does not give the level of information required to gain sufficient understanding of what accidents are occurring where. The codings are too generic, and combine several industries (both within and outside the waste industry) such that the majority of the accidents are concentrated in only a few categories. This causes problems in identifying in sufficient detail the areas to be targeted for intervention.

20. The accidents predominantly occur during refuse collection, with significant numbers also occurring during loading / unloading and on-site transfer activities.

21. Over 3-day injury accidents account for around 85% of the total number of accidents. Handling and sprain injuries resulting from refuse workers handling refuse during collection account for the largest proportion of these over 3-day accidents.

22. The age profile of those involved in the accidents peaks in the 30 to 39 age group. Overall, the age profile of the accidents reported in the UK waste industry is similar to that for UK industry. The main differences being that the proportion of accidents

reported involving younger workers (under 30 years old) is slightly lower for the waste industry, whilst the proportion involving older workers (over 30 years old) is slightly higher than that for UK industry.

23. Considering all injury severities, handling / sprain injuries are the most significant, with heavy weights being the most frequently involved in handling injuries followed by sharp objects and awkward loads.

24. When considering those accidents that result in fatal or major injuries, being struck by refuse collection vehicles, being struck by falling objects, trips and low falls are particularly significant.

In terms of the factors that influence accidents in waste collection the following conclusions can be drawn from the discussions held at the workshop reflecting the views of the small focus group:

25. The level of *competence* is variable, with the level reached as a result of induction training being the minimum from which *competence* increases. However, there is less need to rely on individual competence in teams where there are some competent workers to 'carry' the others.

26. Workers are not inherently *compliant*, with compliance depending on the supervision / team leader. Large companies have structures that aid compliance, small ones do not.

27. Dust, smells and broken glass are all encountered in the *external working environment*. In addition, there are violence, abuse and stress from the public. It can be difficult to get workers to wear trousers (instead of shorts) and high visibility clothing in high temperatures.

28. Larger companies are more responsible. Older *equipment* is typically passed on to smaller operators where it may not be so well looked after. Design is driven by manufacturers; largely to give them competitive advantage. Their effort tends to be put into the body rather than the chassis, which may lead to difficulties with access due to steps and low quality handles.

29. The provision of *safety equipment* is excellent as good equipment is available. Correct use and maintenance are the issues. However, the use of equipment is still reasonable, and better than it used to be. Large companies tend to fare better. However, buyers do not always understand the requirements and needs of workers.

30. *Recruitment and selection* can prove difficult due to the limited availability of labour.

31. On the job *training* is the key. However, cost, time and not wanting to train someone who will leave to join a competitor are the main barriers to training.

32. *Procedures* are good in large organisations. However, mergers and acquisitions can cause problems in integrating different procedures.

33. Within licensed facilities, *risk assessments* are mandatory. The question was raised as to whether or not they would always be applied.

34. *Incident management and feedback* were considered to be better for actual accidents than near misses.

35. Employing the right person was felt to be the key to getting appropriate *management and supervision*. An understanding of the waste industry and the company were felt to be essential, as was the ability to motivate people to do an unpleasant job. Those recruited from within the waste industry were felt to be more likely to succeed.

36. *Safety culture* was felt to be good in the larger companies, but less so in some smaller companies.

37. *Equipment purchasing* is limited by what is available on the market. Local authorities can specify within their contracts what equipment companies should buy. However, this may include large kerbside boxes capable of containing heavy loads.

38. Local authority *contracting strategy* will require a minimum health and safety standard to be met but, beyond this, price was considered likely to be the primary criterion.

39. *Company culture* has been improving, and companies are good at sharing information. Waste companies do take a long-term view as most contracts are typically for long terms.

40. Companies' *organisational structures* typically include a health and safety director or compliance officer answerable to the chief executive.

41. *Labour relations* were felt to be good in some of the larger companies.

42. *Company profitability* was felt to be good within the expectations of the waste industry. However, margins are low.

43. *Government* was felt to be pushing ahead to increase recycling to meet its targets without giving sufficient thought to the wider issues.

44. The two main *regulators*, HSE and the Environment Agency, were viewed differently. HSE were now considered to be promoting improvements in culture and providing good advice. However, the perception was that some of the requirements of the Environment Agency were potentially detrimental to health and safety.

45. The *market* influence was felt to be good, with companies now turning away unsuitable work. However, there were felt to be some circumstances where local authorities awarded single contracts to small companies who had no other waste contracts.

46. Environmental products are valued by *society*, but waste management is not seen as part of this.

In terms of the factors that influence accidents in waste landfill / treatment, the following conclusions can be drawn from the discussions held at the workshop:

47. Plant drivers and the incineration plant workforce both contain pockets of excellent *competence*. However, there was felt to be a need to monitor line pickers in material recovery facilities (MRFs) without relying on individual competence. The key issue is that those who are not suitably competent should not be in charge of large expensive plant.

48. *Motivation and morale* are high on landfill sites and people tend to stay with their jobs. MRFs rely more on short-term or agency workers as it is more difficult to motivate people for such a repetitive job on a permanent basis.

49. Day to day operations on landfill sites require *teamwork* between landfill staff and customers. In particular, directing customers requires a tip marshal. On landfill sites, workers undertake separate functions due to the nature of the job. In MRFs, the aim is to get the product out, and the team needs to work together to achieve this.

50. There are two extremes; landfill operators with heavy plant have high *perceptions of risk*. On smaller landfill sites and MRF picking lines *risk perception* is low.

51. The workforce is essentially self-selecting, as those susceptible to musculoskeletal and other *health* problems would not be working in the industry. There is little occupational health testing.

52. Educational levels are becoming a major issue now in terms of basic skills, with literacy being low on landfill sites and MRF picking lines.

53. The biggest problem was felt to be with customers on landfill sites, as they have little perception that it is important to *comply* with health and safety legislation.

54. The *external working environment* is likely to have a low influence on health and safety. However, weather conditions can cause problems with moving vehicles on muddy un-compacted tips.

55. Standards of *internal work environment* are relatively good in expensive plant. However, MRFs have traditionally been adapted from equipment produced for other industries. Ergonomic considerations have also been lacking in the past. MRFs have typically been incorporated into old (sometimes unsuitable) buildings that are not high enough and may be enclosed on three sides. The situation is improving in MRFs with the introduction of process engineering skills.

