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ORGANIC WASTE MANAGEMENT IN APARTMENTS

Final Report

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Environmental Research Technological Development and Innovation (ERTDI) Programme 2000-2006

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

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Environmental RTDI Programme 2000–2006

Organic Waste Management in Apartments (2005-WRM-DS-23-M1)

Final Report

Prepared for the Environmental Protection Agency

by

RPS

Authors:

Carmel Carey, Warren Phelan and Conall Boland

ENVIRONMENTAL PROTECTION AGENCY

An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699
E-mail: info@epa.ie Website: www.epa.ie

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DISCLAIMER

WASTE

The Waste Section of the Environmental RTDI Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in this area. The reports in this series are intended as contributions to the necessary debate on waste and the environment.

ENVIRONMENTAL RTDI PROGRAMME 2000–2006

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Details of Project Partners

Carmel Carey
RPS Consulting Engineers
West Pier Business Campus
Dun Laoghaire
Co. Dublin
Ireland

Tel.: +353 1 4882900
Fax: +353 1 2020707
E-mail: carmel.carey@rpsgroup.com

Warren Phelan
RPS Consulting Engineers
West Pier Business Campus
Dun Laoghaire
Co. Dublin
Ireland

Tel.: +353 1 4882900
Fax: +353 1 2020707
E-mail: warren.phelan@rpsgroup.com

Conall Boland
RPS Consulting Engineers
West Pier Business Campus
Dun Laoghaire
Co. Dublin
Ireland

Tel.: +353 1 4882900
Fax: +353 1 2020707
E-mail: conall.boland@rpsgroup.com

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Executive Summary

This 10-month desk study was carried out by RPS as part of the ERTDI Programme 2000–2006 to address the issue of organic waste management at apartments in Ireland.

Organic waste (i.e. food and garden waste) constitutes the single largest component (~36%) of household waste. Irish waste management policy requires source separation of organic household waste to divert this material away from landfill to higher treatment options. The preferred sustainable option is to biologically treat organic waste and produce a valuable reusable end product, i.e. compost.

Governmental awareness-raising campaigns and increased participation in new source-separate waste collection schemes have seen a move away from the traditional method of disposal to landfill to recycling and recovery. In 2005, the pay-by-use system was introduced nationwide to encourage source segregation and to allow the waste management system to be equitable. Separate kerbside collection of mixed dry recyclables is now operating in all local authorities in Ireland although the level of coverage varies in each county.

For organic waste, four local authorities (Galway City and County and Waterford City and County Councils) have organic waste collection schemes established in the past few years for both single and multi-storey dwellings, and two Dublin local authorities (Fingal County Council and Dublin City Council) have recently commenced pilot schemes. For the most part, the organic waste collection schemes in Ireland serve single-dwelling houses with a very small number of apartment complexes included.

1 Methodology

Information and data for this report were gathered through a combination of literature review, stakeholder consultation and a questionnaire survey of existing apartment residents.

A desktop literature review was carried out examining the following:

- Organic waste management practises and policy in Ireland
- Apartments in the Irish building sector
- Organic waste generation from apartments
- National and international organic waste collection schemes and systems.

A questionnaire survey was completed by a sample of apartment residents in Dublin and provided information on waste storage, presentation and collection issues.

Two organic waste collection systems were visited in a 2-day study tour to the Netherlands and Belgium, and consultation took place with a local authority representative and a private waste collector involved with these schemes.

Consultation was also carried out with key stakeholders in the Irish waste industry, including apartment residents, property management companies, private and public waste collectors, architects and a property developer.

2 Key Findings

2.1 Organic waste generation from apartments

The boom in house building in the last 10 years in Ireland, especially in the large urban centres, has seen a rapid increase in the number of apartments. Organic waste generation from these types of buildings currently represents 6% of the total organic waste generated from households in Ireland and is expected to grow (see Table 1).

2.2 Issues associated with different types of apartments

A review of apartments in Ireland identified three general categories. Each has its own particular characteristics and challenges in terms of delivering effective source-separated waste management systems (Table 2).

For all of the classified apartments, the challenge of education, promotion and awareness of waste is an ongoing one. These challenges can be further complicated by the transient nature of apartment living and increasing numbers of non-English-speaking apartment residents.

Table 1. Summary table of organic waste generated from apartments.

	Quantity
Percentage of Ireland's housing stock in apartments	9%
Organic waste generated from apartments	32,000 t
Percentage of total household organic waste generated from apartments	6%
Estimated organic waste generated from apartments in 2016[1]	50,000 t

[1]Based on expected growth in number of households.

Table 2. Characteristics of three apartment categories.

Type	% Housing stock	Main issues
Purpose-built blocks	64	• Retrofitting of storage areas and/or bad design of waste storage areas a problem • Access difficult for RCVs from underground storage areas • The identification of waste bins, inconsistent colour coding • Dealing with management company
Converted or shared houses	26	• Storage and space for bins often an issue at these buildings • Bins may cause obstructions in the walkway and at the entrance gates • Bins often gathered together, not stored in bays/sheds
Apartments in commercial buildings	10	• With entrance/exit doors facing onto streets, these have the least amount of space for a dedicated waste storage area

2.3 International and national organic waste schemes

A review of the international practices and schemes**,** including a site visit to the Netherlands and Belgium, revealed the following:

- Source-separate collections of organic waste from apartments have been commonplace in the Netherlands and Flanders for many years. Deep storage bins are the preferred collection methods for organic waste collection at the apartments visited. Both schemes were operating reasonably well although they are not without their problems.

- The scheme visited in the Netherlands is currently experiencing high contamination levels of the organic waste collected from apartments. Bins servicing apartments are located on the pedestrian pathways outside the apartment block perimeter. The bins are not locked and are accessible by non-residents. The local authorities are attempting to tackle this problem through a new awareness campaign and improved enforcement.

- In Flanders, keeping contamination levels low is also a challenge for the operators of the collection scheme examined. The waste collection company responsible for the scheme has found that where bins are locked and householders hold a key for which they must pay a deposit, there is an improved waste separation at source. Also, if the organic bin is contaminated the collection company charges a fee to the building management company, which then passes on the fee to the residents. These enforcement measures have proved successful in reducing levels of contamination.

A literature review of schemes in Ireland, France, Italy, the UK, New Zealand and Australia has revealed common themes for successful organic waste collection from apartments. A summary of these is as follows:

- Schemes are prompted by local authorities attempting to meet national recycling targets.

- Schemes are highly publicised and promoted before they begin.

- Small indoor and larger outdoor bins are used. Outdoor bins are stored in communal areas, usually in a designated waste storage area.

- Higher recovery rates of the organic material occur with more frequent collections, usually weekly for organics.

- Consultation between stakeholders is important, as is ongoing education, promotion and awareness raising for the scheme.

- To support publicity campaigns, incentive schemes can encourage participation, as can regulation and bin inspections.

2.4 Stakeholder consultation

Consultation with stakeholders including people living in apartments, management companies, waste collection companies, architects and developers reveals that:

- There is an ever-increasing demand by residents for source-separated waste facilities on-site.

- Waste storage facilities need to be designed at the development stages and guidelines are urgently needed from the planning and waste departments of local authorities, supported by the Department of the Environment, Heritage and Local Government (DEHLG).

- Space is the biggest issue for waste storage, particularly if there is no garden or underground area, as bins would need to be stored internally.

- Ground-level waste storage areas are a possible preferred option at waste storage sheds/rooms with good ventilation and space.

- For bin storage, the proximity of the waste area to residents and access for both residents and waste collectors are issues to be addressed.

- The communal bin system is usually used at apartments, as it is the easiest way to address space and collection-time issues. However, when charges are divided equally among all residents there is no incentive to segregate waste. A more equitable waste charging system needs to be examined.

Other findings are listed in the main report.

3 Conclusions

The separate collection of organic waste at apartments can often be overlooked, as there can be challenging issues at these dwellings associated with the storage, presentation and collection of this material. However, national and international studies show that when key considerations are taken into account at the earliest possible stage, the implementation of source-separated collections of organic waste is possible from apartments.

Successful organic waste collection is not always possible from all types of multi-storey dwellings in some areas.

4 Recommendations

Prior to introducing an organic waste collection to apartments it is recommended that a suitability assessment should be carried out for each apartment.

This includes:

- Examining the profile of the apartment complex

- Current waste management arrangements

- The design of the building and its waste storage area

- Carrying out consultation with the stakeholders involved.

Every development should be examined on its own merits and assessed accordingly. If an apartment is suitable for the introduction of an organic waste collection the following considerations should be taken into account:

- **Awareness/Education/Promotion**
    - The initial and ongoing education, awareness, and promotion of the scheme to the residents/tenants are essential.
    - Multilingual communication is important.
    - Stakeholder (e.g. residents, property management, waste collector) co-operation is critical to keep contamination levels low.
- **Waste storage areas (including organic waste bin/bag type, access, health and safety)**
    - Kitchen caddies are useful to store food indoors for short periods.
    - Communal external waste storage areas on ground level for outdoor bins are preferable. These should be well ventilated and fenced off.
    - Proximity of waste storage areas to residents and refuse collection vehicles is an important consideration.
    - Access to waste storage rooms or sheds should only be by residents and the management company.

- **Collection frequency**
    - Weekly collection frequency is preferred for apartments, although this can be adapted as appropriate.

Guidelines should be provided at national and local levels to aid developers, architects and property management to implement this type of waste collection system. This can be done at the planning stages for new developments as well as guidelines outlining the best way to retrofit a waste storage area to an apartment complex already built.

Further research programmes should be supported by the appropriate funding and national decision-making bodies to examine the implementation of organic waste schemes at apartments.

1 Introduction

1.1 Study Details

This desk study is funded by the ERTDI Programme 2000–2006 and addresses the thematic area of developing sustainable organic waste management and composting. The study was 10 months in duration from 13 February to 15 December 2006 and was carried out by the RPS Group. The Steering Group is made up of the RPS Group, the Environmental Protection Agency (EPA) and the Waste and Water Sections of the Department of Environment, Heritage and Local Government (DEHLG).

1.2 Study Objectives

The purpose of this study is to investigate the potential development of effective kerbside organic waste collection for existing and proposed multi-storey dwellings[1], to assess the key issues and challenges, and to deliver robust guidance on how to implement such a system. This study will also attempt to identify and set down some general design guidelines so as to incorporate waste collection issues for existing multi-storey buildings also at the planning stage. For ease of description, multi-storey dwellings shall hereafter be referred to as apartments.

1. **Multi-storey dwellings** are classified as buildings designed for use as two or more separate flats, apartments or separate dwelling units and occupied by more than one household.

1.3 Background to Study

The National Waste Database Report published by the EPA in 2006 suggests that although household waste only makes up just over 2% of the national waste arisings produced in 2004 the importance of addressing the issue of waste generation from the household sector cannot be understated. The report also shows that organic waste (i.e. food and garden waste) constitutes the single largest component of national household waste, and has risen from 32.2% of the total in 2001 to 36.2% in 2004 (see Fig. 1.1).

The need to reduce the landfilling of biodegradable waste has been identified by EU policy, and subsequently adopted into Irish legislation, as being critical in reducing landfill gas emissions and greenhouse gas emissions. The improved management of household organics through source separation can vastly reduce the organic content of the household waste and landfilling of the waste and the subsequent leachate that this can produce.

Since the mid-1990s Ireland has moved from a waste management system previously solely reliant on disposal to landfill to an integrated waste system with source separation a fundamental principle. A ‘3-bin’ system was adopted as the preferred approach as national policy and has been implemented into most Regional Waste Management Plans. This system was considered the most efficient method to achieve high recycling rates and clean material for resource recovery. The implementation

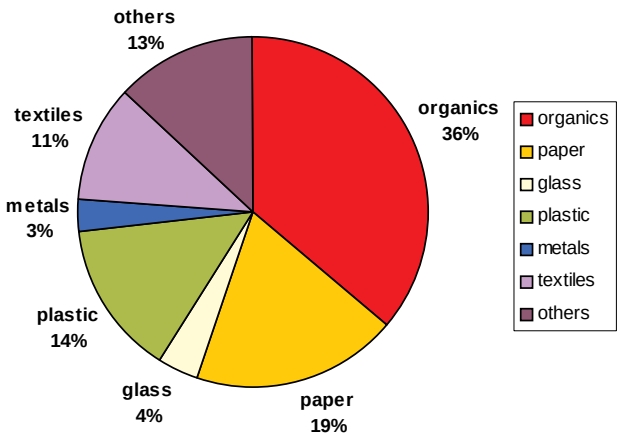

Figure 1.1. Composition of mixed residual household waste, 2004.

Source: EPA (2006).

of a 3-bin collection system for householders has been slow to progress across the country, with local authorities in Waterford and Galway leading the way. These schemes have been successful in providing single-unit households with a separate collection of organic waste, although very few apartments are included.

With the rapid increase in multi-storey housing in Ireland in recent times there is a need to establish an effective organic waste management scheme for these types of dwellings. This study focuses on apartments and the logistics of collecting organic waste from high-rise or high-density housing compared to 'conventional' collections from single-dwelling households. There is a strategic need for all local authorities, specifically of urban areas, to address this issue in order to provide equal access to waste segregation to all residents.

