6. RECOVERY AND DISPOSAL OF HAZARDOUS WASTE

This chapter discusses the broad categories of recovery and disposal of hazardous waste but also addresses the situation and particular needs in relation to a number of specific waste types.

The main emphasis of this Plan is on making recommendations for the prevention of hazardous waste. However, even the most ambitious target of the Prevention Programme will not reduce hazardous waste quantities much below 1996 levels. For this reason, it is important to ensure that adequate and suitable recovery and disposal outlets exist for the hazardous waste that will continue to arise.

6.1 Recovery of hazardous waste

6.1.1 On-site in Ireland

A significant amount of hazardous waste is recovered on site of generation in Ireland (see Chapter 3). Generally speaking, on site recovery is carried out by the chemical and pharmaceutical industry and forms an integral part of many of the manufacturing processes being undertaken. The majority of such facilities have obtained IPC licences from the EPA. IPC licensing places waste prevention requirements on licence holders and some measures of success have been achieved and reported upon in the *Report on IPC Licensing and Control 1997* and *1998* (EPA, 1998 and EPA, 1999). Relatively high levels of waste management expertise exist at these facilities and where improvements in environmental performance are required, IPC licensing will have identified and prioritised needs. No further detailed consideration of this sector is made here.

6.1.2 Off-site in Ireland

The data for 1998 shows that some 68% of the hazardous waste processed off-site in Ireland was subjected to recovery operations, compared to 85% in 1996. Section 6.4 illustrates the range of processing capability that is available. With some additional investment, adequate processing capacity can be developed for many of the waste streams identified. Certain waste streams which are currently disposed of contain components which are wholly or partially recoverable.

Many of the hazardous waste facilities are not operating to capacity. In some cases, this is due to inadequate collection rates or insufficient takeup of collection services. Examples of sectors where collection rates are a fraction of the existing processing capacity are lead acid batteries, oil filters and fluorescent lamps. What is primarily required is an increase in the collection rate of these wastes. This is required regardless of the prevention mechanisms which may be adopted as use of these 'products' is unlikely to be totally eliminated.

The Department of the Environment and Local Government has provided grant aid to a number of hazardous waste recovery facilities. A list of all recipients of grant aid in 1998 is given in Appendix E. The Department of the Environment and Local Government has given further commitment in its policy statement of September 1998 '*Waste Management – Changing Our Ways*' to explore options for increased funding for waste management commensurate with national waste recovery objectives.

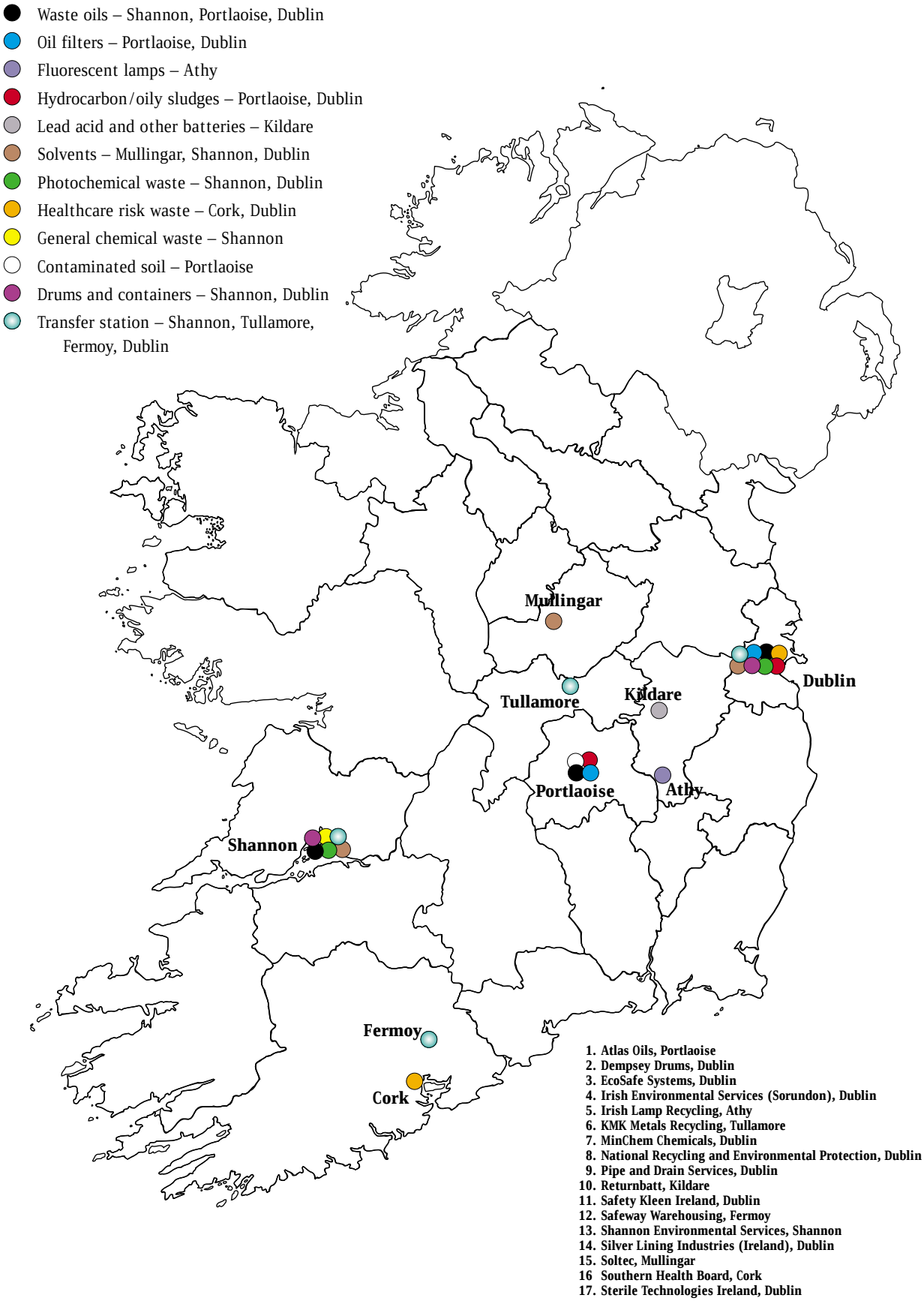
There are varying levels of technology in use in the recovery of hazardous waste. By October 1999, an application for a waste licence or waste permit or IPC licence should have been submitted to the EPA or the relevant local authority for each hazardous waste recovery facility. It is likely that, as a result of licensing and control, some facilities will require further investment in order to improve management practices and reduce emissions to the environment.