56. Newer expensive *equipment* is more likely to be maintained. However, the standard is poor on some small landfill sites.

57. There are differences between the standards of *safety equipment* for employees and customers on landfill sites. Rear view cameras started being fitted more than 5 years ago. Even smaller skip operators will have high visibility clothing. People need to understand why they have to wear PPE rather than just be told to wear it.

58. For MRFs, *recruitment and selection* is based largely on whether workers turn up and stick with the job.

59. *Training* expenditure is generally low, although this will vary. Having the money available is a key issue. In MRFs, there may be a tendency to do the minimum in terms of training, as companies do not know whether workers will stay or not. Companies will invest in people once they have established themselves and look likely to stay.

60. In landfill operations, *procedures* are effectively job descriptions. There are few common industry standards. With the industry now maturing, there is more collaborative work through forums such as the WISH forum and the ESA.

61. On occasions, existing facilities can be transferred to companies by local authorities at short notice.

62. On landfill sites, there are clear and precise accident recording procedures with accidents reported, no matter how small they may be.

63. Graduate *managers and supervisors* were felt to be more receptive to health and safety messages in general than the older workers who have always done it that way in the past. However, there are significant barriers to graduates being 'accepted'.

64. Local authorities were not felt to be interested in worker welfare in the past, and workers retain the view that employers are not interested in them. Nevertheless, workers think that health and safety is something for their company to deal with, not them. However, there tend to be responsible corporate structures now, and a more positive *safety culture* is developing.

65. Waste companies that purchase their own equipment are typically good at providing specifications and *purchasing equipment* on best value. The landfill manager will also be involved, and will approve the specification as well.

66. *Equipment purchased* by clients tends to be dominated by price. Waste companies are typically not consulted, and the purchasing is often a function of the particular local authority. The waste companies then have to make this equipment safe.

67. As part of their *contracting strategy*, some local authorities were felt to try to hand over their responsibilities to waste companies including that for their duties under the Health and Safety at Work Act (which they obviously cannot do).

Objective 3: To analyse the workplace transport accidents in the waste industry

68. Around 60% of the waste industry accidents are associated with workplace transport. This is particularly so in refuse collection where many of the accidents occur in the vicinity of refuse collection vehicles. The conclusions from the accident data are presented under the conclusions for Objective 2.

69. Similar limitations in the data were found to those for Objective 2. However, the new coding system for agents introduced in 2001/02 does provide greater detail on the type of vehicle involved.

70. More workplace transport accidents occur in the general public services sector than the sewage / refuse sector, perhaps reflecting the amount of refuse collection undertaken in the public sector.

71. Analysis of the workplace transport subset for accidents involving workers being struck by moving vehicles indicates that the majority of these occur in refuse collection in both the private and the public sectors, typically involving either refuse collection vehicles or private cars.

72. More accidents involve vehicles moving forwards than in reverse. However, less time is likely to be spent in reverse, thus making the accident rate per unit time higher than that for moving forward.

73. There are essentially five broad issues surrounding accidents where workers are struck by moving vehicles:

- Workers having their ankles and feet run over by forward-moving vehicles either due to standing too close or due to slipping / tripping from kerbs whilst the vehicle is moving past.
- Workers being injured whilst trying to get onto or off of moving vehicles.
- Reversing vehicles being guided by two ‘banksmen’ and striking one whilst the driver was watching the other for instructions.
- Banksmen failing to stop reversing vehicles with either verbal or hand signals and either themselves or others being struck.
- Workers not expecting vehicles to move, and being struck (i.e. the driver was not aware of the worker behind).

74. There was felt to be a high *awareness* of the risk associated with hazards such as transport and sharp objects. (This is in contrast to the *perception of risks* associated with manual handling, which is much lower). On landfill sites, operators with heavy plant have high *perceptions of risk*.

75. *Inspection and maintenance* tend to go beyond the regulatory requirements. Operational needs are paramount, as the costs are considerable if a vehicle breaks down. Health and safety benefits accordingly. This is not necessarily the case for skip trucks.

76. Operational issues predominate in *design* of refuse collection vehicles, with the vehicle industry being reactive rather than proactive. The situation has improved in recent years, with bins being interchangeable between different vehicles. However, the design of vehicles and facilities are rarely co-ordinated.

77. Workers are provided with communications radios on landfill sites, as companies do not want plant drivers stopping to receive verbal instructions. Special signalling codes have been developed for *communications* on landfill sites.

Objective 4: To foresee trends in the industry that may affect its health and safety performance

78. The UK waste industry is driven by legislation and regulation. Much of the legislation originates from European Directives that are implemented in the UK.

79. The implementation of the UK waste strategy is likely to have an impact on employment numbers and patterns within the waste industry. In particular, if targets to decrease waste generated and increase the amount of waste recycled are met, there may be a transfer of jobs from the traditional refuse collection and landfill sectors to materials recovery facilities (MRFs) and material reprocessing.

80. It is estimated that if the 30% national recycling target is to be met in 2010 then around 45,000 extra jobs could potentially be created in the UK. This estimate consists of around 9,000 extra jobs in collection, 26,000 in sorting and 9,000 in reprocessing.

81. Potential future changes in the waste industry may result in more exposure to manual handling due to the number of jobs required in collecting and sorting waste.

82. Potential future changes in the waste industry may also result in more exposure to workplace transport due to the number of jobs required in collecting waste for recycling.

83. With the UK waste strategy requiring the public to sort more waste and take some bulky and recyclable waste to civic amenity sites, there is a potential to transfer risk from the waste industry to the public.

84. Landfill was felt to be in decline due to the legislative approach requiring more recycling and less landfill and, as such, landfill is not a popular career choice within

the waste industry. There is a HGV driver shortage affecting UK industry as a whole. This is exacerbated in the waste industry as other driving jobs may appear more attractive. The recruitment and retention situation in the waste industry needs to be rectified as the workforce is aging and there may be problems in 10 years time as a result of demography and increased demand.

85. The government was felt to be interested in recycling targets, but want everyone else to deliver against these targets.

86. The waste industry offers the potential for the creation of new economies and jobs. Unfortunately, recycled products are viewed as inferior to new ones. Whilst shareholders have a desire for more socially responsible companies, they were felt to be interested in health and safety only in terms of the environment.