2 Organic Waste Composition and Targets

2.1 Nature of Organic Waste

The National Strategy on Biodegradable Waste (DEHLG, 2006a) defines organic waste as "*any waste that is capable of undergoing anaerobic or aerobic decomposition through a biological treatment process, such as food and garden waste*".

Organic waste is often also known as putrescible waste or bio-waste. Sources of household organic wastes include all types of uncooked and cooked food (meat, bones, fruit, vegetables) and garden material (such as grass and hedge cuttings) – see Fig. 2.1. The organic fraction of household waste is generally heavier than other types of waste due to higher moisture content.

For most householders in Ireland, organic waste is disposed of in their mixed waste bin along with many other household items. The practice of segregating organic waste in households is currently the exception rather than the norm. Home composting is becoming more popular, however, and the nationwide introduction of pay-by-weight bin charges in January 2005 increased sales of composting bins dramatically. Expansion of source-separated household organic waste collections is expected throughout local authorities to target single-unit households at the outset and then multi-storey dwelling households.

2.2 Organic Waste Treatment in Ireland

Local authorities recognise the immediate need to divert organic material away from its present primary form of disposal to landfill. Disposal of household organic waste to landfill sites has traditionally been the principal method of treatment – in 1995 just under 90% of biodegradable waste disposed of in the State was sent to landfill (DEHLG, 2006a). This option is becoming less and less viable due to the long-term negative impacts on the environment caused by landfilling organic waste. In 2004, approximately two-thirds of all waste generated in Ireland was disposed of to landfill, a notable improvement within the space of a decade.

Composting and anaerobic digestion are two of the best methods to treat organic waste as they produce compost or fertiliser product which can be handed back to householders or sold on to local farmers for use on the land.

2.2.1 Biological treatment

2.2.1.1 Composting

The process whereby organic matter is broken down by micro-organisms in the presence of moisture and heat is known as composting. Composting produces a valuable and high-quality end product and returns nutrients back into the soil and reduces the amount of waste being sent to landfill. This therefore is a sustainable method of organic waste management.

Organic waste can be composted by the householder in the garden using a home composting bin (Fig. 2.2) or collected, separated and sent to a centralised composting plant for treatment. Garden waste and food waste of vegetable origin are particularly suitable for home composting. Windrow composting is the most common form of composting used in Ireland (Fig. 2.3), followed by in-vessel and aerated systems.

A total of 39 composting facilities were in operation in Ireland in 2005, and an estimated 79,396 t were treated that year. The majority of waste composted at the

Figure 2.1. Contents of household organic waste bin in Galway City.

Figure 2.2. Home composting bins.

Figure 2.3. Windrow composting within centralised treatment facility.

surveyed waste management facilities by the EPA (2006b) was green waste and household organic waste.

2.2.1.2 Anaerobic digestion

Anaerobic digestion involves the breakdown of organic compounds by micro-organisms in the absence of oxygen to produce methane and carbon dioxide gases. When the waste is digested it can be separated into solid and liquid fractions. Digestion itself takes place in a reactor and the methane gas produced is stored alongside the reactor in large fabric bags (ENFO, 2006). There are currently three centralised anaerobic digestors operating in the Republic of Ireland, with a fourth being in operation in County Fermanagh (DEHLG, 2004).

Anaerobic digestion can also be used to treat some forms of biodegradable waste, such as animal slurry, livestock manure, sewage sludge, the organic elements of municipal solid waste, by-products of industry, food processing wastes and milk (DEHLG, 2006c). This type of treatment is a highly effective and safe way of dealing with these types of wastes. The methane produced can be used as a source of energy for heat or electricity. The liquid portion can be spread safely on agricultural land, supplying nutrients, and the solid part can be used as highly nutrient compost. Garden waste is often unsuitable for anaerobic digestion because of the high lignin content (Scottish Executive, 2003).

2.2.1.3 Animal by-products legislation

In addition to the permits/licenses issued by local authorities and the EPA, biogas and composting plants wishing to process animal by-products, including food waste, will need to be approved by the Minister for Agriculture and Food under the Animal By-Products Regulation (Regulation (EU) 1774/2002). This ensures a safe way of treating this type of waste. The Animal By-Product Order also prohibits the land spreading of compost produced from kitchen waste.

2.2.2 Landfill

Disposing of organic waste via landfill is an unsustainable option. Organic waste is high in moisture content and contributes significantly to the generation of methane and leachate from landfills. Diverting organic wastes from landfills is critical to reduce both landfill emissions and the contribution to global warming and climate change. Therefore alternative treatment needs to be sought. The progressive diversion of biodegradable municipal waste (BMW), of which organic waste is a significant component, is a mandatory requirement under the EU Landfill Directive, and implementing this policy will extend the life of our current landfills.

3 Organic Waste Management Policies and Targets

3.1 EU Waste Management Hierarchy

The core principle of the European Waste Policy is the EU Waste Management Hierarchy as shown in Fig. 3.1. At the top of the hierarchy is prevention, the preferred solution to waste management but the most difficult to achieve. At the bottom of the hierarchy is waste disposal, the least favoured and most unsustainable method of waste management. Recycling is a higher waste treatment option than disposal and in practical terms can be implemented successfully by local authorities.

3.1.1 EU Landfill Directive

The EU Landfill Directive (1999/31/EC) sets a clear agenda of BMW diversion from landfill for Member States. It identifies procedures and standards for the operation, monitoring, closure and aftercare of landfill facilities to ensure safe environmental management. The EU Directive also requires that each Member State prepares a national strategy for the reduction of biodegradable waste going to landfill. Figure 3.2 shows the required levels of BMW that are to be diverted from landfill.

In Ireland, the DEHLG has recently published the *National Strategy on Biodegradable Waste* (2006a) and set national targets for disposal of biodegradable municipal waste to landfills. These are further outlined in Section 3.2, part 4.

3.1.2 EU thematic strategies

EU Waste Management policy is laid down in a series of Directives and more recently 'Thematic Strategies'.

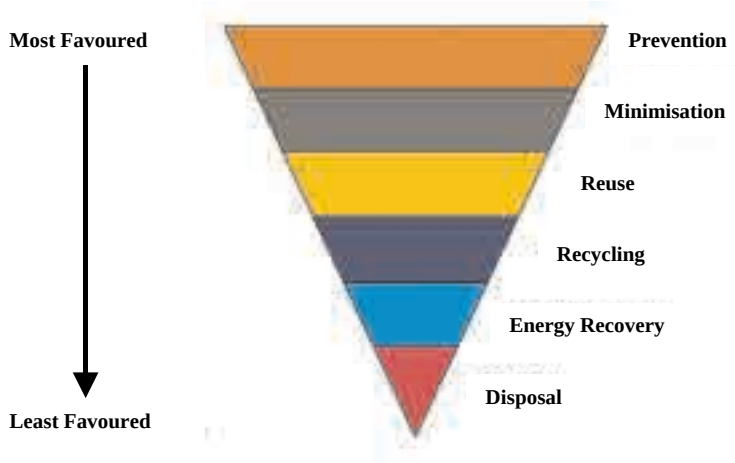

Figure 3.1. The EU Waste Management Hierarchy.

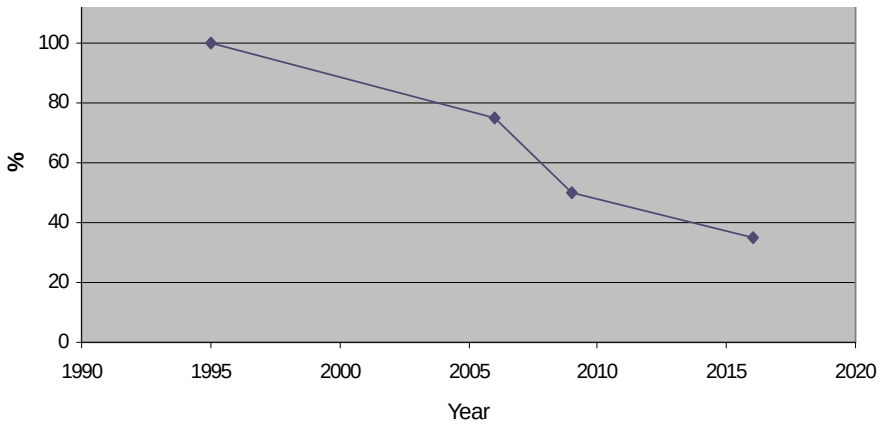

Figure 3.2. Required percentage reduction in landfill of BMW.

- The EU Sixth Environment Action Programme focuses on the areas in Europe's environment where particular attention is needed by setting out objectives and targets in the document *Environment 2010: Our Future, Our Choice* (European Commission, 2001a). One of the four environmental areas to be tackled for improvement includes natural resources and waste. The document proposes that this can be achieved by developing and promoting an EU-wide strategy on waste recycling with targets and monitoring to compare progress by Member States. It is also recommended that waste recycling should be maximised and it is necessary to bring "*final disposal to an absolute minimum*". In particular, it encourages legislative initiative on biodegradable wastes.

- The EU published a second draft of the working document on the *Biological Treatment of Biodegradable Waste* in February 2001 (European Commission, 2001b). The main aim of this document was to promote the biological treatment of BMW and to help achieve the targets set out by the Landfill Directive. Out of this was a proposal for a Bio-Waste Directive, which has been recently amalgamated with work on a Framework Directive on Soils. This has delayed legislation on composting and other bio-waste processing. However when this comes into effect it is anticipated to encourage the composting and biogas sector and the provision of such facilities. This is because the current rules relating to animal health protection greatly constrain the operation of such facilities and the markets for any compost derived from them. The proposed directive includes the need for local authorities to source separate BMW (Fig. 3.3).

3.2 Irish Waste Management Policy and Targets

There are a number of national policy documents dealing with waste management in Ireland that set objectives and targets for organic waste management. These are:

1. ***Changing Our Ways*** **(DEHLG, 1998)**
   This document focused on the need for a significant reduction in our reliance on landfill and the implementation of an integrated approach to waste management. It set the following targets, aimed mainly at local authorities, for achievement over a 15-year timescale:

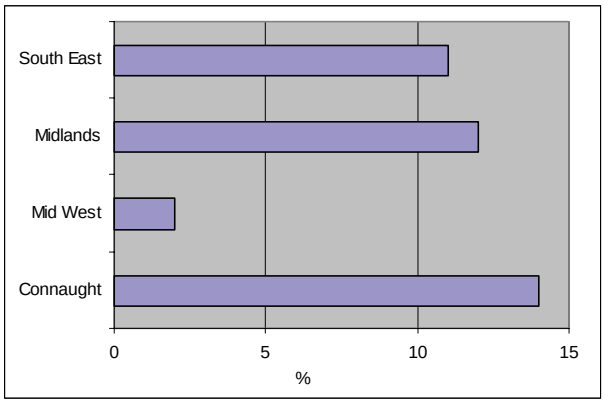

Figure 3.3. Percentage households with separate collection for organic waste, 2003.

   - A diversion of 50% of overall household waste away from landfill
   - A minimum 65% reduction in biodegradable municipal wastes consigned to landfill
   - The development of composting and other feasible biological treatment facilities capable of treating up to 300,000 t of organic waste annually
   - Endorses source separation as the preferred waste collection system.

2. ***Preventing and Recycling Waste: Delivering Change*** **(DEHLG, 2002) – Policy Objectives**
   This document focused specifically on waste prevention and recycling and included fiscal measures to modernise our recycling infrastructure, the introduction of a landfill levy, as well as new producer responsibility initiatives. Some of the aims of this policy document with regard to the management of biodegradable waste were to:

   - Draw up a *National Strategy on Biodegradable Waste* in the municipal waste stream
   - Support the development of widespread home composting
   - Support the provision by local authorities of infrastructure for the biological treatment of organic waste.

3. ***Waste Management – Taking Stock and Moving Forward*** **(DEHLG, 2004a)**
   This document details the progress of Ireland's waste management from 1998 to 2003. Some of the key points brought to the fore in relation to organic waste management include:

- Of those households with a collection of dry recyclables, 52,000 also have a segregated collection of organic waste.
- Biodegradable waste is to be targeted for major improvements in recycling – the *National Strategy on Biodegradable Waste* was published in April 2006.

Keeping in line with the EU Waste Hierarchy, the move towards a reduction in the number of landfills available is continuing. There are now 35 municipal waste landfills remaining, compared to 50 in 2001.

4. ***National Strategy on Biodegradable Waste* (DEHLG, 2006a)**

   The *National Strategy on Biodegradable Waste* outlines Ireland's approach for the long-term sustainable management of biodegradable and organic wastes. The document states that each Local Authority Waste Management Plan should aim to meet the targets set out by European and National Policy, by combining best practises of collection and treatment types that suit local conditions and objectives.

   The targets set out in this document include the following for household organic waste by 2016:

   - 50% biological treatment (home composting and centralised treatment plants)
   - 70% coverage for separate collections
   - 16% home composting.

   The preferred approach for local authorities in order to achieve these targets include source-separated collections and the delivery of an adequate waste infrastructure. The strategy recommends that pilot studies be carried out in urban areas of multi-dwelling households and, if successful, a separate collection system for food and garden waste be introduced.