Map 6.1 illustrates the location and the hazardous wastes accepted at seventeen hazardous waste recovery and disposal facilities.

The conclusions to be drawn in relation to the recovery of hazardous waste in Ireland are:

- there has been significant investment in recovery facilities;
- adequate capacity exists at recovery facilities for certain hazardous waste streams;

Map 6.1 Hazardous waste recovery and disposal facilities



- a significantly increased collection rate of most waste types is required to ensure that full use is made of existing and new facilities; and
- investment is likely to be required at some facilities in order to improve environmental performance.

6.1.3 Abroad

Table 3.4 details the quantities of waste exported for recovery in 1996. The three major processes used were:

- reuse as fuel – which includes incineration with energy recovery and use as a fuel in cement kilns;
- solvent recovery; and
- metal recovery – the principal metal being lead (from lead acid batteries).

By comparison, Table 3.5 and Table 3.6 detail the quantities of waste exported for recovery in 1998 and 1999. The three major processes used were:

- recovery of inorganic substances;
- solvent recovery; and
- metal recovery.

In 1996, 85% (43,916 tonnes) of all exported hazardous waste went to the UK. In 1998, 35% (34,188 tonnes) of all exported hazardous waste went to the UK and in 1999, 32% (45,495 tonnes). As illustrated in Tables 3.4 to 3.6, the relative importance of the Netherlands, Germany, Belgium and Denmark has dramatically increased, reflecting to some extent the impact of the *United Kingdom Management Plan for Exports and Imports of Waste* (1996, HMSO) which sets out UK Government policy on the import of waste. A general ban exists, except in exceptional circumstances, for the import of waste into the UK where that waste is destined for disposal. The UK plan granted an exemption to Ireland for the import of hazardous waste for high temperature incineration. This exemption was based on the quantities of hazardous waste arising in Ireland being insufficient to justify a purpose built thermal treatment facility. The UK Department of Enterprise, Transport and the Regions (DETR) recently consulted interested parties on proposed revisions to the *United Kingdom Management Plan for Exports and Imports of Waste* and their impact on the future of exports of hazardous waste from Ireland to the UK. Continued access to UK disposal facilities is not guaranteed and should not be assumed in the long term.

The export of hazardous waste for recovery and disposal would appear to be occurring in a stable market although individual states' national policy can alter at any time, affecting one or more waste streams. This uncertainty leaves Ireland in a vulnerable position in relation to our reliance on foreign governments and other authorities and emphasises the need for our adoption, where feasible, of the principle of self sufficiency.

There is no scope for EU Member States to restrict the movement of waste for the purpose of recovery. On the other hand, Member States may and do restrict the movement of waste for disposal. Development of the recovery industry in Ireland is important but the market limitations on this industry, on the basis of free inter-EU movement of waste for recovery, must be recognised. These market limitations include:

- the economics of scale in developing facilities in Ireland's relatively small market; and
- the competitive forces available to large established organisations in other countries with access to larger markets and sources of waste.

Thus, while Irish industry is assured of access to foreign facilities for the recovery of waste, the same assurance does not exist in terms of waste disposal. The following sections discuss access to facilities abroad in terms of the disposal of hazardous waste.