87. Society's indifference to the health and safety of workers in the waste industry was felt to be in stark contrast to their views on the environment.

Objective 5: To provide information that will enable HSE to intervene effectively and influence the waste industry

88. In addition to the summary information contained in this report, the following suite of data analysis tools has been developed for HSE:

- **Waste RIDDOR Data Tool** – For detailed graphical analysis of the RIDDOR accident data by any of the fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for the industry as a whole or individual organisations.

- **Waste RIDDOR Report Tool** – For detailed analysis of the RIDDOR accident data by any of the fields reported under the RIDDOR regulations plus the notifier comments and investigation reports for industry as a whole or individual organisations.

- **Waste Company Profile Tool** – For analysis of the processes and locations of the major waste companies (based on the ESA membership).

- **Waste Sector and Employment Tool** – For analysis of the location of the number and size of organisations and number of workers by region in the waste and recycling industries (based on Annual Business Inquiry data).

- **Waste Tonnage and Employment Tool** – For analysis of the number of tonnes of municipal, industrial and commercial waste by region plus estimates of the associated number of workers (based on Environment Agency data).

- **Licensed Waste Site Tool** – For analysis of the location, ownership and type of licensed waste sites (based on Environment Agency and Scottish Environmental Protection Agency data).

- **Waste Skip Hire Profile Tool** – For analysis of the location of skip hire operators (based on directory listing data).

89. This suite of tools provides HSE with rapid and convenient means to: identify accident 'hot spots', benchmark the performance of individual organisations within the waste industry, and identify specific groups for targeted intervention.

90. Access to such intelligence can enable HSE to optimise its resources and target the most appropriate areas for intervention.

12. RECOMMENDATIONS

12.1 GENERAL RECOMMENDATIONS

Based on the work undertaken, the following recommendations are presented as means of improving the health and safety within the UK waste industry:

1. In order to provide improved intelligence for targeting risk controls, both the Standard Industry Classifications (SIC) and RIDDOR reporting systems need to be amended. In terms of industry classification systems, the waste industry needs to be treated as a separate industry rather than being combined with the water industry. In terms of the RIDDOR accident recording systems, specific codes are required to reflect waste management activities other than refuse collection (e.g. the various recycling and sorting activities). In addition, the agents involved in waste management activities need to be expanded to capture those that relate to recycling and sorting. These amendments are important now, but as the industry changes and moves towards greater recycling, their significance in delivering relevant data is likely to increase.

2. A strategy needs to be developed for intervening with local authorities, with the intention of reducing the number of waste-related accidents in the public sector.

3. In order to meet the Re*vital*ising targets for reducing the number of fatal and major injury accidents, strategies need to be developed to reduce the number of accidents resulting from being struck by vehicles, being struck by objects, trips and falls from vehicles.

4. In order to meet the Re*vital*ising targets for reducing the number of lost working days, strategies need to be developed for reducing the number of handling-induced injuries. This requires input from clients as well as waste organisations, such that unsuitable containers are not imposed on waste companies and their workers.

5. In tackling these issues for the waste industries, the *regulator* needs to influence *company culture*, *ownership and control*, *organisational structure* and *health and safety management* via companies' head offices. These head offices then need to influence *training* and *management / supervision* in order to influence *competence*, *team working* (where appropriate), *communications* and *compliance*.

12.2 RECOMMENDATIONS FOR FUTURE WORK

1. Given the number of accidents in the public sector, and the lack of readily available information on public sector waste services, further work is required to survey local authorities in the UK in order to gain a better understanding of how many workers they employ in the waste sector, what these workers do, and why such a large number of accidents are occurring. Local authority employment data could be sought as part of the yearly Municipal waste survey. Such information would allow HSE to better target its interventions in the public sector.

2. A survey should be undertaken of the number of agency workers employed in waste organisations in both the public and private sectors. This information should be provided anonymously, and would give an indication of the extent to which agency workers are used in the waste industry and in which processes and regions.

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APPENDIX A

WORKSHOP BRIEFING NOTE

WASTE INDUSTRY HEALTH AND SAFETY

INFLUENCE NETWORK WORKSHOPS

BRIEFING DOCUMENT

1. AIMS AND OBJECTIVES OF BRIEFING DOCUMENT

The aim of this briefing document is to provide you with enough background material to prepare you for the Influence Network workshops on health and safety in the waste industry to be held at the BOMEL offices near Maidenhead on:

- 10 July 2003 – Waste collection
- 11 July 2003 – Landfill / treatment

This short document:

- Briefly describes the process to be adopted during the workshop.
- Defines the overall objectives of the project.
- Defines the objectives of the workshop.
- Describes the background to the Influence Network approach.
- Describes the context to be considered in the workshop.
- Provides a customised diagram for consideration prior to and during the workshop.
- Defines the factors considered to influence health and safety in the waste industry.

2. PROJECT OBJECTIVES

The project was commissioned by HSE to carry out a study on health and safety in the waste industry from source to sink. This project has the following complementary objectives:

- To scope the waste industry from source to sink in terms of process, size and employment.
- To identify the health and safety performance of the industry.

- To provide information that will enable HSE to intervene effectively and influence the waste industry.
- To foresee trends in the industry that may affect its health and safety performance.
- To analyse the workplace transport accidents in the waste industry.

One element in meeting these objectives is a pair of workshops with industry involvement, one focussed on waste collection activities and the other focussed on landfill / treatment activities.

3. WORKSHOP OBJECTIVES

Each workshop provides an opportunity for those involved with the waste industry to examine the underlying causes accidents and ill health and subsequently consider the potential effectiveness of a variety of risk control measures. In particular, the key objectives of each workshop are to:

- Identify the factors that influence health and safety.
- Rate and weight these factors in terms of current practice and their influences on other factors.
- Identify possible risk control measures.
- Identify the potential effects of future trends in the industry (such as increased recycling) on health and safety.

4. CONTEXT

Given the complexity and nature of the UK waste industry, two separate workshops are being held to address:

- Waste collection
- Landfill / treatment

In each of these workshops the intention is to address health and safety in terms of the typical activities that are undertaken in the two areas. Activities under consideration will include those associated with operating the facilities (such as transfer stations, civic amenity sites, landfill sites etc.), their associated equipment and the range of vehicles and plant associated with collecting, transporting and processing waste.