3.2.1 Pay by weight

Waste management in Ireland has recently gone through a phase of legislative and policy orientation towards variable charging systems, moving from a system of general levies) to one where householders now pay by use/pay by weight for their waste disposal. This requires a greater investment to establish nationwide bin identification and weighing schemes. The consolidation of the waste industry with a small number of larger professional and well-organised companies has seen an increase in waste charges to reflect an increasingly integrated waste management system and more efficient level of collection service. It is hoped that the long-term savings realised from the disposal of reduced residual waste will compensate for the cost of additional collection of organic waste by local authorities and motivate householders to recycle more.

3.2.2 Regional Waste Management Plans

Regional Waste Management Plans adopted throughout Ireland have had a dramatic impact on the approach to managing waste throughout the country since 1998. Over the period 1998–2002 waste management plans were drawn up to cover seven regions in Ireland: Dublin, the North-East, the Midlands, Connacht, Limerick/ Clare/Kerry, Cork and the South-East, with three counties – Kildare, Wicklow and Donegal – preparing plans independently (DEHLG, 2004b). Each region has set its own targets for improved performance to satisfy the National Targets of *Changing our Ways* (DEHLG, 1998) and have put in place collection systems and waste management facilities to meet these.

The preferred strategy in the regions is the introduction of source-separated collections for dry recyclables, kitchen and garden wastes and residual. The implementation of the 3-bin system has been slow with full collection schemes in Galway, Waterford and Dublin. Galway City and County have rolled out the 3-bin system since 2001 and Waterford County since 2003. Fingal County Council in Dublin has piloted organic waste collections from single-dwelling households in 2006 and is hoping to extend this to apartments shortly. Under the recently adopted 2nd generation Regional Waste Management Plans, local authorities are committed to expand existing schemes and specifically address the issues of household organic waste collection.

4 Organic Waste Generation from Multi-Storey Dwellings in Ireland

4.1 Household Waste Generation

4.1.1 Introduction

According to the Organisation for Economic Co-operation and Development (OECD) there are several key elements that have a direct impact on the generation of household waste. Population and sustained economic growth in Ireland since the early 1990s has contributed to a dramatic increase in the generation of waste. A report recently published by the OECD entitled *The OECD Factbook 2006* shows Ireland to have the highest *per capita* waste generation of all 30 OECD countries (Fig. 4.1), with every Irish person producing 760 kg of municipal waste[2] a year (OECD, 2006a).

2. **Municipal waste:** waste from households, as well as commercial and other waste, which because of its nature or composition, is similar to waste from households (*Draft National Strategy on Biodegradable Waste*: DEHLG, 2004c). Note: Ireland's definition of municipal waste is broader than that of some other countries and in this regard the results in Fig. 4.1 may not be appropriately comparable.

4.1.2 Current situation in Ireland

The following statistics from the *National Waste Report 2004* (EPA, 2006a) published by the EPA provides an up-to-date overview of the household waste generated in Ireland in 2004.

- Household waste arisings accounted for 1,737,416 t in 2004.
- Figure 4.2 shows the increase in household waste arisings that occurred from 1995 to 2004: 1,324,521 t to 1,737,416 t.
- Household waste now stands at 430 kg/capita (approximately 1,684,000 tonnes)[3]. This figure is expected to increase in line with current population trends and by the end of 2006 the total household waste in Ireland is expected to be approximately 1.8 million tonnes.

3. Based on a population of 3,917,203 (*2002 Census of Population*: Government of Ireland, 2004).

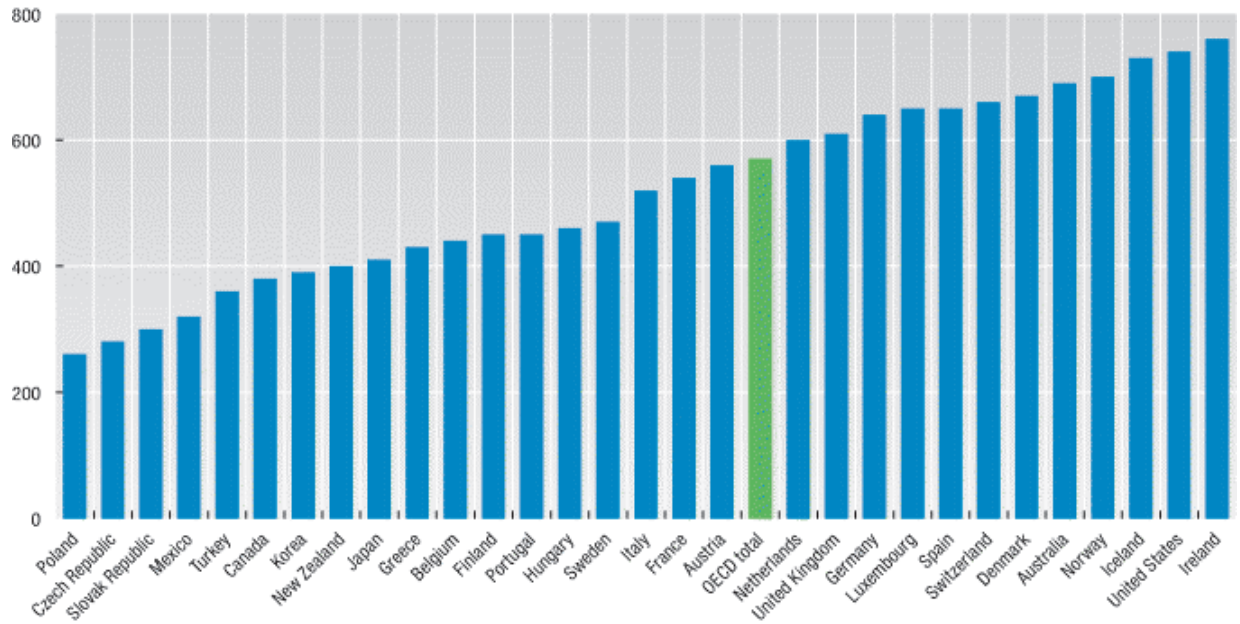

Figure 4.1. Municipal waste generation for 30 OECD Countries (kg/capita).

Source: OECD (2006a).

- Diversion of household waste from landfill has increased from 13% in 2003 to 19% in 2004 (national 50% landfill diversion is the national target for 2013).

From Fig. 4.2 it is clear that Ireland has produced an increasing amount of waste. While there is an apparent reduction in the quantities of household waste arising, the EPA (2000) comments that it is more likely that the 1998 figure is simply a more accurate reflection of the actual quantities arising as the difference between reported quantities collected and estimated quantities arising is considerably less for 1998 than for 1995. Since 1995 waste collection mechanisms have improved and the EPA waste reports provide an accurate reflection on the level of household waste generated. To date we have yet to see a slowdown in waste growth, which could also be due to improved regulation of waste.

Secondly, Ireland is in the process of moving away from landfill as the dominant means of waste disposal to an integrated system of waste management. This indicates an optimistic trend for the future of Ireland's household waste management. Figure 4.3 indicates that the level of household waste landfilled has steadily decreased since 2001. This is a result of improved source-separated collection services, including source separation, more bring banks and recycling centres, the introduction of pay-by-use waste charges and improved awareness of waste management and recycling.

4.2 Composition of Mixed Household Waste

In 2004, the EPA commissioned research into the composition of municipal waste as an initiative under the

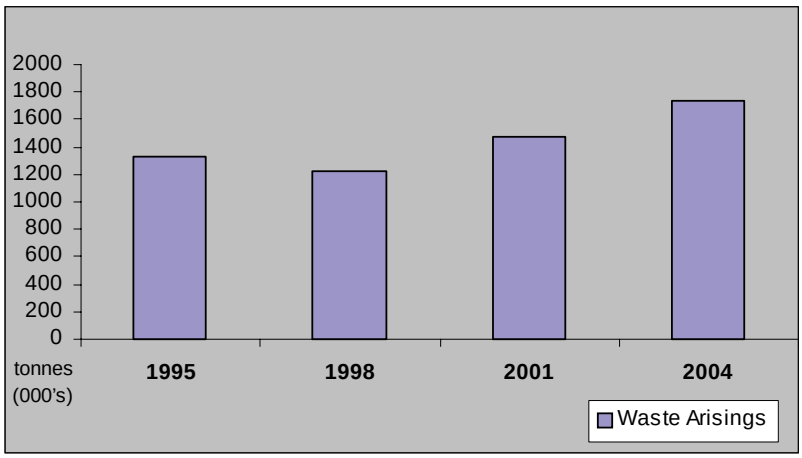

Figure 4.2. Household waste arisings, 1995–2004.

Source: EPA (1996, 2000, 2001a,b, 2006a).

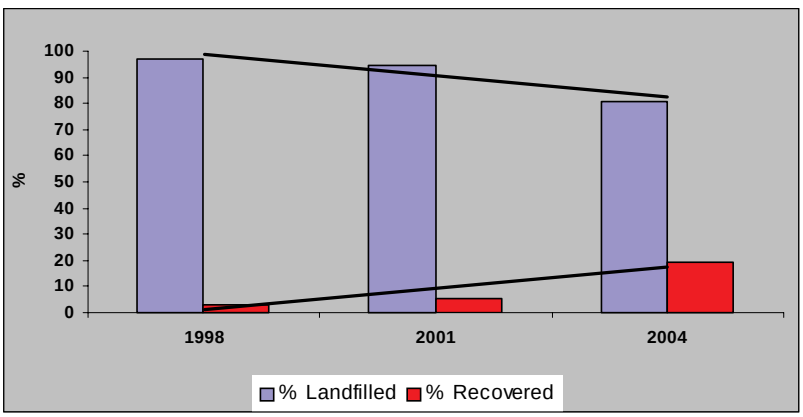

Figure 4.3. Household waste landfilled and recovered.

Source: EPA (2006a).

National Waste Prevention Programme (EPA, 2004). Extensive waste characterisation surveys undertaken between August 2004 and May 2005 in nine local authority areas across Ireland resulted in compositional data for household, commercial and industrial wastes.

The study – *A Programme for Municipal Waste Characterisation* (EPA, 2005) – found that the expansion of source-separated collection systems in Ireland can result in significant compositional differences from region to region. The organic content of the residual bin was found to be as high as 37% in certain urban areas compared to 22% for householders in towns with a 3-bin system in place.

Figure 4.4 illustrates the varying amount of organic waste found in the average 2-bin and 3-bin systems in rural and urban areas in Ireland and an average single residual bin in a city. The 2-bin system in all three areas contains the highest fraction of organic waste. This difference reflects the compositional change that has occurred with the introduction of nationwide 2-bin collection systems allowing for the removal of many recyclables from the residual waste stream.

The study also found that the introduction of use-related charging and the ongoing public move to recycling in the past decade have contributed to the change in the composition of the household waste presented.

Table 4.1 compares the organic waste arisings in houses and apartments generated from the data collected during the national study. The main reason for the difference in waste arisings in Table 4.1 is probably due to the number of people in the household (see Section 4.3.3). The number of people per apartment is generally lower than the number of people per house. The difference in the percentage of organics by weight could be due to the lifestyle differences between those usually living in houses and those living in apartments.

4.3 Multi-Storey Dwellings in Ireland

4.3.1 Recent trends in the housing sector

The building industry in many ways is representative of the dramatic changes that have taken place in the Irish economy and population growth since the 1990s. According to the *Quarterly National Household Survey* for September to November 2005, there were 1,478,200 households in Ireland (CSO, 2006a). The boom in the demand in housing, most recently by the large number of young labour market entrants, has led to an unprecedented output in the building sector – with 500,000 new houses produced in the past 10 years. In 2006, the Central Statistics Office (CSO) reported the

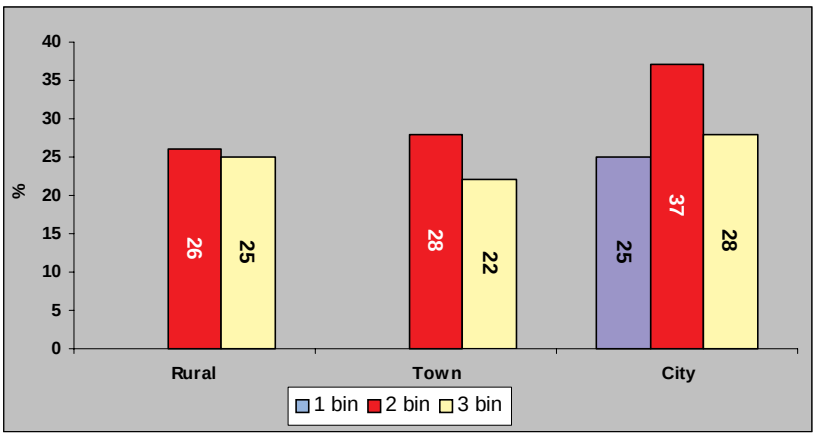

Figure 4.4. Organic fraction of household waste generated in rural, town and city areas, 2004.

Source: EPA (2005).

Table 4.1. Comparison of arisings and composition between apartments and houses.