6.2 Thermal treatment of hazardous waste

Identification of the problem

Between 1996 and 1998, the quantity of hazardous waste being incinerated in Ireland and abroad increased by 43%, up from 45,964 tonnes in 1996 to 65,631 tonnes in 1998. Based on the 1996 data and excluding hazardous waste incinerated on the site of generation, it was projected that by 2006, assuming no successful prevention initiatives, 42,880 tonnes of hazardous waste would be available for off-site thermal treatment in Ireland.

In actual fact, in 1998, 47,751 tonnes of hazardous waste were exported for disposal by incineration. By 1999, the quantity exported for disposal by incineration increased to 61,266 tonnes.

The data would appear to indicate that sufficient quantities of hazardous waste exist to justify the provision of a thermal treatment facility in Ireland. Significant and probably increasing quantities of this waste will be exported for use as fuel or in waste to energy incinerators, in other words for recovery abroad, in the absence of a thermal treatment facility in Ireland. Irish authorities do not and cannot restrict the transboundary movement of waste which is destined for recovery operations.

A number of scenarios for thermal treatment have been examined and these are summarised in Table 6.1. The value of the scenarios is that they present an indication of the scale of investment likely to be incurred in developing a hazardous waste thermal treatment facility. The costs are based on international experience. Actual operating costs can be highly variable and are influenced by

Table 6.1 Thermal treatment options based on an analysis of the data for 1996

Aspects	***A: Export, this is the current situation***	***B: Small all-purpose kiln, capacity 15,000 tonnes, capable of handling all hazardous waste types***	***C: Two kilns: (a) MSWI[1] capable of co-burning certain solid hazardous wastes (b) liquid injection kiln, capacity 8,000 tonnes***	***D: Other technologies***
Technically feasible	Yes	Yes	Yes	Under development
Investment	0	£10.5 million[2]	£3 million[3]	–
Extra annual cost	0	£0 to 750,000[4]	0 or negative	–
Environmental effects	None additional	None additional	None additional	None additional
Quantity remaining to be exported	18,880 tonnes[5]	0[6]	approx. 3,000 tonnes[7]	–
Remarks	Depends on other countries	Over capacity may inhibit prevention efforts. Under capacity may require export.	No capacity for certain 'difficult' waste types, such as drummed waste	Technically not proven on a commercial scale

Notes:

1. Municipal solid waste thermal treatment facility.
2. Estimated investment cost of £700 per tonne of capacity.
3. The capital cost of a liquid injection kiln of 8,000 tonnes per annum capacity. Capital cost of a MSWI to be borne by others.
4. Between zero and £50 per tonne more expensive than current costs.
5. Situation as at 1996.
6. Design to meet 1996 capacity for all hazardous waste types.
7. An estimated 3,000 tonnes will still have to be exported – that is, solid hazardous waste not suitable for co-combustion in a MSWI or in a liquid injection kiln.

market conditions. In addition, the current cost of export of hazardous waste is relatively low, although recent data suggests that export costs are increasing. In each case, the waste would be incinerated in kilns with state of the art flue gas cleaning and emissions control systems. All emissions would be required to comply with the relevant environmental standards.

Column D of the table highlights other thermal treatment technologies. This refers specifically to such processes as gasification, pyrolysis and high temperature melting. Many of these technologies have not been applied to the treatment of hazardous waste at a commercial scale but may, subject to further research, present real alternatives to incineration. There are a number of reported advantages to the use of alternative thermal treatment technologies and the option of using these alternatives should be considered in the context of the requirement to use the best available techniques (BAT) as required by the IPPC Directive (96/61/EC).

It should be noted that Table 6.1 is intended only as a guideline on the level of expenditure likely to be incurred in the event of hazardous waste thermal treatment capacity being constructed in Ireland. The table does not represent any preference on the part of the Agency towards any particular thermal treatment technology. The selection and licensing of any thermal treatment technology will be contingent on its representing best available techniques (BAT). The Agency's involvement in any proposed facility will begin upon receipt of an application for a licence for that facility.

Arguments for and against a facility

Factors against the establishment of a thermal treatment facility are:

- Future quantities of hazardous waste are uncertain. The two main uncertainties are collection rates of previously unreported waste and the success or otherwise of the prevention programme developed during the implementation of this Plan.
- Experience in other countries shows that improved collection rates bring in previously unreported waste. This is likely to be relatively heterogeneous waste which may be difficult to handle and process. This means that, even if a thermal treatment facility is established, it may not provide the solution for all of the waste types likely to be collected.
- A thermal treatment facility may hinder prevention initiatives. For example, aggressive marketing may target certain waste types (particularly those with high calorific values) at costs to waste generators too low for prevention to represent value for money.
- The relatively low cost of exporting waste, particularly those with high calorific values, is likely to negatively affect the viability of a thermal treatment facility.
- The data for hazardous waste disposal by incineration, particularly abroad, is uncertain in the sense that some of the waste exported for "disposal" may in fact be burned at a sufficient calorific value for its combustion to be classed as "recovery". The real ratio of disposal versus recovery is not likely to come to light until such time as exporters are faced with restrictions on the export of waste for disposal.