Use of the Influence Network in the workshop (as described below) will serve to structure thinking on the potential influences on health and safety. A range of factors such as risk perception, teamwork, safety culture, contracting strategy and Regulatory influence will be explored in order to get closer to why accidents

happen and ill health occurs. Using the Influence Network will help to ensure that a wide range of risk control options for the waste industry are identified and their potential impact assessed. The Network enables behavioural factors to be captured alongside hardware considerations and external elements which all affect safe and healthy working.

5. INFLUENCE NETWORKS

Most accidents are caused by a complex combination of events; they do not happen in isolation, but are part of a wider system of causal factors. This is shown in Figure 5.1 as a set of nested systems or domains that influence the performance of people and hardware in a hazardous situation. The effect of each domain on the others can be characterised by a set of influences, each having a potential effect on any influence within the enclosed domains. All of these influencing domains interact in the causes of accidents, and are also the areas where error prevention and risk control measures can be introduced.

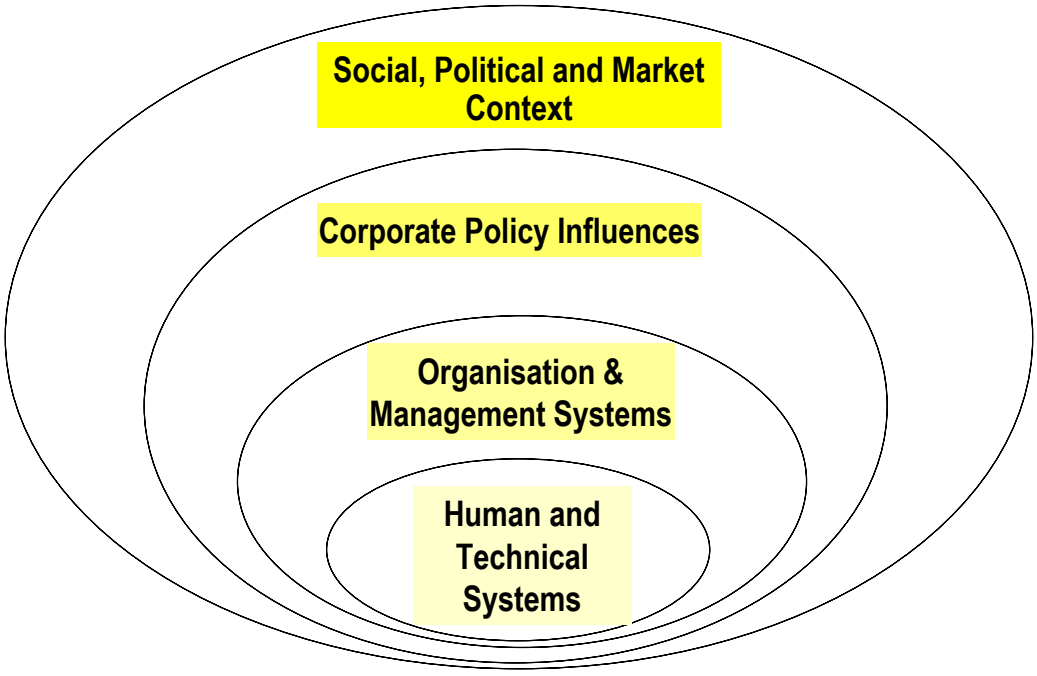

Figure 5.1 Nested System of Influences

Effective safety management requires a clear understanding of the various technical, human and organisational factors that affect risk, and of the influence that each of these factors exerts. It is also essential to reflect the different mechanisms of influence within different industry sectors. Influence Networks have been developed to deal with this complexity of factors influencing an accident or undesirable event.

An Influence Network is a model representing the various factors that influence the occurrence of a particular undesirable event. The development of an Influence Network involves the definition of the event under consideration and the identification of the hierarchy of influences upon the event. The approach has been adopted as part of a comprehensive five step (hazard identification, risk assessment, risk control, cost

benefit assessment and decision making) Formal Safety Assessment methodology by the Maritime and Coastguard Agency (supported by the International Maritime Organisation) which utilises the techniques to provide a direct evaluation of the effectiveness of regulatory changes in improving marine safety and as a means of assessing the influences on safety across the maritime industry. The technique has also been used in previous studies for the HSE to examine a number of health and safety issues including falls from height (pan-industry), hand-arm vibration syndrome, goods delivery, construction plant and safety at roadworks.

Figure 5.2 illustrates the typical composition of an Influence Network, and the various domains of influence that can be identified. This diagram has been customised to reflect the particular issues and influences associated with health and safety in the waste industry. Within the workshop session, this diagram will be further customised to reflect your experience and judgment about critical influences.