	Apartments		Houses	
Primary waste category	**% by weight**	**kg/household/week**	**% by weight**	**kg/household/week**
Organics	20.81	3.64	29.59	7.09
Total		**17.47**		**23.94**

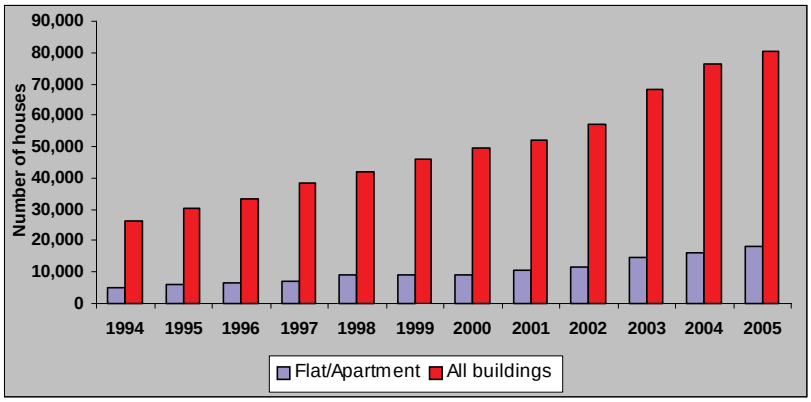

Figure 4.5. New dwellings completed in Ireland, 1994–2005 (the DEHLG's *Construction Industry Indicators* report (January 2006) provides information on existing statistics and trends in construction activity in Ireland).

Source: DEHLG (2006b).

remarkable fact that "*one third of Ireland's houses have been built in the past decade*" (CSO, 2006a).

Figure 4.5 illustrates the significant increase in the number of new dwellings built each year since 1994. The figure of 81,000 new buildings in 2005 is equivalent to a house-building rate of 20 units per 1,000 of the population compared with three units on average across Western Europe and around five in the UK (DEHLG, 2006b). This graph also shows the steady growth of apartments over the period from 1994 to 2005. In 2005, apartment units accounted for 11.6% of the State's households and 23% of the total number of new dwellings built in the same year. This figure has remained high as 10.1% of the State's houses in 2006 were apartments (Government of Ireland, 2007).

4.3.2 Apartments in Ireland

The *National Spatial Strategy* (Government of Ireland, 2002), the central policy document driving the future shape of development, calls for a more centralised, compact form of development and expects the increase in urban densities and the continued trend in house building, in particular apartments.

The DEHLG's report *Guidelines for Planning Authorities on Residential Density* (DEHLG, 1999) promotes the conversion of large houses in inner suburbs to multiple-occupancy dwellings. It also recommends that in newer areas planning authorities should consider policies that would permit more intense residential usage, subject to design safeguards.

Historically, only a small percentage of the housing stock comprised apartments. In Ireland in the 1960s, there was limited apartment building, with a rapid increase in building supply just before 1970 until the 1980s, and a slowdown in the 1980s, according to Dunne (2005)[4]. The increase in building began again in the late 1980s, most likely due to urban renewal incentives and Irish densification policies. Since then the proportion of apartments and flats in the Irish stock has been growing rapidly to deal will the urbanisation of the country and the trend of population moving to cities. Apartments are the preferred household design for high-density urban areas in Ireland today and are expected to be the dominant form of housing in the future. The price of property, a growing population and the expansion of the city boundaries have resulted in a more sustainable approach to household urban development.

The *Census of Population, 2002* (Government of Ireland, 2004) puts the total number of private apartment/flat households[5] in Ireland at 110,458. Added to the 60,618 new apartment units that have been built between 2002 and the end of 2005 (Fig. 4.6), the total number of apartments is likely to currently be over 171,000.

4. *Historical Profile of Housing Stock.* PowerPoint Presentation. http://www.housingunit.ie/Presentations/Ann%20Conf%20DAY%20TWO%202005/Tom%20Dunne.ppt
5. A **private household** comprises either one person living alone or a group of people (not necessarily related) living at the same address with common housekeeping arrangements – that is, sharing at least one meal a day or sharing a living room or sitting room.

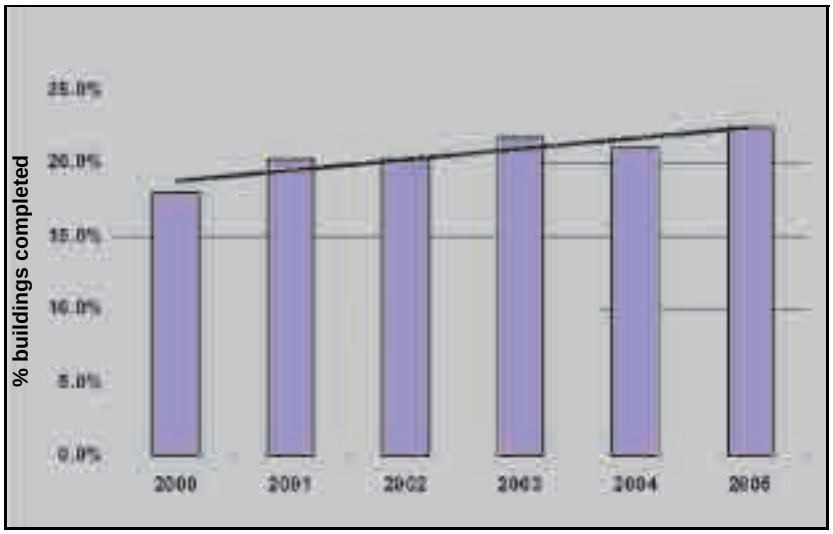

Figure 4.6. New flats/apartments completed (by percentage of total dwellings) 2000–2005.

Source: (DEHLG, 2006b).

The EPA (2005) has estimated the average number of private apartment households to be 9% of the total number of households in Ireland. The EPA also estimates that apartments made up 29% of the total number of households in Dublin City in 2003. The *Annual Housing Statistics Bulletin* (DEHLG, 2007) estimates that 53% of all housing units built in the Dublin Region in 2005 were apartments.

4.3.3 Household size

The rise in number of apartments in Ireland has also coincided with the reduction in size of Irish households from 4.48 persons/household in 1926 to 2.94 persons/household in 2002. The *Quarterly National Household Survey* (CSO, 2006a) forecasts this figure of 2.94 persons/household to decrease further and approach the European average of 2.63 persons/household over the next few years. Household size tends to be smaller in apartments and according to the *Census of Population, 2002* (Government of Ireland, 2004) the average number of people residing in apartments as of 2002 was 1.9 persons/household.

4.4 Organic Waste Generation from Apartments

Based on available data an attempt has been made to quantify the amount of organic waste arisings so as to highlight the extent of this waste stream. The calculation, as outlined in Table 4.2, has been made using the latest data from a selection of key reports. An estimation of the extent of organic waste arisings from apartments in Ireland is provided. The total figure calculated is approximately 32,000 t.

The corresponding calculation for non-apartment households is 482,000 t per year, which gives a total of approximately 514,000 t of household organic waste produced each year. It is therefore estimated that apartments are currently generating 6.3% of the total household organic waste in Ireland. This figure is

Table 4.2. Estimated organic waste arisings from apartments.

	Quantity
Average weight of organic waste from single-unit dwellings per week	7.09 kg[a]
Average weight of organic waste from apartments per week	3.64 kg[a]
Approximate number of apartments in Ireland	171,000 units[b]
Estimate of organic waste arising from apartments per week	622 t
Estimate of organic waste arisings from apartments per year	32,344 t

[a](EPA, 2005).
[b]DEHLG (2006) and Government of Ireland (2004).

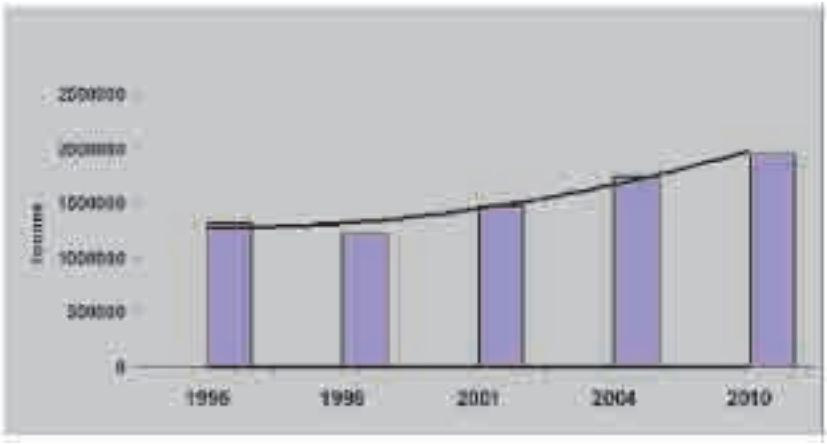

Figure 4.7. Trends in household waste arisings, 1995–2004, and estimated increase to 2010.

Sources: EPA (2003) and DEHLG (2004b).

expected to grow with the significant upward growth trend in household waste arisings and the increased number of apartments currently being built and the continued urbanisation of the towns and cities in Ireland.

4.5 Projected Growth

4.5.1 Future household waste arisings

The trend in household waste arisings in the last 10 years has been upwards, as illustrated in Fig. 4.7. It is estimated in the *National Overview of Waste Management Plans* document that household waste arisings will rise to 1,943,079 t by 2010 (an estimated increase of 25% over the 2001 figure) (DEHLG, 2004b).

If the current growth rate of household waste generation continues at 25% over 5 years (2001–2006, Fig. 4.7) and the organic component of household waste remains similar to present percentages, the amount of organic waste from apartments that will have to be managed is estimated to be ~40,430 t in 2011 and ~50,538 t in 2016.

4.5.2 Trends for the construction sector and in population settlement

There has been a steady increase in the number of people moving from rural areas to urban areas, as is shown in Fig. 4.8. As more people move to cities and towns the building of high-rise dwellings has also increased to accommodate them.

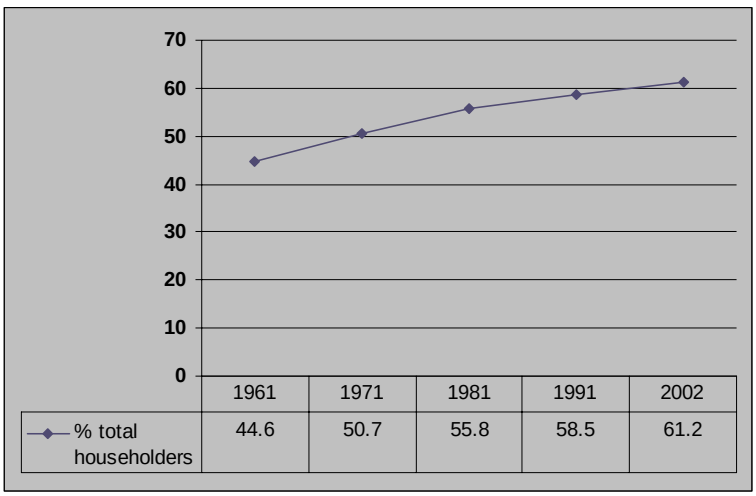

Figure 4.8. Percentage of householders living in urban areas, 1961–2002.

Source: Government of Ireland (2002).

By 2010, the DEHLG (2004b) envisages the number of households (based on current population trends and the trend towards smaller household size) in the State to be 1,693,458. The *National Spatial Strategy* (Government of Ireland, 2002), based on economic growth projections, conservatively estimates that there will be about 2.1 million households by 2020. Based on the threefold increase in the number of apartments in Dublin in the past decade, it can be estimated that the number of apartments will increase to 54,105 in 2015 if growth were to continue at the same rate. Many factors contribute to this, including:

- Demographic pressures, especially the rise in numbers of young adults
- Cultural changes, in terms of family patterns and behaviour
- Immigration by returning Irish citizens and citizens of other EU countries.

With the present trend of urbanisation and the growth in the development of high-rise buildings, the strategic plans of policy makers will need to address the issue of waste management at apartments, including organic waste.

4.6 Summary Table of Key Statistics

Table 4.3 outlines the key findings from this chapter.

Table 4.3. Summary table of key statistics from Chapter 4.

	Quantity
Household waste generated in 2006	1,821,018 t
Organic waste arisings from apartment households per week (2004)	3.64 kg
Total estimated number of apartments in Ireland (2005)	171,000
Percentage of households in Ireland that are apartments (2004)	9%
Average number of people per apartment household (2002)	1.9
Estimate of organic waste arisings from apartments per year	32,344 t
Estimated percentage of total household organic waste generated from apartments in Ireland	6.3%
Estimate of organic waste arisings from apartments in 2016	50,538 t

5 Apartments in Ireland

5.1 Introduction

This chapter examines types of apartments in Ireland, describing both the physical characteristics of the buildings and exploring the typical problems associated with implementing waste management systems in these buildings.

5.2 Classification of Apartments

The *Census of Population, 2002* (Government of Ireland, 2004) classifies all apartments in the State into three categories:

1. Flats/apartments in purpose-built blocks (63.8% of apartment housing stock), hereafter referred to as 'purpose-built' apartments.

2. Flats/apartments in converted or shared houses (26.5% of apartment housing stock), hereafter referred to as 'converted' apartments.

3. Flats/apartments in commercial buildings (9.7% of apartment housing stock), hereafter referred to as 'commercial' apartments.

For this research, it was considered appropriate to apply these classifications when describing the different types of urban apartments. The representative percentage of each category of apartment is detailed in Fig. 5.1.