Factors which favour the establishment of a thermal treatment facility are:

- Directive 75/442/EEC on waste requires that the principles of proximity and self sufficiency be implemented. Ireland should therefore strive for self-sufficiency in hazardous waste management.
- If prevention initiatives recommended in this Plan succeed, then the quantities of hazardous waste will decrease. While this will not eliminate hazardous waste which will require thermal treatment, it will stabilise (whilst possibly reducing) the quantity available for thermal treatment.
- The security of export routes cannot be guaranteed. Current export markets are stable but they are only accessible as long as national governments allow the importation of hazardous waste. While the hazardous waste contracting industry has always been successful in finding outlets for hazardous waste, it may be only a matter of time before other countries close the door on hazardous waste.
- The provision of thermal treatment for the

recovery and disposal of hazardous waste is likely to reduce significantly the quantity of hazardous waste exported to other countries for high temperature incineration and for the recovery of energy (by incineration or co-incineration, for example in cement kilns). Such a reduction will reduce the potential risks associated with the sea transport of hazardous waste.

The issues of capacity, plant type and cost are issues which will entail different levels of risk on the part of potential investors in such facilities. These issues cannot be quantified by this study.

In the event of a facility being established, it may be appropriate to control the availability of waste by the imposition of import and export restrictions. Export restrictions would have to bear in mind the right of access of waste contractors to the EU-wide waste recovery market.

During the public consultation period, significant opposition to incineration as a technology was encountered. On the other hand however, some of those opposed to incineration were keen to promote alternative thermal treatment technologies. Policy in other countries and jurisdictions was indicated in support of alternatives to incineration. However, upon examining the literature published by regulatory authorities in other countries, little evidence was found to exist of "bans" on incineration. In most cases, official support was given to the concept of energy recovery from waste.

Conclusion
EU policy states that Member States should, where possible, apply the proximity principle for the disposal of waste. Ireland should therefore strive for self sufficiency where technically and economically feasible. On the face of it, the quantities of hazardous waste exported for incineration between 1996 and 1999 would appear to justify the establishment of a high temperature thermal treatment facility for the disposal of hazardous waste in Ireland. This would conform with the principles of proximity and self sufficiency set out in the Waste Directive 75/442/EEC. Increasing quantities of hazardous waste increases the burden on Ireland to take responsibility for the management of our own hazardous waste. It also provides other countries with a reason to restrict imports of Irish waste for the purpose of disposal.

On the other hand however, there are uncertainties in regard to future quantities of hazardous waste and also in regard to the types of waste that can be expected to arise as collection rates improve. In addition, the impact or success of prevention programmes can only be determined when they have been in place for a number of years. It is important that the establishment of a thermal treatment facility does not inhibit the success of prevention programmes.

Having regard to the above considerations, it is considered that the development of a thermal treatment facility for the disposal of hazardous waste is required if we are to achieve self sufficiency and reduce our reliance on export. It is considered that any thermal treatment facility developed in accordance with this Plan for the purpose of hazardous waste disposal should incorporate provision for the recovery of energy. This should, subject to favourable market conditions in the context of exports for recovery, allow for an overall reduction in the quantity of hazardous waste exported for thermal treatment, be it recovery or disposal.

Under current definitions, waste-to-energy is classified as waste recovery. While primarily recommended in this Plan to provide for hazardous waste disposal, any new thermal treatment facility is likely, in accordance with the provisions of Directive 2000/76/EC on the incineration of waste and Directive 75/442/EEC on waste, to incorporate provision for energy recovery. Such a facility may, because of its energy recovery capability and taking other factors into account, be classified as a waste recovery facility for certain waste streams of relatively high calorific value. For all other waste streams, it would be classified as a waste disposal facility.

6.2 Landfill of hazardous waste

Identification of the problem
Waste disposal generally means two ultimate destinations – incineration without energy recovery and landfill. Even if waste is subjected to treatment

processes to recover certain components or to improve its ease of handling, it will still yield residues that will require final disposal. Incineration and other thermal treatment technologies, while regarded as final disposal options, may produce an ash that must be landfilled. Landfill is the final disposal option and there is no purpose built commercial hazardous waste landfill operating in Ireland at the moment. In the past, hazardous wastes were accepted at some municipal landfills but this is changing with the introduction of waste licensing by the EPA under the Waste Management Act.

The landfill disposal option for certain types of hazardous waste has decreased in recent years for reasons related to operators' decisions not to accept it and heightened awareness of the consequences of disposal to facilities that are not engineered to the required standards. In addition, Directive 1999/31/EC on the landfill of waste requires that hazardous waste be disposed of solely in purpose built hazardous waste landfills. The Landfill Directive prohibits the disposal of hazardous waste at non-hazardous waste landfill facilities.

At present some hazardous wastes are disposed of in landfills, either in this country or abroad. The principal wastes landfilled in 1996 include metal hydroxide sludges and ion exchange resins from metal coating industries, paint and ink sludges from paint industries, other metal containing industrial sludges, asbestos from the construction and demolition industry and various other hazardous product wastes.