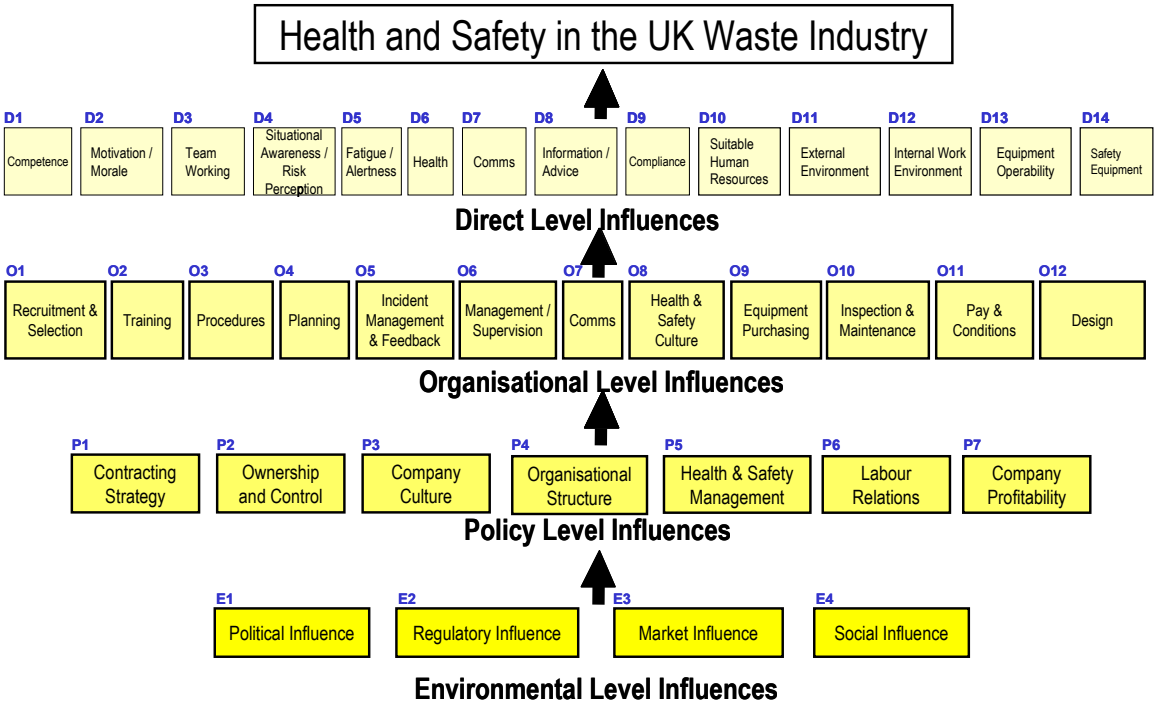

Figure 5.2 Influence Network for health and safety in the waste industry

Within Figure 5.2 there are four levels of influencing factors, reflecting the domains shown in Figure 5.1:

Direct Level, which refers to the immediate workplace factors that have a bearing on the human and technical conditions which can lead to unsafe acts and/or technical failures that are responsible for the accident.

Organisational Level, which refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human/technical failures.

Policy Level, which comprises the policy and corporate level factors that determine the organisational processes.

Environmental Level, which refers to the regulatory and wider external influences that determine corporate and organisational policies and processes.

Within each domain, there are several potential influencing factors. Those adopted for the workshop session are defined in the attached Appendix. These definitions will be used within the workshop as a basis for discussion to identify the particular characteristics of relevance within the waste industry. The descriptions of best and worst practice will be discussed and customised to reflect the practices and changes in practice in the waste industry. It will be important to highlight current industry or HSE initiatives addressing specific influences and / or to highlight any data indicating their significance.

Based on these scales, current practice across the industry will be 'rated' in the context of the risks associated with accidents or ill health occurring. This rating exercise and discussion will result in a comprehensive understanding of the relevant issues across the sector and particular practices or issues of concern will be highlighted.

In the next stage, the relative strength of the influences at one level will be assessed in terms of their impact on the influences at the level above. A quantitative 'weighting' will be assigned.

With these weightings and ratings in place, an understanding of the underlying causal influences on accidents and ill health in the waste industry will be generated. A risk index can then be calculated.

Areas for potential improvement will be identified through the session and estimates of their potential to improve ratings will be made.

6. THE WORKSHOP SESSION

Within the workshop session the aim is to customise the Influence Network to reflect the critical influencing factors having a bearing on health and safety in the waste industry. The quality of each of these factors will be rated and their importance in influencing health and safety will be weighted.

Prior to the workshop it would be useful if you could familiarise yourself with the Influence Network and think about the pertinent issues across the waste industry, especially the kind of influences that may have a bearing on health and safety. If you feel that the influences identified do not completely reflect all relevant factors, then this can be explored within the session. No other preparation is required, and the full procedure will be explained on the day.

We look forward to seeing you there.

Further information can be obtained from Mike Webster at BOMEL Tel: 01628 777707 Fax: 01628 777877 Email: mikewebster@bomelconsult.com.

APPENDIX A
INFLUENCE NETWORK FACTORS

Direct Level Influences

This refers to the immediate workplace factors that have a bearing on the human and technical conditions that can lead to unsafe acts and/or technical failures that are responsible for the accident.

D1 – Competence	
The skills, knowledge and abilities required to perform particular tasks safely.	
Poor	Workers cannot perform a task without direct instruction and supervision. They have little or no knowledge of equipment functioning. They have little or no understanding of their job role or responsibilities.
Moderate	Workers can perform routine tasks with speed and efficiency, but need assistance with complicated or novel situations. They are able to utilise equipment only in normal operations. They have a basic understanding of their role and responsibilities.
Excellent	Workers can perform complicated tasks with speed and efficiency and can problem-solve efficiently in novel situations. They are considered experts in their trade/profession, able to deal with a range of conditions. They are completely familiar with their role and responsibilities as well of those of any junior personnel.

D2 - Motivation / Morale	
Workers incentive to work towards business, employer, personal and common goals.	
Poor	Workers' morale may be low for a number of reasons including poor terms and conditions, an industry downturn, the lack of opportunity for them to use their skills, little discretion for them over how work is performed or a poor safety record which they feel they have no control over. As a result, they express negative and pessimistic views about their jobs and motivation towards health and safety issues is low.
Moderate	Workers are mostly neutral about their jobs and conditions. They perform their duties with care and attention most of the time because they have some control over the work. They are motivated to look at health and safety issues if they can be presented as important enough.
Excellent	Workers are positive and optimistic about their jobs and conditions and are proactive in relation to health and safety. They demonstrate high levels of commitment to high quality work and improving health and safety.

D3 - Teamworking	
The extent to which individuals work in teams and look out for each other's interests.	
Poor	People work on individual work fronts and rarely interact to talk about health and safety. There is negative peer pressure (with respect to health and safety) in that people are expected to get on with work irrespective of risks and well-intended advice is perceived as interference.
Moderate	People work in teams some of the time. They will sometimes discuss health and safety and may look out for each other in terms of certain hazards.
Excellent	There is positive interaction within teams, with people actively looking out for each others health and safety. There is positive peer pressure and advice is welcomed.

D4 - Situational Awareness/Risk Perception	
The extent to which workers are aware of hazards and risks.	
Poor	Lack of awareness of hazards and disregard of the risks.
Moderate	Acknowledgement of hazards and risks but little effort towards behaviour modification.
Excellent	Clear recognition of hazards and risks with appropriate behaviour modification to compensate.