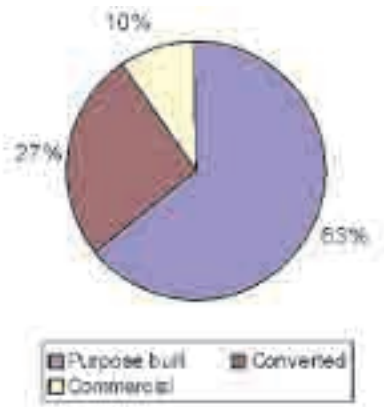

Figure 5.1. Apartment categories.

Source: Government of Ireland (2004).

5.3 Characteristics of Apartments in Ireland

In Ireland, there is a wide variety and mix of apartments within the three official classifications as described by the CSO. Apartment blocks vary in design, size and scale, which need to be understood before introducing an organic waste collection. The following sections describe the typical characteristics of apartments in each of the three official classifications and the issues relating to waste management. The information that follows is based on anecdotal data and visits to a variety of apartments in Dublin City and suburbs. Visits to apartments in Cork City and Galway City and suburbs were also made.

5.3.1 Purpose-built apartments

5.3.1.1 General description

Purpose-built apartments have been built in Ireland since the 1960s but the majority of these buildings have been constructed in the last decade (Fig. 5.2). They vary from modern, self-contained small-scale blocks of apartments in their own grounds (Fig. 5.3), typically found in most cities nationwide, to large high-density flat complexes.

Some of the typical features of purpose builds are listed below:

- Car parking at modern purpose-built apartments is typically provided underground, particularly in city urban areas. Older apartment complexes tend to have surface area car parking within the grounds.

Figure 5.2. Apartment block construction.

Figure 5.3. Self-contained apartment block.

- Typically, purpose-built apartments have communal courtyards, green areas and walkways.
- Residents typically share bins.
- Management companies are generally responsible for the services of the building, including waste collection, etc.

5.3.1.2 Typical waste storage

This is possibly the most important issue. The location, size and access to the waste area affects bin size, collection, access, etc.

Purpose-built apartments are self-contained blocks of living units, often within a defined curtilage or boundary marking the footprint of the development. These apartments range in size from small blocks with a small number of units to large high-density complexes. Waste storage areas in purpose-built apartments are located in basements, underground car parks or in some instances in designated waste storage areas/sheds (Figs 5.4 and 5.5).

Figure 5.4. Designated bin storage area.

Figure 5.5. Designated bin storage shed.

- Space is often a constraint in purpose-built complexes and waste is often stored wherever space is available.
- Surface-level storage areas generally have better access for collection vehicles with waste storage typically within the on-site car parking area.
- In some purpose-built apartments, waste storage areas are in sheds, concrete-walled areas, bays, or separate rooms within the building.
- Storage areas within purpose-built apartments are communal to all residents: individual units tend not to have their own bin.
- Residents of purpose-built apartments typically bring their rubbish to the waste storage area, usually in plastic bags.
- Depending on the scale of the development, property management companies may employ a full-time caretaker/cleaner/groundskeeper who maintains the waste storage area and wheels the bins to the exit/entrance for collection.

5.3.1.3 Bin types

Bins used at purpose-built apartments are generally wheeled bins shared by all residents of the complex although smaller developments can sometimes have individual bins for each unit. Separate bins for dry recyclables are available at some developments but the availability of these services is low compared to single-unit dwellings (see Chapter 6).

The most common type of bin provided for mixed residual waste is a metal or plastic wheelie bin with a capacity of 1,100 l (Fig. 5.6). If bins for dry recyclables are provided they tend to be of a similar capacity.

Figure 5.6. Typical 1,100-l bins.

5.3.1.4 Collection frequency

The waste collection services at most purpose-built apartments are arranged by the building management company, which employs a waste collector to service the block, although local authorities are increasingly involved in servicing apartment blocks. Typically private waste collectors service purpose-built apartments although this can vary from region to region.

- Generally waste bins are collected on a weekly basis from purpose-built apartments. If available, mixed dry recyclable (MDR) bins are typically collected once a fortnight but collection frequencies are often altered as required.

- The space restriction at apartments often limits the number of bins that can be provided at a complex and this can increase the need for more frequent collections.

5.3.1.5 Access

Access to waste storage areas at purpose-built apartments can be a problem for waste collectors, particularly if underground. The security and management arrangements at developments can cause access problems. Modern apartments often have controlled security gates and car-parking areas are in use.

- Due to security or access restrictions, the private waste collector will often request the management company or caretaker to bring the waste bins to the front of the building prior to collection.

- For gated apartments, the driver for the private collection company may have the permission of the property owners to gain access by using a key, electronic pass or security code (Fig. 5.7). If the bins are not close to the entrance the drivers will be notified of the point of collection (Fig. 5.8). In some cases, the bins are wheeled closer to the entrance gate by the property management company.

Figure 5.7. Gate with security code system.

Figure 5.8. Designated collection area.

5.3.1.6 Education and awareness

Management companies that maintain waste areas are often responsible for informing tenants of waste collections and expansion of services. Residents within purpose-built apartments regularly form their own committee to improve living arrangements within the complexes. Committees can be very active and in some instances have prepared their own brochure or literature on recycling and waste. This is not exclusively specific to purpose-built apartments, but this most commonly occurs in this type of building.

5.3.2 Converted buildings

5.3.2.1 General description

In cities such as Dublin, large older (typically of the 18th-century Georgian era (Fig. 5.9)) town houses in the city centre are regularly converted into offices or to incorporate multiple-household units. Moving away from the city centre and towards the suburbs buildings that were originally built as one house are often renovated to incorporate multiple units (typically flats/bedsits).

Some of the typical features of converted buildings include the presence of:

- A small garden in front or to the rear of the house that is shared amongst all units
- A narrow walkway leading to the front door of the house
- Steps leading to units above and below ground level
- Bins generally shared by tenants.

Figure 5.9. Converted Georgian town house.

5.3.2.2 Typical waste storage

Typically bins are stored in the curtilage of the house, either situated in the walkway or inside the entrance gates. These bins are usually placed against railings or hedges that separate the buildings (Figs 5.10 and 5.11).

Figure 5.10. Bins stored alongside hedging.

Figure 5.11. Bin stored in trellised area.

- In many cases, there is no designated waste storage area although bins are kept together.
- Converted houses typically do not have an on-site management company. This means that residents bring the rubbish to bins in bags and a caretaker or residents are often responsible for the presentation of waste for collection, depending on the size of the building and the number of units.

5.3.2.3 Bin types

Generally smaller bins are used at this type of building than at purpose-built apartments. The most common type of bin provided for residual and MDR waste is the 240-l wheelie bin (Fig. 5.12).

Figure 5.12. Smaller 240-l bins outside a converted town house.

- These bins are shared between all residents of each unit in the building.
- Space largely determines the number of bins that a building is provided with.

5.3.2.4 *Collection frequency*

Bins are collected generally once a week, either by a local authority or by a private collector (Fig. 5.13).

Figure 5.13. Bins awaiting kerbside collection.

5.3.2.5 *Access*

From the data available nationwide there are generally no major issues for the waste collectors in terms of access provided the bins are brought to the kerbside.

5.3.3 *Apartments above commercial premises*

5.3.3.1 *General description*

Most of the apartments in this category are flats/bedsits located above a commercial premises (Fig. 5.14). Front-door access is usually directly onto a pedestrianised walkway.

5.3.3.2 *Typical waste storage*

Of the three categories of apartments examined, the apartments over commercial businesses are least likely to have space for bin storage.

- As can be seen from the photos many of these buildings face directly onto the street (Fig. 5.14) and therefore the storage of bins outside each front door is not possible. In most cases, there is limited space at the rear of the building.

Figure 5.14. Apartments above commercial premises.

- In some newer buildings, residents may have access to an internal storage room or bins may be stored in a utility room. Figure 5.15 shows a waste storage room to the right of the main building although this is often the exception rather than the rule.

5.3.3.3 *Bin types*

Since bins are often problematic to store in these cases, especially in the city centre, residents are given the option to put stickered bags out for collection instead of bins (Fig. 5.16), in areas determined by Dublin City Council to be inadequate for bin storage (front door on street, bin too big to store indoors, no storage space at rear or sides) or at apartments situated down narrow streets inaccessible by the RCV.

Figure 5.15. A waste storage room to the right of the main building.

Figure 5.16. Stickered refuse bags awaiting collection.

5.3.3.4 Collection frequency

Bag rounds for residual waste are carried out on a weekly basis and on a fortnightly basis for MDR bags although this depends on the arrangements of the waste collector.

5.3.3.5 Access

Waste is left out on the kerbside for collection.

6 Stakeholder Consultation

6.1 Introduction

Consultation with key stakeholders involved with waste management was undertaken to improve our understanding of the challenges of introducing organic waste collections to apartments. The consultees included local authorities, private waste collection services, developers and property management companies and apartment residents. In addition, a survey was prepared and completed by a sample of apartment residents from Dublin. The findings and format of the survey are outlined in Section 6.2.

6.2 Survey of Apartment Residents

In order to gauge the opinions of residents in apartments, a questionnaire survey on waste and recycling was prepared. The survey provided a small sample of results on waste management at apartments, which are nevertheless considered to be representative of the national averages. Details of the questionnaire and the respondents who took part are as follows:

- A selection of people living in apartments were contacted by e-mail – RPS employees and their acquaintances (those living in apartments) were asked to participate. Most of these were from the Dublin area although residents from Cork and Galway were also sampled.
- Respondents were both male and female, generally in the 20- to 40-age bracket.
- The respondents may be more sensitised to waste/ environmental issues than non-RPS respondents.

Information was obtained about the types of apartments in Ireland and their associated waste management systems. The data collected from the survey are available upon request. The type of data collected included:

- The type of apartments concerned
- Waste storage areas and bin types
- Types of waste separated
- Waste collection (including frequency and collection company)
- Building management.

6.2.1 Findings from the survey

The surveys have improved our understanding of the specific issues associated with the types of apartments. The style of purpose-built apartments can vary significantly from one development to the next, with storage and space in new builds often a problem. For example, older apartment blocks tend to have larger communal areas and surface parking compared with modern blocks, which typically have underground car parking.

The surveys highlight some of the difficulties and frustration that some residents have with building management companies. Issues typically include poor communication and a lack of adequate bins and recycling services for the residents. Most residents generally would like to have more on-site source separation but there is little financial incentive for tenants to reduce their waste and attempt to recycle more. An outline of the findings from the surveys conducted is as follows.

6.2.1.1 Types of apartments

- The highest proportion of respondents to the survey (68.5%) live in purpose-built apartments. In fact this figure closely mirrors the national figure in 2002 of 63.8%. Just under half of these apartments were built in the 2000s with approximately 25% being built in the 1990s or between 1970 and 1990.
- The percentage of survey respondents living in converted apartments (28%) is similar to the national average of 26% (Government of Ireland, 2004).
- Only one of the 35 respondents surveyed lived in an apartment above a commercial unit.

6.2.1.2 Waste storage areas

- These areas varied in size and location, depending on what was appropriate for the number of units they were servicing. The most common number of units serviced by a waste storage area is between 20 and 30 units, but there is no strict ratio for this and anything up to 270 units are serviced by only one waste storage area.

- For **converted** apartments, the number of units typically ranged from three to ten, with one building incorporating 50 units. In almost all cases, the bins were stored at the front of the house. Only three of the respondents had bins stored at the back of the building (e.g. in the case of the building with 50 units). The fact that one city centre building stored eight bins on the balcony, wheeled down to the entrance gates on the day of collection, emphasises the issue of space.

- The only person in the survey who lived in a unit above a **commercial** premises had a waste storage room on ground level within the building, to which only the residents and the waste collector had a key to unlock (see Fig. 6.1). This was accessed from the street at the side of the building. There is no source separation of the waste.

Figure 6.1. Waste storage in internal room, commercial apartment.

6.2.1.3 *On-site source separation*

- Almost four out of every five purpose-built apartments had source separation of dry recyclables. This is likely to be fewer elsewhere in the country. In some of these cases, the introduction of a separate bin was only provided recently on the request of the residents. In one case, facilities for glass recycling but not for MDRs were provided for residents. The resident responses showed that the most common practice of private collectors at purpose-built apartments is to provide one 1,100 l bin for every five to ten units, although in some cases this many bins would have to service considerably more units.

- Similar to the results found in the purpose-built apartments, one out of five of the converted apartments did not have a collection of MDRs. This occurred in two: the 50-unit building and the building whose bins were stored on the balcony. This again suggests that there may not be enough space for the extra bins in these cases.

6.2.1.4 *Waste collection frequency*

The collection frequency at apartments varies from block to block, as shown by the survey results.

- Generally, both waste bins were collected weekly at a minimum but in two cases MDR waste was collected fortnightly and in two cases the bins were only emptied when full. This suggests communication between the collector and the property management company. From one apartment both types of waste were collected twice a week.

- Many people have stated that the MDR bin is not collected often enough and have brought this to their waste collector's attention.