In 1996, 24,634 tonnes of hazardous waste were landfilled on-site of production. One company accounted for 20,900 tonnes (metal bearing salt cake) of landfilled waste. A further 3,730 tonnes of hazardous waste were disposed of by either land treatment or surface impoundment on site of production. In 1998, total on-site disposal increased to 28,499 tonnes, with an additional 100 tonnes disposed of by land treatment.

In 1996, 2,964 tonnes (excluding hazardous product waste) are known to have been landfilled off-site in Ireland, mostly in local authority landfills. This waste includes metal hydroxide sludges and ion exchange resins (824 tonnes), paint and ink sludge (822 tonnes) and other metal containing industrial sludges (696 tonnes). In 1998, 3,430 tonnes of hazardous waste were landfilled off-site in Ireland. In 1998, a further 7,151 tonnes were disposed of by land treatment.

Export of hazardous wastes for landfill amounted to 5,630 tonnes in 1996. Of this, 5,350 tonnes of industrial sludge were exported to the UK (1,950 tonnes of metal hydroxide sludge underwent physical-chemical treatment prior to landfill) and 280 tonnes of asbestos waste were exported for landfill in Germany. The quantity exported for landfill in 1998 decreased to 2,037 tonnes, all going to Germany. In 1999, 3,502 tonnes of hazardous waste were exported for landfill, principally to Germany.

Table 6.2 illustrates that the total requirement for off-site landfill (excluding land treatment) in 1998 was 5,467 tonnes of hazardous waste compared to 8,594 tonnes in 1996.

Options for landfill capacity

In order to ensure hazardous waste landfill capacity, a number of options exist. The current practice of disposing of hazardous waste at non-

Table 6.2 Illustration of the requirement for hazardous waste landfill in 1996 and 1998 (with export data for 1999)

Landfill destination*	***1996***	***1998***	***1999***
On-site in Ireland**	20,903	28,499	-
Off-site in Ireland	2,964	3,430	-
Exported	5,630	2,037	3,502

* excluding land treatment
** mostly one company, Aughinish Alumina, Co. Limerick

engineered and unlined landfill facilities is not sustainable. However, capacity will be required for inorganic wastes for which no other option exists until the generation of these waste substances is eliminated. On the basis that there is no engineered commercial hazardous waste landfill in Ireland, the following options must be considered:

- export all hazardous waste for which landfill is the only final option;
- construct a dedicated engineered hazardous waste landfill; or
- construct engineered hazardous waste cells adjacent to existing facilities.

By opting for export, the costs, logistics, planning and environmental impact assessments involved in setting up a hazardous waste landfill are avoided. However, Irish industry will be completely reliant on the willingness of foreign authorities to accept hazardous waste. In the long term this is not a viable option as EU policy is to discourage the export of waste for disposal except where economies of scale do not exist.

It is accepted internationally that the absolute minimum economic scale for a dedicated hazardous waste landfill is in the region of 25,000 tonnes per annum. The operating cost per tonne at this size is approximately £70-£100. Costs grow in an exponential fashion below the scale of 25,000 tonnes per annum. For a 25,000 tonne per annum hazardous waste landfill facility, capital costs are estimated to be in the region of £2,500,000.

The construction of a hazardous waste landfill cell adjacent to an existing landfill facility offers a less expensive option. Infrastructural costs could be minimised due to the combined use of facilities such as access roads, weighbridges, fencing and other infrastructure. There is no minimum economic scale for such a facility as the area required can be quite small. The construction of a single cell is estimated to have a minimum capital cost of £500,000. It is envisaged that capacity would be required at at least two locations, one in each of the largest hazardous waste producing areas – the south-west and Dublin areas. A facility in the Dublin area is likely to become increasingly important as, in proportion to its population, the quantity of unreported hazardous waste collected increases. In addition, in the event of a thermal treatment facility (whether for municipal, non-hazardous or hazardous waste) being constructed, a hazardous waste landfill facility will be required for ash. If thermal treatment facilities are constructed in other parts of the country consideration will have to be given to the provision of hazardous waste landfill capacity and additional facilities may be required.

For engineered hazardous waste landfill, charges to the waste generator are estimated at £75 per tonne more than existing charges. If 8,000 tonnes per annum are to be landfilled, the additional cost to waste generators are estimated to be £600,000 per annum. The actual cost will be dependent on construction and operational costs.

Immobilisation of hazardous waste by binding it into a matrix prior to landfill disposal may be appropriate in certain circumstances. The objective of waste immobilisation is to reduce the possibility of hazardous substances leaching from the waste. In effect, the solubility of the waste is reduced thus reducing the chance of substances being transferred to the liquid leachate phase. Technologies exist for the immobilisation of organic and inorganic wastes and costs can range from £10 per tonne for the use of additives such as cement, chalk or other substrate to £300 per tonne for high temperature melting. The requirement for immobilisation will depend on the type of hazardous waste involved. Estimated costs for a 10,000 tonne per annum capacity immobilisation plant are likely to be in the region of £547,000 for construction and £389,000 per annum for operation. Investment costs include for the provision of cement silos, mixers, conveyers, containers and other items. The requirement, and hence cost, for binding materials such as cement can vary depending on the leaching characteristics of the substance being bound and also on the availability of cement replacements such as incinerator fly ash and filter sludge.