D5 - Fatigue/Alertness	
The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol.	
Poor	People are inactive, drowsy or tired leading to poor judgements and unnecessary risks.
Moderate	People are generally alert and vigilant. Capacity for work is normal, although certain situations (such as prolonged periods of excessive activity) may temporarily affect capacity for work and increase risks.
Excellent	People are exceptionally alert, vigilant and attentive and always make good decisions in order to minimise the risks.

D6 - Health	
The well being of body and mind of the workforce.	
Poor	There are relatively high levels of poor physical/mental health, e.g. musculoskeletal disorders, which increases the risk of accidents and occupational illness.
Moderate	Any physical or psychiatric conditions are minor or transient and will only temporarily affect capacity for work.
Excellent	Physical and psychiatric conditions are low. Capacity for work is at its peak.

D7 - Communications	
The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and teamwork.	
Poor	Communication is unclear, unreliable or too infrequent resulting in poor task/team work.
Moderate	Communication is usually clear, timely, and reliable, but deteriorates occasionally.
Excellent	Communication is always clear, reliable, timely and appropriate for those who require the information, resulting in effective task/team work.

D8 - Information / Advice	
The extent to which people can access information that is accurate, timely, relevant and usable.	
Poor	Information is too frequent or infrequent, unobtainable, irrelevant, incomplete or difficult to interpret.
Moderate	Information is obtainable and relevant, but at times is difficult to interpret or too infrequent.
Excellent	Information is accessible, understandable, relevant, complete and timely.

D9 - Compliance	
The extent to which people comply with rules, procedures or Regulations.	
Poor	Rules, procedures and Regulations are frequently violated or not followed at all.
Moderate	Rules, procedures and Regulations are followed without consideration of their appropriateness to the context.
Excellent	Rules, procedures and Regulations are complied with and due consideration to the appropriateness of the context is always given.

D10 – Suitable Human Resources	
The relationship of supply to need for suitable human resources. Relates to the appropriate mix and number of workers in terms of experience, knowledge and qualifications.	
Poor	There is a lack of workers available (with the necessary experience and knowledge required by the industry). As a result, people will be stressed, and / or experience excessive workload.
Moderate	Workers (with knowledge and experience) are available most of the time but occasionally people are overstretched.
Excellent	There is a stable and regular supply of workers (that possess the appropriate experience and knowledge required by the industry).

D11 – External Working Environment	
The conditions external to the work site which impact on work activity e.g. weather, public proximity, traffic, external distractions, muddy conditions etc.	
Poor	Night time, strong winds, poor visibility, heavy rain, muddy conditions, public proximity.
Moderate	Dull conditions, intermittent rain and light wind, occasional site disturbances etc.
Excellent	Day time, dry, light, warm, protected site.

D12 - Internal (Vehicle / Plant) Work Environment	
The level of noise, temperature, congestion, light and vibration within, on or around the vehicle / plant.	
Poor	Noise and temperature are often extreme, space is congested, lighting levels are poor and motion or vibration is persistent and of high frequency.
Moderate	Occasionally and transiently one environmental factor is extreme.
Excellent	All environmental factors are at an optimal level, with infrequent and minor deviations from this level.

D13 – Equipment (Vehicle / Plant) Operability	
The extent to which the design of the equipment / vehicle / plant allows safe operation and the degree to which it is inspected and maintained to promote safe operation. This relates to inherent design features such as stability, access, visibility and physical protection.	
Poor	Equipment / vehicle / plant is of poor quality / grade and never or rarely inspected, serviced or maintained. The risk of accidents is higher as a result.
Moderate	Equipment / vehicle / plant is generally reliable but quality may not be consistent and maintenance is not always to a reasonable standard.
Excellent	Equipment / vehicle / plant is of high quality and reliability which is conducive to safe working. Manufacture is continuously being improved and the end user is consulted. Inspection and maintenance is carried out to a high standard.

D14 - Safety Equipment / PPE	
The extent to which SAFETY equipment / PPE is available, conforms to best practice, meets the usability needs of the worker and is inspected and maintained. This includes features such as protective clothing, vehicle restraints, safety signs, warning devices and visibility aids.	
Poor	Safety equipment / PPE is either absent, of poor quality or impractical and are never or rarely inspected, serviced or maintained.
Moderate	Safety equipment / PPE is usually available and is of reasonable quality/usability although quality may not be consistent and maintenance is not always to a reasonable standard. This means that sometimes health and safety are compromised.
Excellent	Safety equipment / PPE is always available and is of high quality and usability which gives maximum protection to workers. The equipment is reliable and performs consistently. Inspection and maintenance are carried out to a high standard.

Organisational Level Influences

Refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human / technical failures.

O1 - Recruitment and Selection	
The system that facilitates the employment of people that are suited to the job demands.	
Poor	There are no clear selection criteria for jobs: recruitment is informal and discriminatory; selection is subjective and casual. There are no defined competencies to inform worker selection.
Moderate	There are selection criteria but they do not conform to best practice and are likely to be subjective, albeit formal; people are unlikely to be selected on the basis of their match to the demands of the job. There are broad competencies to inform worker selection.
Excellent	Guidelines for selecting people are clear and up to date. Best practice is conformed to such that people are selected on the basis of their ability to perform the job. The competencies required to perform the job are clearly set out.

O2 – Training	
The system that ensures the skills of the workforce are matched to their job demands.	
Poor	There is no budget or system for identifying personnel training needs or assuring competence e.g. no appraisal system. There is no investment in the workforce.
Moderate	There is a system for training personnel that is based on minimum legal requirements, but does not target individual needs. There is minimum investment in the workforce.
Excellent	There is a system of training based on individual training needs and resources are made available to ensure that the competence of the workforce is continually assured. There is considerable investment in the workforce.

O3 - Procedures	
The system that ensures that the method of conducting tasks and/or operations is explicit and practical.	
Poor	There are no procedures in place to guide or inform people. Any such procedures do not represent actual tasks or are so poorly presented / inaccessible as to render them ineffective.
Moderate	There are procedures but they are of inconsistent quality; e.g. they do not require the level of detail required.
Excellent	Procedures are systematically updated involving people whose responsibility it is to perform the tasks. They are informed by risk assessments and are well presented, organised and effective in guiding operations.