6.2.1.5 *Odour/Hygiene issues*

- Overflowing rubbish bins, especially from MDR bins, occur in about 50% of the apartments surveyed. If bins are full residents either bring their rubbish bags back to their unit to store there until the bins are emptied or leave the bags beside the full bins. This leads to untidy and unclean waste areas, a concern for health and safety reasons.

- The issue of MDR bins overflowing was also reported in converted apartments, causing in some cases obstructions to the building walkway and at the entrance gates. In some cases, residents have to compress the rubbish in the bins to deal with overflow.

6.2.1.6 *On-site management*

- In some cases, property management companies ignored residents' requests for source separation of waste. Pressure from residents on these companies meant that recycling facilities were implemented in a few cases. As mentioned previously, almost 20% of

those questioned in purpose-built apartments do not have the option of source separation.

- At one purpose-built apartment several shops located beside the complex were using the residential bins in the ground-level car park
- The converted building with 50 units has a property management company that is involved in the upkeep of the area.

6.3 Waste Collectors: Private and Public

Private waste collectors service the majority of apartments in Ireland and RPS spoke to a number of collectors about apartment waste collections and the typical issues encountered from a collection perspective. Dublin City Council was also consulted in relation to collection of waste from apartments in commercial buildings. Because of the limited involvement of the public sector in waste collection from apartments above commercial buildings, the consultation for this section is restricted.

6.3.1 Purpose-built apartments

6.3.1.1 Types and quantities of bins provided

The calculation for the quantity of bins put in place at apartments varies from waste collector to waste collector.

- Of the four private waste collectors consulted, generally a 1,100-l bin is provided for every ten apartments (Fig. 6.2). This can vary depending on collector judgement, e.g. more bins could be added if there are overflowing bins or bags beside the bins.
- In some cases, smaller bins will be supplied if deemed appropriate, e.g. in converted buildings or if an apartment unit has an individual green area. One private waste collector is now also providing a new type of communal bin specific to apartments called the 'slot and lock' bins to combat contamination. These bins are designed with a special lid that can be opened only enough to allow small items be disposed of, therefore reducing the likelihood of contamination from plastic or glass.

Figure 6.2: Storage of grey wheelie Eurobin outside apartment.

6.3.1.2 Collection frequency

- Waste collectors often address overspill rubbish by increasing their collection frequency or supplying more bins. However, the frequency of collection is far more expensive than supplying extra bins, unless space constraints are an issue. Waste from apartments is collected at minimum once a week, and on occasion more than that. If bin bays are scattered throughout apartment complexes, more bins will be supplied in place of a more frequent collection service, as driving to the different bays can be time consuming for the drivers, according to one private collector.
- There can be a problem with overflowing rubbish after Bank Holiday weekends, when collection is pushed forward a few days.

6.3.1.3 Access

- Many of the private collectors consulted recommended ground-level three-walled bin bays as being the most convenient waste storage area to access. These would have limited negative visual impact if the open side were placed away from observable view, perhaps at the back of the building. They all mention however that the location of bays depends on space availability.
- Two of the main waste collectors in Dublin don't access underground waste storage areas and so it's necessary for the property management of the apartments they service to make arrangements for the bins to be left at the front gates. If quad bikes or tows are not available to the property management, an individual(s) will have to pull/push these 1,100-l bins up ramps, which raises health and safety issues.

6.3.1.4 Issues

Problems that private collectors have noted are:

- Residents not putting bags in the bins, which can lead to the waste storage area looking untidy. The Council

will not collect bags left outside of bins whereas private collectors will.

- Contamination of MDR bins with plastic, glass, organics, nappies and even clothes. One private collector, at a few locations, has had to remove some of the MDR bins from apartments because of high levels of contamination.

There is no uniform colour-coding scheme in place for waste collection containers, which causes problems for residents with identification of which materials must go in the appropriate bins. For example:

- One private collector usually provides green bins to apartments for MDR but in some cases where they do not have enough green bins available will provide purple bins with stickers to notify users that these bins are to be used for MDR.
- Another uses orange bins for MDR and blue bins for residual waste.
- Another is introducing a red bin for residual waste to match its corporate logo.

6.3.2 Converted apartments

6.3.2.1 Types and quantities of bins provided

There is no specific bin-to-unit ratio for converted buildings and the decision is left up to the landlord to determine the required number. However, if there are more than six persons within a household they are entitled to a second black bin.

6.3.2.2 Collection frequency

The collection frequency varies depending on the waste collector, but is usually once a week for residual waste and weekly or fortnightly for MDR. The provision of more MDR bins however is not a suitable solution if space is an issue, as is often the case in converted apartments.

6.3.3 Commercial apartments

6.3.3.1 Types and quantities of bins provided

- At the request of residents in commercial apartments, a survey is carried out by a Dublin local authority to evaluate if there is adequate space for a bin; if not they are eligible to be included in the bag route. Almost all of this type of residential apartment is serviced by the bag collection in inner city Dublin (Dublin 1, 2 and 3) and many in the suburbs (Dublin 4, 7 and 8), in areas where bins cannot be stored safely. The local authority also commented that older people who find bins awkward to use could also use the bag collection system. The prepaid sticker can be purchased in local shops for €2.65.
- A private collector provides 12 bags to residents every 3 months, so residents can therefore leave two bags out every 2 weeks for collection. These are light green in colour and see-through to distinguish residual waste and do not require stickers.

6.3.3.2 Issues

- A Dublin local authority has commented that here are generally no problems with bags spilling or being torn open, as people are advised to use strong big bags and to tie the bags fully. Residents are also directed to leave the bags out no longer than an hour before collection. There are some cases reported of bags being ripped by dogs and cats in suburban areas.

6.4 Property Management Agent

Consultation with a property management agent was conducted to gauge issues associated with waste management in purpose-built apartments. The main comments included:

- Waste storage facilities need to be designed at the development stages and there should be dedicated bin stores for large residential schemes in particular. Architects need to drive this issue, as it is not generally a huge concern to developers.
- The presence of a janitor/caretaker is essential for the proper upkeep of the waste storage area.
- Property management often does not like to include glass recycling on site, as there are often issues with noise for residents and collectors and a health and safety concern with broken glass around the bins. If the complex is not gated there is also the risk of non-residents using this facility. This may be why this service is rarely offered at apartments.
- Bin stores are often located underground to reduce the potential for negative impact, a considerable concern of both residents and developers.
- There is an ever-increasing demand by residents for source-separated waste facilities on site – people want to recycle but are unhappy about travelling to recycling bring centres to do this.

- Space is the biggest issue for waste storage, particularly if there is no garden or underground area, as bins would need to be stored internally.

6.5 Apartment Builder and Developer

Consultation with a builder and developer was useful to further examine waste and recycling storage systems and requirements.

- This developer would like to see statutory requirements put in place for adequate waste and recycling storage areas to be included as a criterion to gain planning permission for each new development, or at the very least guidelines from local authorities. At present there is confusion for developers about what is required on their behalf.

- Waste storage is usually an afterthought and decisions on the placement of bins often only occur as residents are at the moving-in stage. If a waste area is designed and included in the plans, it is usually for residual waste only, which may cause problems if bins for separate waste are added later.

- A critical factor for locating the bin storage area is the aesthetic impact it creates. Proximity to residents and access for waste collectors are issues. Residents can be unhappy if the area is located too close, yet it needs to be close enough for residents to use. Accessibility in bad weather conditions and for the elderly needs to be considered also. In newer 'court'-type developments, e.g. Adamstown in Dublin, there is not often any obvious place to locate the waste storage area, e.g. against building gables or free-standing walls.

- Bins need to be housed in some way, preferably in a three-walled area with the opened side facing away from obvious view to avoid them becoming an eyesore (Fig. 6.3). A door is also favoured to reduce the negative visual impact and odour from the area. This developer recommends a timber unit with a pergola roof and louvres for natural ventilation to help stop odour build-up within the building. Developments that have bin gathering areas solely tend to have problems with bins getting kicked around and being knocked over.

- A potentially beneficial design feature for new developments could be a separate mini-recycling centre within the complex if the development was large enough to merit it.

Figure 6.3. Three-walled, roofless bin bay.

- The problem with communal bins is the lack of personal responsibility on behalf of the residents. When charges are divided equally among all residents there is no incentive to segregate waste. There is no tracking system.

- Underground car-park waste storage can be a problem: it can take a long time to get 1,100-l bins up ramps to the collection trucks at ground level and while the truck is waiting it can block up exit points for cars.

- It is important that someone is employed to maintain the area. CCTV in waste storage areas has been shown to be effective in the prevention of vandalism.

6.6 Architects

Design aesthetics and landscaping are important when incorporating a waste storage area into a new development, and architects consult closely with developers and building contractors to get an idea for 'best fit' for each new apartment development. Two architects involved in apartment design were consulted and they commented as follows:

- The specific requirements for waste storage areas for planning permission can vary for each local authority. General DEHLG guidance documents are needed nationwide so time isn't wasted complying with different rules.

- New waste management technologies that have had the potential to be effective for apartment complexes such as biodigesters for food waste should be

employed, according to one consultee. Developers often reject these for cost reasons.

- Source segregation will not succeed at apartments as long as the charge for waste disposal is divided evenly amongst all residents. But the communal bin system is the only one that addresses space and collection-time issues. A balance of these issues is required.

- The most convenient waste storage area is located at ground level as it is the most accessible for the resident and the RCV. The biggest factor in the placement of bin bays is locating them far enough away so that odours will not be an issue for residents. The aesthetic value of these areas is also very important for design purposes

- Landscaping of the waste storage area is an important factor to consider when designing. Usually at new developments a bay area is designed to hold waste for 30 to 40 units. This is usually semi-enclosed: one side opening and having a free-floating roof so that residents living in floors above ground level would not be looking down into the bin area and to stop birds getting into the bay.

7 Irish and International Organic Waste Collection Schemes

A desk review was undertaken to identify international organic waste collection schemes from apartments. Data on collection schemes were sourced through an Internet search, reviewing scientific literature and consultation with Local Authorities and other organisations involved in similar schemes. In addition a study tour to the Netherlands and Flanders was undertaken and different collection schemes were visited. Table 7.1 summarises a selection of both Local Authority and community-based schemes providing recycling and organic waste services for apartments. The key findings detailing the perceived advantages and disadvantages of the different approaches used are outlined in Sections 7.1 and 7.2.

It is important to note that the type of waste being examined in this research is food and garden waste, but many of the schemes listed below were/are carried out alongside existing dry recyclable collections. The housing type is exclusively high- and low-rise apartments and flats.

7.1 Irish Schemes

The Irish situation contrasts markedly with some European countries (such as Denmark, the Netherlands and Sweden). Many of these countries began source-separating waste in the 1980s and therefore have around 20 years experience of kerbside collections. In Ireland, Galway City Council and Waterford County Council have taken a lead nationally in the collection and recovery of household organic waste.

7.1.1 Galway City Council organic waste collection

At present, a household organic waste collection scheme is operated by Galway City Council in the urban city area as part of the implementation of the 3-bin system. The scheme primarily serves single-unit dwellings although some apartments in the city are now provided with a 3-bin collection system. Roll-out for brown bins began in February 2001 in Galway City and now services 18,000 households, although only a small percentage of this comprises apartments (<5%). In general, the apartments in the city are serviced by a mix of public and private waste collectors.

The Replacement Waste Management Plan for the Connacht Region (2006–2011) noted that in 2004 only about 2% of household waste in Galway City was collected by private operators, who do not segregate waste collected from apartments. The plan highlights the need for the 3-bin collection system currently in operation in Galway City to be extended to include apartment complexes.

7.1.1.1 Collection logistics

Some apartment complexes have a 3-bin collection service and bins are shared between apartments. Co-operation was sought from apartment owners and management companies. Collections are alternated – dry recyclables and organics are collected one week with the mixed residual bin collected every alternate week to reduce overall collection costs. Galway City Council is putting in a great effort to address the issue of collection from apartments. Those private operators that do service apartments in Galway City largely collect only mixed waste.

7.1.1.2 Education/Promotion

The scheme was rolled out with the support of a team of local authority staff and environmental awareness officers. In the city ten trained awareness staff called door to door to explain the new system before the phased roll-out of bins. Support is ongoing and information campaigns relate the performance back to the public.

Bin inspections are undertaken regularly to ensure that the householder is using the right bin and that contamination is kept to a minimum.

7.1.1.3 Treatment

The organic waste collected by Galway City Council is sent to Carrowbrowne for composting. In Galway City Council, the tonnage of segregated organics diverted from landfill through household collections in 2004 was 4,945 t. This contributes significantly to an overall recycling rate of 51% in the city.

7.1.1.4 Issues and outcomes

Only a small number of apartments were included in the Galway City scheme because of contamination and logistical fears. It was found that demographic factors affected contamination rates of the organic waste communal bins presented for collection in estates and apartments. Contaminated bins were tagged with bright

Table 7.1. Organic waste collection schemes in other countries.