Table 6.3 summarises the options for the landfilling of hazardous waste. As before, the costs should be taken as indicative of the required scale of investment only.

Table 6.3 Options for hazardous waste disposal

	Status quo	*Export*	*Dedicated landfill*	*Cell at an existing landfill*
Technically feasible		Yes	Yes	Yes
Economically feasible		Yes	No	Yes
Investment required	None	None	£2,500,000	a minimum of £500,000 per cell
		Immobilisation plant if required - £547,000		
Annual cost to waste generators (in excess of current landfill costs at non-hazardous waste landfill facilities)	None	£300,000	£600,000	£600,000 overall
		Immobilisation plant if required - £389,000		
Remarks	Not sustainable	Depends on other countries	No economy of scale, unnecessarily expensive	Favoured option

Photo 6 Hazardous waste landfill in the Netherlands.

6.4 Sectoral issues for certain waste types

This section summarises the key points pertaining to eighteen discrete hazardous waste types. These represent the principal categories of hazardous waste arising in Ireland and those for which particular concern was expressed during the consultation phases. As stated in section 4.7, priorities should be selected from the sectors and products listed below for inclusion in the prevention programme. The priorities should reflect the likelihood of reducing the environmental impact of the wastes and those sectors and/or products where early progress can be made should be selected initially.

Waste type	**Waste oil**
Main recovery or disposal route	Oil recovered for use as fuel
Residues	Sludge to landfill or further processing Waste water to sewer
Capacity in Ireland	Adequate - capacity may be expanded with relatively little investment.
Bottlenecks or difficulties	Directive 75/439/EEC on the disposal of waste oils requires regeneration as the preferred processing option. This option would reportedly require greater economies of scale than exist in Republic of Ireland. Currently, waste oil is recovered for use as a fuel. Possible lack of outlet in future in Ireland for sludge residue.

Waste type	**Oil filters**
Main recovery or disposal route	Oil recovered for use as fuel Steel recovered in Ireland
Residues	Residues as waste oil processing Other plastic and paper residues
Capacity in Ireland	Adequate
Bottlenecks or difficulties	Collection rates have significant scope for improvement

Waste type	**Lead acid batteries**
Main recovery or disposal route	Lead recovered Plastic recoverable
Residues	Acid to neutralisation and disposal
Capacity in Ireland	Adequate Significant quantities of whole units are exported to the UK for recovery. The lead fraction (at least) must be exported for recovery.
Bottlenecks or difficulties	Collection rates have significant scope for improvement

Waste type	**Other batteries including small consumer batteries (non-lead acid batteries)**
Main recovery or disposal route	Landfill - batteries are generally unsegregated Scope for metal and other material recovery
Residues	–
Capacity in Ireland	None. A limited collection network exists. No processing capacity. Recovery facilities exist in other countries.
Bottlenecks or difficulties	Collection rates are currently negligible - significant scope for improvement

Waste type	**Fluorescent lamps**
Main recovery or disposal route	Mercury recovered Glass and metal recovered
Residues	Fluorescent powder after mercury removal
Capacity in Ireland	Adequate Significant quantities of whole units are exported to the UK for recovery
Bottlenecks or difficulties	Collection rates have significant scope for improvement

Waste type	**Photochemical waste**
Main recovery or disposal route	Silver recovery
Residues	Other components - recovery options for other components are likely to increase as technology becomes more widely used.
Capacity in Ireland	Adequate for silver recovery Significant quantities are exported to the UK for silver recovery
Bottlenecks or difficulties	Grant aid has been awarded for the development of silver recovery capacity in Ireland.

Waste type	**Solvents**
Main recovery or disposal route	Solvent recovery Incineration with or without energy recovery
Residues	Distillation residues to further processing and/or disposal Incinerator ash
Capacity in Ireland	Recovery: Inadequate - 50 tonnes recovered *off site* in Ireland in 1996 compared to 9,663 tonnes exported. Disposal: Inadequate - no merchant thermal treatment available
Bottlenecks or difficulties	Significant scope for increased merchant capacity

Waste type	**Healthcare risk waste**
Main recovery or disposal route	Potentially infectious healthcare risk waste is treated at non-incineration disinfection facilities. The remaining fraction is exported for incineration.
Residues	Treated waste to landfill. There is scope for recovery of component plastic, metal and paper fractions.
Capacity in Ireland	Adequate nationally for potentially infectious waste. None for other categories (e.g. blood products, some anatomical, chemical and medical wastes).
Bottlenecks or difficulties	Ensuring segregation of waste types at ward level.