O4 – Planning	
The system that designs and structures work activities	
Poor	Planning is reactive and schedule driven with no regard to safe methods. Risk assessments are not undertaken as part of work planning.
Moderate	Basic planning exists but with little regard for how different activities may be affected. Risk assessments are only undertaken sporadically.
Excellent	Planning is proactive and interactive for different work activities. Risk assessments are an integral part of the work.

O5 - Incident Management + Feedback	
The system of incident management that ensures high quality information is available for decision-making when and where it is required, including the collection, analysis and feedback of incident and near-miss data.	
Poor	There are no procedures for recording information on incidents that can be used to prevent further occurrences.
Moderate	Information on incidents is recorded but may be poor in quality and not be disseminated. Near miss data is not given high priority.
Excellent	Good quality information about incidents is recorded in a clear and comprehensible manner and is effectively disseminated. Information on incidents enables steps to rectify and prevent further occurrences. Near miss data is actively used in decision-making and feedback.

O6 - Management / Supervision	
The system that ensures human and hardware resources are adequately managed/supervised.	
Poor	There is poor management and supervision of work activity. Human and hardware resources are often used inappropriately which increases risks.
Moderate	There are management procedures for some aspects of health and safety and supervision is helpful although seldom proactive.
Excellent	Management and supervisors are proactive in controlling the risks to the health and safety of workers. To this end, resources (human and hardware) are used appropriately.

O7 – Communications	
The system that ensures that appropriate information is communicated clearly to its intended recipients.	
Poor	Information on health and safety hazards and risks is not collected or communicated.
Moderate	There are systems in place for gathering and communicating health and safety information, but breakdowns occur and little thought is given to information requirements.
Excellent	There is a system in place to ensure the effective collation and dissemination of practical health and safety information. This information is received and understood by those who need it when it is required.

O8 - Safety Culture	
Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to health and safety.	
Poor	Health and safety is given little or no priority. There is apathy towards accidents and work related ill health which stifles the sharing of relevant information. Control of health and safety is generally regarded as someone else's responsibility and people are resistant to new ideas for improvement.
Moderate	Health and safety only has a high priority to the extent it maintains image. The sharing of information is not encouraged and often ignored. Responsibility for health and safety is confined to a few people. People are only proactive now and again and this is not always well received.
Excellent	Health and safety has a high priority and is openly addressed. Information is actively sought and dissemination is encouraged, responsibility is shared, sub-standard performance leads to inquiries without blame and new ideas for improvement are welcomed.

O9 - Equipment Purchasing	
The system that ensures that the appropriate range of equipment is available.	
Poor	There is no budget and no thought is given to specifying and acquiring new plant / equipment which would help to reduce the risks during plant operations. Money that is available is used for the purchase of the cheapest available plant / equipment that rarely suits what is required.
Moderate	Plant / equipment for minimising the risks during plant operations is obtained but it does not necessarily meet user or task requirements.
Excellent	There is a purchasing policy for plant / equipment to reduce the risk during plant operations which results in purchases of high specification with appropriate levels of functionality that meet user's current requirements, and pre-empt, to some extent, future requirements.

O10 - Inspection + Maintenance	
The system that ensures vehicles, plant and equipment are maintained in good working order.	
Poor	There is nothing to ensure the inspection and maintenance of vehicles / plant / equipment essential for safe operations. The operational life of vehicles / plant / equipment is frequently exceeded. Any repairs are aimed at maintaining working progress but not at preventing further degradation.
Moderate	Inspection and maintenance conforms to minimum requirements in terms of plant safety but vehicles / plant / equipment may be maintained past its operational life to avoid new purchases.
Excellent	Systems of inspection and maintenance for safe plant operations surpass minimum requirements. Vehicles / plant / equipment are replaced or maintained to a high standard as and when required. Procedures cover long-term planning and contingency management.

O11 - Pay + Conditions	
The remuneration package and benefits in the context of working hours and conditions and welfare facilities.	
Poor	Lower than average rates of pay or piece work payment, long working hours and minimal welfare facilities.
Moderate	Average pay rates, bonuses linked to productivity, reasonable working hours and welfare facilities.
Excellent	Above average pay rates and welfare facilities. Bonuses linked to safety performance as well as productivity.

O12 – Design	
The extent to which design of facilities, plant and vehicles takes into account the work activities and how they can be carried out safely and without detriment to health.	
Poor	Design takes no account of the operational activities and their associated hazards. There is no coordination between designers, nor explicit recognition of the risk factors involved with using the facilities, plant or vehicles.
Moderate	The design process is carefully managed, but consideration of the operational activities is only sometimes taken into account. Attempts are made by designers to address health and safety issues in so far as their knowledge of waste activities allows them to deliver.
Excellent	Design explicitly covers the operational activities and their associated hazards. Designers take full account of the safe use of plant by identifying hazards, assessing the risks and then eliminating the hazards or reducing the risks at the design stage. There is coordination between designers of all disciplines and consultation with users.

Policy Level Influences

This comprises the policy and corporate level factors that determine the organisational processes.

P1 - Contracting Strategy	
The extent to which health and safety is considered in contractual arrangements and the implications.	
Poor	Contracts meet no more than minimum legal requirements on health and safety. There is no consideration of health and safety in contractor evaluation or award criteria. The overarching strategy is for minimum cost and avoidance of liability. Attempts are made to pass responsibility for health and safety as far down the contractual chain as possible. Contracting is fragmented with multiple levels of subcontracting without clear lines of responsibility and accountability for health and safety. Those carrying out the work, particularly the self-employed or small organisations, are unclear of their health and safety responsibilities. As such, contractors take little or no measures to minimise the risks.
Moderate	Contract procurement specifications explicitly address health and safety requirements. Safety is included in contractor evaluation criteria, but may be secondary to cost. Whilst no attempt is made to 'offload' responsibility for health and safety, it is not clear what the responsibilities of each party are.
Excellent	There is a strong emphasis on health and safety through contract procurement and these considerations affect contracting strategy. Health and safety requirements are identified for all stakeholders and include recognition of interface issues and change control. Health and safety is a primary consideration in contractor evaluation and contract award (in respect of contractor proposals and health and safety record). The contractual arrangements are such that the responsibility for health and safety of each party is appropriate to their role. The communication of responsibility is clear and obvious.