Name/Location of scheme, date	Organisation/ Participation rate	Type of apartment	Collection method	Type and location of containers	Collection frequency	Promotion/Awareness	Comments
Nightingale Estate, Hackney, London, UK, March 2004	ELCRP 84%	High-rise, 17 estates. 6,500 households	Door-to-door collection. 10–12 bio-bags into 35-l bin, 2 bins per trolley. Operatives work in pairs	5-l bin with a handle-locking mechanism Biodegradable liner Bags of flakes	Weekly – appointed day of collection. 1,200 units per day	• Won National Recycling Awards 2004 – Best Community Project • Won Composting Association Awards 2004 – Best Community Initiative • Helpline for people's queries, or if they ran out of flakes or bio-bags • If participation decreases, continue door knocking and open meetings	• Meets requirements of ABPR[1] • Substance added to food preventing smells, flies, maggots • Rocket composter only company in UK to hold ABPR licence • 'Closed-loop' composting – the resulting compost is used on flower beds in the estate to help with aesthetics of area • Rat sightings dropped to almost none, crime levels dropped, local employment • Collect 2.7 kg per week per unit
Niort, France, 1994–present	Department of Deux-Sèvres	Housing estates and city flats – 12,000 in total	Kerbside collection	120-l and 240-l bins	Weekly	• Press conference + regular press communications • Public notices and meetings and distributed info door-to-door. Half-yearly newsletter • Guided tours of composting site • Freephone number for queries	• Refuse collection vehicle used • Kitchen and outside bins distributed free of charge • Opt-in scheme – voluntary, therefore very good-quality compost. Used around city and used in other communes. Local Authority hoping to obtain quality label for compost to promote the scheme
Brescia, Italy, 2004	Azienda Servizi Municipalizzati	110,000 households (30% low-rise, 70% high-rise, 3–10 floors)	Communal collection points – 2,400-l bins for organic waste	6.5-l bin and biodegradable plastic bags	Three times weekly		
Cinisello Balsamo, Italy, 2004	Private collector	High rise >4 units Low-rise	Central or near entrance collection	In communal waste storage area (inside or outside)	Twice weekly		• High-rise: 120-l wheeled bins per 10–12 households • Low-rise: 30-l communal lidded buckets per 4 households
Christchurch, New Zealand May–July 2002 300 homes	Christchurch City Council 100% after 2 weeks, 80% at end	Unknown apartment type, 2 buckets – 4 l for kitchen, 20 l storage in laundry, shed, garage	Kerbside collection	Kerbside	Weekly (same day as refuse + recycling collection)	• 2,000 letters, promotional flyers mailed to households • Follow-up letters • Telephone and e-mail services available	• Involvement voluntary • Biodegradable liners and Bokashi flakes supplied. • No difference in participation rates in different socio–economic areas • Noticeable reduction in waste produced. "*A resounding success*" – those involved willing to continue with service, even paying for it
Chifley, Canberra, Australia, Aug 2000-June 2001	Australian Capital Territory 90%	4 apartment complexes – 1 bin for 3 units sharing	Kerbside collection, shared waste bins	96 × 240-l wheelie bins shared use 5-l kitchen caddies	Weekly[2]	• Information pamphlets + questionnaires delivered throughout trial • Residents package – calendar + information brochure explaining 3-bin system	• Bio-bins in the multi-unit complexes were cleaned by the contractor • Audits carried out at seasonal intervals – significant decrease in food and kitchen waste • Apartments averaged 19% food + kitchen waste in the residual waste bins, compared to 20% in single households • Compost generated from this waste of high quality

Table 7.1 *contd.*

Name/Location of scheme, date	Organisation/ Participation rate	Type of apartment	Collection method	Type and location of containers	Collection frequency	Promotion/Awareness	Comments
Northumberland County, Ontario, Canada, 1996–present	Private collectors 65%	1,345 households, mainly apartments with >5 units	Kerbside collection	Black or green waste bags, plastic bags or a can labelled 'wet'	Weekly	• At start of programme County Waste Services received >2,000 telephone calls from residents • Extensive public meetings, ongoing press releases • Info packages delivered to all households, advertising in various media, newsletter	• Max. 3 bags/cans can be set out per household per week • 70% organic waste diverted at an anaerobic digester off site
Greater Copenhagen, Denmark, 1999–unknown (trial complete)	Danish EPA	16,366 households including blocks of flats in Copenhagen city	Kerbside collection	Kitchen – paper bags with wire basket or brown waste bin Outdoors – brown plastic container or paper sack	Weekly	• Prior to and during trial printed and project website info provide to participants – printed material sufficient as only 4% visited website	• During collection visual control made to ensure clean organic product • Some organic waste not separated because paper bags too small • Liquid leaked from paper bags in kitchens • During warm periods maggots in plastic container • Organic waste transported to co-digestion plant for pretreatment and anaerobic digestion • Only 4% contamination – criteria for separation understood by participants • Distribution of paper bags to blocks of flats in Copenhagen expensive

[1]Animal By-Products Regulations.
[2]Including compostable nappies.

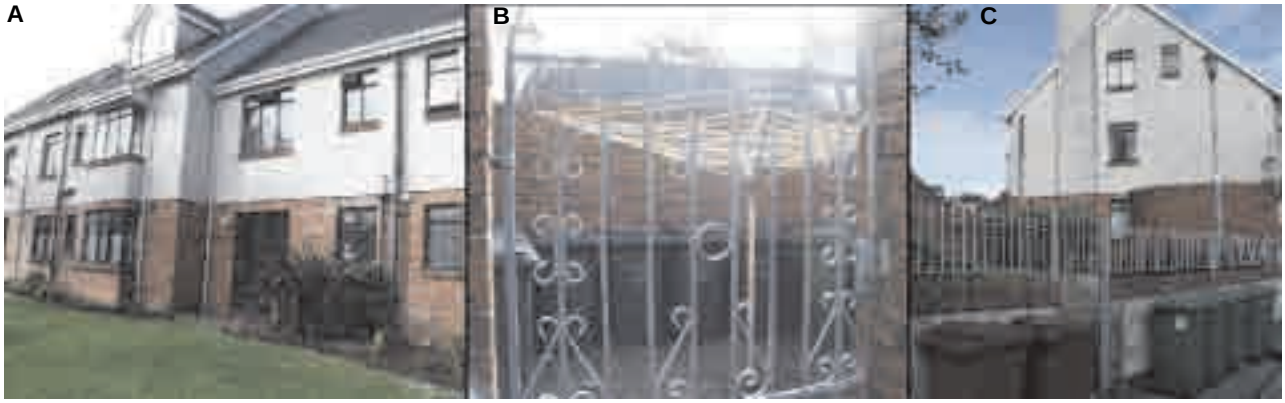

Figure 7.1. (A) Cappavanaveah Estate. (B) Waste storage area. (C) Waste collection arrangements.

red stickers. Council staff followed trucks on the various routes to talk to householders and leave further information regarding this. Following a period of grace contaminated bins were not collected.

Participants in Galway were concerned about the reduction of collection frequency of residual waste from weekly to alternate week collections. However, when the food waste was removed from the residual bin and transferred to the organic waste bin people's fears were abated, as they had no significant problems with overflowing residual waste.

Case Study: Cappavanaveah Estate, Salthill, Galway (Fig. 7.1)

- Serviced by Galway City Council
- 31 units. Seven brown bins, ten green bins. All brown bins only a third full on average, collected fortnightly
- Bins wheeled out onto kerbside on a narrow street for collection. Bins spread along wall at kerbside for the length of the apartment estate
- Bin storage area beside the front gates, easy to wheel out to front gate
- No black bags allowed in the green or brown bin. Biodegradable bags available in shops.

Case Study: Suncroft Court Apartments, Salthill, Galway (Fig. 7.2)

- Serviced by Galway City Council
- 14 units, gated electronic entrance for which Galway City Council have the code
- RCVs access bins by driving to storage point at the back of the estate. Lots of space, easy access
- Two out of 14 bins are for organic waste, less than 25% full, collected fortnightly
- Evidence of biodegradable bag usage and food being wrapped in newspaper.

Figure 7.2. (A) Suncroft Court Apartments. (B) Gated electronic entrance. (C) Fenced waste area.

Figure 7.3. (A) Deep storage bottle bin. (B) Fenced-off waste storage area. (C) The four inlet bins.

Case Study: Cúirt Seoige Apartments, Bohermore Road, Galway (Fig. 7.3)

- 115 apartments in total but currently only 50 units in which people are residing, as it is a new development.
- Innovative underground or deep storage bins waste collection system in place on site. Underground system with four inlet bins for different waste streams – mixed residual, glass, dry recyclables and food waste. The bin capacities are: residual bin 5 m^3, MDR and glass 3 m^3, food 1.3 m^3.
- A private waste collector services the complex and empties the system each week but not necessarily needed that frequently for food and glass.
- Developer put system in as apartments were being built and according to the Irish representative the system does not cost significantly extra to install compared to the cost of developing a waste storage area.
- Waste area is fenced so not visible from the public street.

7.1.2 Waterford Organic Collections

The dry recyclables collection has been under way since 2003 in Waterford County and City, and the organic waste bin was introduced in 2004. Waterford City Council was first to phase in the brown bin in May 2003, and Waterford County Council followed in September 2003.

7.1.2.1 Scheme set-up

The need for the introduction of a source-separated organic waste collection service came about when the Dungarvan landfill site closed and the Tramore landfill site was fast approaching full capacity. A second bin for source-separated dry recyclables was already in operation. An organic waste collection was phased in and 17,500 households in the county and city received a free 140-l brown bin and kitchen caddy and info pack. Kitchen waste (including cooked meat and dairy) and green waste are accepted.

7.1.2.2 Education/Promotion

Instructional brochures detailed the programme logistics, such as the weeks of collection and the areas that would be serviced; in some areas the brown bin would be left out with the refuse bin and in others the refuse was left out with the dry recyclables (Fig. 7.4). These also outlined the types of materials that could be accepted, benefits for the individual and the community and contact details for queries or concerns. A calendar showing all the dates when collections are to be made was stuck to the inside of the bins. A telephone hotline was set up to answer people's queries. Promotion brochures were also produced in Irish for people living in Gaeltacht areas (Fig. 7.5).

Figure 7.4. '3-bin' system in Co. Waterford.

Figure 7.5. Promotion brochure in Irish.

Electronic tags were also used to build upon the customer database (Fig. 7.6).

7.1.2.3 Collection logistics

Most of the apartments in Waterford County are in Dungarvan town, which is serviced by a private collector, which does not operate the brown bin system. Only a tiny percentage of the households serviced by the local authority 3-bin collection in the county were apartments. For those that were serviced, a communal bin was put in place. This was deemed not a success, as contamination rates were high and as a result the service was discontinued.

At the beginning of the scheme the collection frequency of the brown bin was every 2 weeks. This was changed in September 2005 to collection every 3 weeks as it was found that the 140-l bins were difficult to fill.

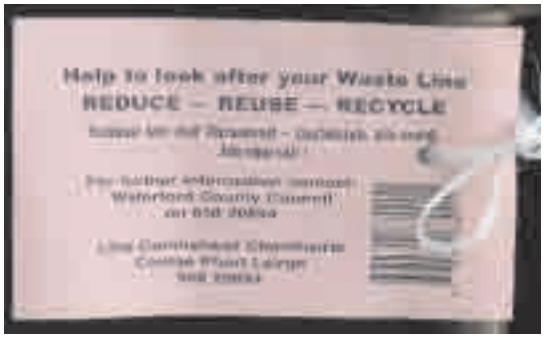

Figure 7.6. Electronic tags for brown bins.

7.1.2.4 Issues

The brown bin collection was rolled out in July (Fig. 7.7), causing problems with odour from the bins and the presence of flies due to the warm weather. These issues also tied in with the frequency of the organic waste collection. Participants were only putting out their 140/240-l brown bin when full to reduce waste charges (pay-by-volume in place). In some cases, bins were put out for collection after 9 weeks, at which stage the contents had started to liquify, causing problems with odours and hygiene. Bins were especially difficult to fill in rural areas, as many householders were already composting green waste or feeding their food scraps to animals.

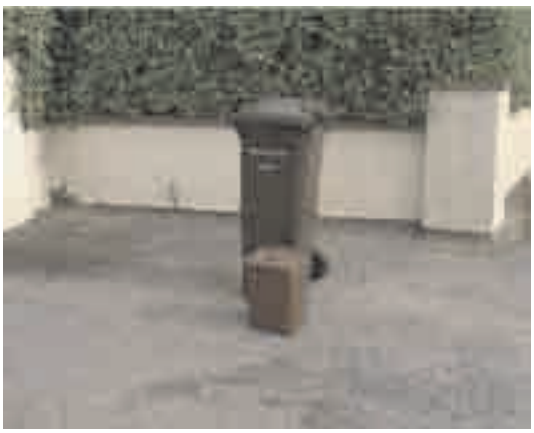

Figure 7.7. 140-l brown bin and kitchen caddy for organic waste.

7.1.2.5 Outcomes

The compost produced is used for roadside landscaping and was returned back to customers at the beginning of the scheme as a promotional tool. Waterford City Council now sells the compost using the bin tags used for waste collections of organic waste as currency to encourage continued use (Fig. 7.8).

The South-East Regional Waste Management Plan 2006 reports that Waterford City and County had a recycling rate of 42% in 2003, and 98% of households have both the green and brown bins. The remaining households are most likely apartments, as most of the Waterford City apartments are serviced by private collectors and many provide only a residual bin due to issues of source separation at apartments.

Figure 7.8. Compost produced from organic waste collected in Waterford City.