Waste type	**Sludges**
Main recovery or disposal route	Landfill in Ireland and abroad Some metal recovery - may be scope for more metal recovery as technologies develop.
Residues	Landfill
Capacity in Ireland	Inadequate. Landfill capacity inadequate for sludges classified as hazardous waste. Immobilisation of sludges to reduce their hazardous properties should be considered.
Bottlenecks or difficulties	Lack of hazardous waste landfill capacity.

Waste type	**Acid and base waste**
Main recovery or disposal route	Neutralisation followed by disposal of liquid and solid residues
Residues	Liquid residues to sewer Solid residues as sludge above
Capacity in Ireland	Adequate. Neutralisation capacity appears to be adequate. Capacity could probably be expanded with relatively little investment.
Bottlenecks or difficulties	Inadequate landfill capacity for sludge, as above.

Waste type	**Paint and ink waste and its packaging**
Main recovery or disposal route	Landfill - unsuitable for disposal in unlined landfill. Scope for separation of paint, ink, metal, plastic and other fractions and recovery of some of these fractions.
Residues	From separation processes, non-recoverable residues require thermal treatment or landfill
Capacity in Ireland	None
Bottlenecks or difficulties	Other than in certain industrial sectors, no segregation of paint and ink waste is currently carried out - therefore no separate collection, processing, recovery or disposal.

Waste type	**Agrochemical and its packaging**
Main recovery or disposal route	Landfill - unsuitable for disposal in unlined landfill. Scope for recovery of packaging thereby ensuring suitable management of chemical residues.
Residues	Neutralisation or incineration
Capacity in Ireland	None
Bottlenecks or difficulties	Some disposal probably taking place on farms. Spent sheep dip a problem requiring appraisal. No segregation currently carried out - therefore no separate collection, processing, recovery or disposal.

Waste type	**Drums and large containers contaminated with dangerous substances**
Main recovery or disposal route	Large proportion is processed at drum recycling facilities.
Residues	Further processing of drained residues likely – physico-chemical or thermal treatment.
Capacity in Ireland	Adequate.
Bottlenecks or difficulties	Increased regulation of unauthorised activities required.

Waste type	**Asbestos**
Main recovery or disposal route	Landfill No recovery option
Residues	Landfill
Capacity in Ireland	None for asbestos waste classified as hazardous waste (classification refers only to “insulation materials containing asbestos” and “wastes containing asbestos from electrolysis”).
Bottlenecks or difficulties	Lack of hazardous waste landfill capacity. Landfill capacity should be available for all asbestos waste.

Waste type	**Polychlorinated biphenyls (PCBs) and PCB contaminated equipment*** (See chapter 6.5 on PCBs)
Main recovery or disposal route	Incineration, or alternative thermal or chemical treatment No recovery option
Residues	Incinerator ash
Capacity in Ireland	None
Bottlenecks or difficulties	None - prohibitions on marketing of PCBs will ensure that historical holdings only will arise. Inventory of PCB holdings is required. The level of PCB contaminated equipment decommissioning (required in accordance with the Directive) to be quantified.

* as defined in Council Directive 96/59/EEC on the disposal of polychlorinated byphenyls and polychlorinated terphenyls (PCB/PCT).

Waste type	**Contaminated soils**
Main recovery or disposal route	Currently landfill in Ireland, treatment in Ireland or export.
Residues	Soil may be reused if treated or may require disposal to landfill.
Capacity in Ireland	One facility is licensed for treatment of oil contaminated soil. Some “on-site” remediation facilities are licensed.
Bottlenecks or difficulties	Capacity and expertise for processing some categories of contaminated soil exist. No major bottlenecks identified.

Waste type	**Contaminated dredging spoil**
Main recovery or disposal route	No contaminated spoil identified in 1996 and 1998 datasets.
Residues	–
Capacity in Ireland	None - except where existing facilities, e.g. for contaminated soils, may be suitable.
Bottlenecks or difficulties	None to date.

Waste type	**Residues classified as hazardous waste from the thermal treatment of waste**
Main recovery or disposal route	No reported arisings in 1996 and 1998.
Residues	–
Capacity in Ireland	No hazardous waste landfill exists for contaminated residues. Reuse of residues may be a viable option (limited application to date in other countries).
Bottlenecks or difficulties	Development of hazardous waste landfill may be required in the event of hazardous and municipal waste thermal treatment capacity being developed.

6.5 Polychlorinated biphenyls

Introduction

The term PCBs is used to describe a family of chemical compounds which includes polychlorinated biphenyls and polychlorinated terphenyls. A full definition is given in the Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998). These Regulations transpose into Irish law provisions of Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT). Article 4(1) of the Directive requires that Member States compile an inventory of equipment with PCB volumes of more than 5 dm^3. Article 11(1) of the Directive requires that Member States draw up (i) plans for the decontamination and/or disposal of inventoried equipment and the PCBs contained therein and (ii) outlines for the collection and disposal of other equipment (which falls beneath a certain threshold established by the Directive). This section of the NHWMP deals with the requirements of Articles 4(1) and 11(1)(first indent) of the Directive.