P2 - Ownership + Control	
The extent to which ownership and control is taken over sustained health and safety performance.	
Poor	Managers/directors are disinterested in taking responsibility for health and safety either within their own organisation or in working with clients or contractors.
Moderate	Managers/directors delegate responsibility for health and safety but take little direct interest and do not always provide the resources needed to tackle specific issues. Regulatory targets are followed but there is little or no proactive activity.
Excellent	Managers/directors have clear roles and responsibilities regarding the control of health and safety. Health and safety responsibilities are embraced and industry initiatives are welcomed. Targets and initiatives are set and contractors/clients are expected to adopt these. Cooperation at all levels is expected and encouraged. A commitment to health and safety is visible and transparent.

P3 - Company Culture	
Culture within an organisation consists of assumptions about the way work should be performed; what is and what is not acceptable; what behaviour and actions should be encouraged and discouraged and which risks should be given most resources.	
Poor	The style of behaviour that is accepted is aggressive or defensive. Management style is either laissez-faire or autocratic. Decision-making is top down or is disorganised and confused. Short-term profit policies prevail to the extent of ignoring risks.
Moderate	Practices are pursued that have a minimum detriment to profits, comply with the law and seek to maintain a clean public image, but fail to address specific risks.
Excellent	Decision-making is by consultation and management style is empowering and delegating. Investment is seen as key to securing long-term goals. There is a strong emphasis on the value of employees, mutual respect and concerns for health and safety, with commensurate standards for behaviour and continuing goals for improvement.

P4 - Organisational Structure	
The extent to which there is definition of health and safety responsibility within and between organisations	
Poor	Roles and responsibilities for health and safety are not clearly defined, with no regard to communication issues or cooperation. Relationships are confrontational and competitive.
Moderate	There is some definition of roles and responsibilities for health and safety but there may be gaps particularly in respect of communication issues.
Excellent	Roles and responsibilities for health and safety are clearly defined, with explicit consideration of communication and cooperation issues. Relationships are open and constructive encouraging continuous improvement.

P5 - Safety Management	
The management system which encompasses health and safety policies, the definition of roles and responsibilities for health and safety, the implementation of measures to promote health and safety and the evaluation of health and safety performance.	
Poor	There are no clearly written roles and responsibilities in relation to health and safety. Health and safety management either does not exist or fails to implement measures such as risk assessments etc. There are no management procedures for monitoring/evaluating health and safety performance.
Moderate	Health and safety measures are implemented at a basic level. The main aim of health and safety management is compliance with the regulations. Health and safety management is not actively maintained and review is infrequent.
Excellent	There are clearly defined roles and responsibilities for health and safety. Health and safety management is evident in all aspects of the operations by workers and management at all levels. Health and safety management is comprehensive, is audited and reviewed for continuous improvement on an ongoing basis. Not only is compliance with the regulations sought, but a positive effort is made to go beyond the minimum requirements.

P6 - Labour Relations	
The quality of the relationship between managers / directors and the workforce. It also concerns the extent to which there is the opportunity for workers to affiliate with associations active in defending and promoting their welfare, and the extent to which there is a system in place for pay negotiation.	
Poor	Management / directors never consult the workforce on health and safety matters. Union affiliation is not permitted and thus no collective bargaining structures exist. There is exploitation of the workforce by the employer with little or no provision for workforce welfare, health and safety.
Moderate	A system is in place that facilitates negotiation of pay and conditions and allows consultation on health and safety. However, it receives minimal commitment from the employer, and is regarded sceptically by the employees. Employees are able to associate with a very restricted range of union / professional bodies.
Excellent	There is full consultation of the workforce on all matters including health and safety. Choice of professional / union association is open, and negotiation on pay and conditions is frequent, productive, and fair.

P7 - Company Profitability	
The extent to which companies are subject to competition over market share and constrained as to the price that they can charge.	
Poor	Falling or poor market share in addition to falling demand. The increasing cost of operations is set against the decreasing rates or prices chargeable forcing unnecessary expenditure to be reduced and corners to be cut.
Moderate	Reasonable and stable returns.
Excellent	Good returns with growing market (share) and sustained profits enabling investment.

Environmental Level Influences

Refers to the regulatory and wider external influences that determine corporate and organisational policies and processes.

E1 - Political Influence	
The profile of, and practices within, Government related to health and safety in the industry.	
Poor	Political instability and / or detachment from important issues within the industry. No active measures to influence health and safety.
Moderate	Stable political environment and / or recognition of the industry under the pretext of 'public interest'.
Excellent	Elevated profile for the industry. High-level political involvement and resulting empowerment of the regulator(s). Fiscal and environmental policies support prosperity of the industry and emphasise health and safety.

E2 - Regulatory Influence	
The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator(s).	
Poor	Guidance pertaining to health and safety in relation to the waste industry is weak and does not impinge on the day-to-day practices for all stakeholders. The Inspectorate is under-resourced and thus unable to influence health and safety. Regulatory requirements emanate from more than one regulator, and results in a lack of clarity and / or conflicting requirements.
Moderate	There is guidance covering many aspects of health and safety in the waste industry for which compliance is checked but the Regulator is under-resourced or unwilling to take effective actions, thus rules are inconsistently subscribed to, implemented or enforced.
Excellent	Guidance relating to health and safety in the waste industry is effective and focuses industry attention with a strong and proactive Inspectorate encouraging improvements and strong enforcement deterring transgressions. Regulatory policy is pro-active and pre-empts potential problem areas. The individual regulators communicate and ensure that their regulations are compatible.

E3 - Market Influence	
The commercial and economic context affecting the industry.	
Poor	Conditions such that, due to work overload or so little work, margins are squeezed, and corners are cut with respect to health and safety. Greater willingness to take on high-risk work, and at low cost.
Moderate	Some application of health and safety measures and risk evaluations but inadequate time or financial margins for substantial investment. High-risk work not addressed adequately.
Excellent	A commercial environment with a balance of workload / availability and return to enable investment in health and safety to be made. If high-risk work is taken on, it is at a cost that allows reasonable risk control and prevention measures to be taken.

E4 - Societal Influence	
Aspects of the community and society at large, which bear upon organisations and workers.	
Poor	Low public regard for industry and / or low concern for the welfare of workers.
Moderate	Neutral attitude to industry and welfare of the workers.
Excellent	Highly valued industry with respect for the skills and societal contribution, and concern for workers' welfare.

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