Table 6.4 summarises the provisions of the Regulations which relate to PCBs. The table is for guidance only and readers should refer to the text of the Regulations for full details. It should be noted that Article 13(2) of the Regulations states that "*any equipment of a type which is likely to contain PCBs shall … be considered as containing PCBs unless it is reasonable to assume the contrary*".

Compilation of an inventory of PCB holdings (Article 15 of the Regulations)

Article 15 of the Waste Management (Hazardous Waste) Regulations, 1998, requires holders of PCBs, used PCBs or contaminated equipment containing more than 5 dm^3 of PCBs to give notice to the EPA of such holdings. To date, two declarations have been made to the EPA; by the Electricity Supply Board and Stonearch Branch Randstone Ltd. According to waste contractors in Ireland and the UK, PCB waste continues to arise in Ireland albeit at a low rate. It has been stated anecdotally that for the most part, large holdings have been decommissioned and that only small holdings remain.

The EPA intends to undertake a project in 2001 to establish the extent of PCB holdings in Ireland subject to inventory, in accordance with the Regulations, and to compile an inventory of such holdings.

Table 6.4 Summary of certain provisions of the Waste Management (Hazardous Waste) Regulations 1998 in relation to polychlorinated biphenyls (PCBs)

Category of PCB holding	*Action required*	
PCBs	To be disposed of as soon as possible (Article 14(1)(b))	
Used or waste PCBs	To be disposed of as soon as possible (Article 14(1)(a))	
Equipment containing > 5dm^3 PCB	Subject to inventory and notification to the Agency of holdings (Article 15(1))	Equipment containing a concentration >0.05% by weight of PCBs shall be decontaminated or disposed of by end 2010 (Article 14(3)(a)).
	Subject to labelling requirements (Article 14(1)(c))	Equipment containing a concentration between 0.005% and 0.05% by weight of PCBs may be decontaminated *or alternatively* disposed of at the end of its useful life (Article 14(3)(b)).
Equipment containing < 5dm^3 PCB	Removal and separate collection of equipment upon taking it out of use, recycling or disposal (Article 14(1)(e)).	
Note: Decontamination and disposal are defined in Article 13(1) of the Regulations.		

Plans for the decontamination and/or disposal of inventoried equipment and the PCBs contained therein (Article 11(1), first indent, of the Directive)
There are two elements set out in the Directive and the Regulations in relation to the removal and disposal of PCBs, as summarised in Table 6.4. These are decontamination and disposal of PCB contaminated equipment and PCBs. While future arisings of PCB waste are likely to be relatively small scale, it is not clear what quantity is involved. Consequently, it is not possible at this time to identify a suitable disposal facility. Based on reported quantities of PCB waste exported in 1996 (71 tonnes) and 1998 (110 tonnes), the quantities of waste PCB arisings are likely to continue to be relatively small.

There are no licensed facilities for the disposal of PCBs in Ireland (other than for storage prior to export). "Disposal" in the context of the disposal of PCBs is defined in Article 13 of the Waste Management (Hazardous Waste) Regulations, 1998. Any facility for the disposal of PCBs will require a licence from the EPA and any relevant disposal technology will be considered in this context.

It is unlikely, given the relatively small quantities of PCB waste expected to arise in future years that a dedicated PCB disposal facility will be established in Ireland. It is more likely that the establishment of a thermal treatment or other suitable treatment facility for the disposal of hazardous waste in general may provide disposal capacity for PCB waste. On the other hand, the Directive states that the disposal of PCBs represents a transitional and temporary problem. It goes on to say that the proximity principle should consequently be interpreted in a flexible manner and that the Community as a whole should provide facilities for the disposal, decontamination and storage of PCBs. In this context, in the absence of hazardous waste disposal facilities capable of processing PCB waste, all PCB waste should continue to be exported for disposal.

There are a number of waste contractors who manage the removal of waste PCBs and contaminated equipment including its storage and onward export for recovery or disposal by high temperature incineration. The network for the removal, collection and onward disposal is considered adequate. There may be a need to make the existing network accessible to small scale generators of PCB waste to ensure that such small scale arisings are collected and satisfactorily managed.

The compilation of an inventory of PCB holdings (see above) may require that technical guidance be provided to holders of PCBs. In this event, technical guidance will be published by the EPA to assist in the decontamination and/or disposal of inventoried equipment and the PCBs contained therein in accordance with the Directive.

All holders of PCBs and contaminated equipment will be made aware of their obligations in respect of the decontamination and disposal of PCB contaminated equipment and the PCBs contained therein.

Prevention potential for PCBs
The marketing of PCBs is prohibited and the disposal of PCBs and decontamination of equipment containing PCBs is being implemented by the Waste Management (Hazardous Waste) Regulations, 1998. No prevention initiatives are required in relation to PCBs and PCB contaminated equipment.