7.2 International Schemes

Schemes from the UK, Denmark, France, Italy, New Zealand and Australia were examined and details of each are discussed under common themes. Summary details of the schemes are provided in Table 7.1.

7.2.1 Schemes' set-up

The studies show that many of the pilot schemes are driven by local authorities that wish to meet targets set in their waste management strategies. Sometimes they provide financial support for community organisations started due to demand from locals wanting to recycle. Almost all local authorities undertook to publicise their organic waste collection schemes before they were implemented, most commonly by distributing awareness leaflets to householders detailing the scheme and explaining why it was being introduced.

7.2.2 Collection systems

A significant concern in selecting suitable source-separated collection methods for apartments is the need to provide convenient and secure services at reasonable cost.

- Of the eight schemes outlined in Table 7.1, five incorporated kerbside collections (where the bins had to be pulled out to the kerbside for collection), two collections were from communal or central points, and one involved door-to-door collection in the London scheme (dealing with high-rise tower blocks). These schemes serviced all types of apartments from a few units in a large building (e.g. Christchurch) to high-rise tower blocks with hundreds of units (e.g. the Nightingale Estate).

- The organisers of the Nightingale scheme felt that door-to-door collection was providing a **kerbside equivalent** system to residents living in flats, especially in areas with limited space or where elderly people predominantly live. The infrastructure for this collection method is simple and the initial investment cost is low. It is easy for residents to use and it is possible to identify who's participating and who isn't. There are other added benefits from the presence of an on-site staff member (Fig. 7.9), such as employment creation and reducing crime. However, it was believed that the operating cost would be far higher than for central or near-entrance collection. However, this method is very site specific and not the norm of the schemes examined.

- The practice of looking through the waste at the kerbside before being collected was also considered beneficial in those schemes.

Figure 7.9. ELCRP's composting facility and a Nightingale Estate high-rise block.

Source: DEFRA (2005).

7.2.3 *Container types*

The type of storage containers to be used, both in the kitchen and outside the house, was a key consideration when developing a scheme.

- Bins seem to be the most practical storage and collection unit for organic waste. Lidded bins are generally preferred because they are considered to be tidier, less likely to blow away, perceived to be owned by the householder, are re-usable and allow waste to be stored outside the house (Scottish Executive, 2003). Bin liners made the storage and transfer of waste food tidier and more convenient. They were found to control the release of odours and limit insect infestation during the collection and transport stage. They also reduced the requirement for washing collection receptacles by acting as a liner. Problems were found, however, where people who ran out of compostable bags began using ordinary plastic bags. Also, problems with bags bursting were reported in the Netherlands

- From the schemes reviewed indoor storage containers were usually stored in a convenient place, such as a countertop or under the sink. Stacked or separated indoor bins are also convenient for users. The combination of small kitchen caddies (2–7 l) (Figs 7.10 and 7.11), liner-compostable bags and larger outside storage bins (25–40 l) in the international schemes are most commonly used in these studies. All participants in the studies were supplied with their own bin(s) and bags (in the cases where this applied). In France, the public authorities

Figure 7.10. Kitchen caddy in Preston.

Figure 7.11. Lidded kitchen caddy and bag of Bokashi; kitchen bucket with handle and kerbside bucket.

managing schemes comment that supplying householders with a container reminds people that they are being provided with a service.

- Residents in many of the studied trials were asked to wrap food in paper (if not supplied with biodegradable bag) and place food-contaminated paper into these same containers before placing them outside into outside larger containers. The larger storage bin was usually kept outside and put out on the day of collection. It was found that outdoor bins should have a lockable lid for protection against pests and contamination.

The bin type also can have a major influence on the quality of the organic waste collected.

- Ventilated containers were used in Copenhagen to store organic waste outdoors before transportation to allow oxygen to enter the waste and encourage the breakdown of the waste.

- Colour coding of bins helps provide participants with a visual reminder to separate waste and what waste goes where. An unvarying colour scheme for containers could help make collection schemes consistent between areas and the idea seem familiar (Fig. 7.12).

7.2.4 *Container location*

There is no one preferred location in apartments for a communal bin for organic waste storage as the specific design and layout of the apartment complex brings

Figure 7.12. Green waste in brown bin.

different factors into play. There are a number of factors that affect the location including:

- Space
- Noise
- Visual amenity
- Security
- Access
- Resident demand.

Most of these factors were taken into consideration for the studied schemes.

- Space constraints are of particular relevance to apartments as these types of buildings generally share communal gardens, car parking areas and walkways. Usually larger collection containers, particularly in large development blocks, are located outside the building, but within the perimeter of the apartment block to ensure only residents access them.
- Central locations where most residents are likely to pass regularly were found to be successful. Walled or fenced areas have been created for sets of recycling and organic waste containers.
- In a number of the international schemes identified, communal containers are kept in a common waste storage room and are placed outside for collection by caretakers or a resident who takes on this responsibility. Those needing access to the containers, such as operatives and caretakers, hold keys. With kerbside collections and communal storage areas, many of the studies identified that a clear advantage of installing recycling and organic waste containers next to the refuse containers is that residents are already in the habit of taking their waste to this area – the change only involves persuading residents to segregate material. Vehicle access constraints were a major factor in identifying suitable container locations.

7.2.5 Collection frequency

Collection frequency is usually determined in conjunction with other factors such as existing waste collection schedules and container size. Higher recovery rates tend to be achieved with more frequent collections. Smaller containers with limited capacity should be collected frequently if the recyclable fraction is to be captured for treatment at a later stage. Householders are less likely to store their organic waste for longer periods unless the container is suitable. At the same time people tend to put out their bin only when full.

- For door-to-door collection schemes, as with kerbside schemes, it was found that collections on the same day of the week, whether weekly or fortnightly, are critical to encourage high participation in the scheme. The priority is to collect efficiently while avoiding overflows. Containers are often emptied upon request or when full. Often contractors seek the co-operation of building caretakers who monitor the recycling containers and inform the contractor when they require collection.
- Of the schemes listed in Table 7.1, the majority had weekly organic waste collections.

7.2.6 Participation rates

The participation rates of the studies shown in Table 7.1 (where available) ranged from 65% to 90%.

- Participation rates can depend on social issues, culture and even religion.
- Placing restrictions on the collection of residual waste at the same time as providing a means of separating waste can be effective to encourage participation.
- The recruitment of staff from the local area, e.g. Nightingale, London, means that residents are familiar with them and increase participation rates, which is important in highly diverse areas. This is specific to this scheme however.

- Collection schemes tend to receive a much better response if they are thought of as a service rather than a householder's 'responsibility to sort' the waste, e.g. the municipality of Niort in France.

- The quality of product may be better in 'opt-in' than in 'opt-out' schemes as those people who choose to participate are interested in separating correctly, e.g. Niort in France is hoping to establish a label for the high-quality compost produced due to its 'opt-in' scheme.

7.2.7 Consultation

Consultation plays a key role in delivering a successful collection scheme and played a part in all of the schemes reviewed. Health and safety requirements, space constraints and other demands on available space, vehicle access, existing refuse collection provision, convenience, security, and noise are all factors that should be taken into account during consultation with key stakeholders.

- Residents' views on these, and other issues, were often incorporated into schemes identified in Table 7.1 before schemes began and on an ongoing basis thereafter. Residents most often had concerns regarding both council and private estates, about vandalism, noise, odours, visual intrusion and loss of car parking. Performance standards were often fully aired at residents' association meetings.

- Often suitable container locations were identified and agreed with residents' and tenants' associations, property management caretakers and cleaners.

- It was also found that gaining the commitment of building caretakers within the schemes was viewed as a key element in winning residents' support. Building caretakers generally monitor bin areas and can liaise with the collection crews if there are problems. Where the chosen collection method requires new or additional external containers, scheme planners will usually consult with landlords or housing managers and caretakers.

- Collection crews are also considered important stakeholders when identifying changes to waste collection rounds and vehicles – they frequently come into contact with both residents and site operators and they can often identify problems not considered by consultants or other council staff.

7.2.8 Health and safety issues

There are very little data sourced on health, safety, hygiene and issues relating to waste collections at apartments.

- In Sweden, research was carried out by Smedlund Miljosystem (1996) concerning the storage of compostable household waste in the kitchen and subsequently in an outside container. It was found that paper bags in the kitchen performed best in terms of weight reduction, odour and strength of bag, providing they are positioned with free access to all sides. Plastic bags performed worst.

- Schouler (1998) suggests that storage of organic material without proper ventilation and over a long period of time could increase the level of harmful microbial presence in organic dust. He states that the concentration of putrescibles increases when organic waste is collected and stored separately, producing odours and potentially attracting vermin.

7.2.9 Social aspects, communication and awareness raising

Effective promotion of waste separation systems and education of householders is now widely recognised as essential to the development of successful collection schemes. In addition, these efforts must be sustained and continually reinforced with householders, particularly in apartments where participation may be lower than in other housing types.

Studies indicate that the highest diversion rates were found in the schemes with the largest communication budgets, demonstrating the importance of education and publicity for scheme success. As can be seen from Table 7.1, promotion for most of the schemes involved:

- Newsletters and information leaflets and calendars

- Door-to-door visits, especially if interest is declining

- Local press campaigns, most commonly in local newspapers and radio

- Free telephone helplines

- Local meetings and press conferences.

In the schemes identified in Table 7.1 most authorities informed residents about their intent to deliver a new or enhanced service and sought to involve residents and a variety of other stakeholders in aspects of the planning

process, predominantly in approving the proposed location for new containers. Wider publicity campaigns were also launched to raise awareness of the service, as outlined above. Performance information and updates should be provided regularly through selected media and should continue to inform and involve residents.

- It has been found that apartments generally have higher turnover rates than single-unit houses and therefore education efforts must be continual and more intensive. A separate educational brochure was distributed to apartments in the Chifley trial to deal with different household practices at these types of buildings.

Many of the studies show that the rate of contamination in schemes was improved through public education and availability of resources and through contacts available for participating residents to ask questions.

7.2.9.1 Informing multi-cultural communities

Some local authorities, as is the case in the London study, offer telephone translation services or leaflets in community languages, which non-English speakers can request. Illustrations of materials can also be used. In El Monte, California, bilingual waste auditors are used to address language barriers. Bilingual posters, brochures and public service announcements are also used (California Integrated Waste Management Board, 2003).

7.2.10 Incentive schemes

In some cases, publicity and educational campaigns on their own are not adequate to promote householder involvement in waste segregation and other incentives are required as follows.

7.2.10.1 Legal

The introduction of national or by-laws to reduce or ban organic waste going to landfill can be the driving force behind the introduction of such schemes in the first place, as is the case in Ireland with the policy for source separation prompting local authorities to roll out the brown bin soon. In many mainland European countries, local municipalities can choose to mandate source segregation of organics. Organic recovery schemes are widespread in Germany since 2005, with the banning of untreated or organic waste from landfill. Organic waste collection schemes were introduced in the early 1990s following a mandatory request to source-separate household organic waste across the Netherlands.

7.2.10.2 Financial

When waste separation is not made compulsory by being backed with either national law or local by-laws, the general consensus by authorities in the schemes studied was that the potential for reducing their waste management charges was a major motivating factor for householders to increase their recycling activity.

The use of variable waste charging (e.g. pay-by-volume, pay-by-weight with on-board weighing and chipped containers) means that it is in the best financial interest of participants to participate in organic waste disposal, as this will ultimately reduce the cost of their annual waste disposal charges. Variable charging is difficult to apply at communal bins at apartments however and contamination can occur if only a small percentage of people are separating waste correctly.

In Dresden, Germany, more than half of the population lives in apartment blocks where bin identification does not provide for direct incentives as they apply to households in the single-family houses. In 1994, a waste collector introduced new collection chamber systems (including organic waste) to individualise the billing of household waste for each flat in big apartment blocks, sponsored by the government of Saxony (Institute for Waste Management and Contaminated Sites Treatment, 2005).

7.2.10.3 Environmental

Putting the onus on residents to improve their local environment was also seen as an effective incentive to encourage participation in the schemes.

- In the Nightingale Estate, for example, the ELCRP emphasises that in addition to providing equal access to recycling services, the regular door-to-door collection of food waste plays an important role in improving the local environment. As a result of the service, most food waste is no longer disposed of in rubbish chutes or communal waste containers and the incidence of vermin has been significantly reduced. "*If you take away the food, you get rid of the rats*", a statement by a project manager of the ELCRP, has helped people to remember to separate their kitchen waste.

- Some London councils advised participants that they were in the process of developing schemes to pass on recycling credits to residents' associations. These credits would then be used for improvements to communal areas, such as landscaping. The credits

will be based on the tonnages collected from individual estates or blocks of flats as appropriate.

7.2.10.4 Others

Additional incentives for participation included providing free or discounted home composting bins to residents and highlighting the fact that some collection schemes (door-to-door in particular, e.g. the Nightingale and Tower Hamlets Estates in London) contributed to generating local jobs and incomes.

7.3 Study Tour to the Netherlands and Flanders

An international study tour of two organic waste collection schemes was carried out from 11 to 13 July 2006. The schemes were located in Rijswijk near The Hague in the Netherlands and in Boom, Flanders.

7.3.1 Rijswijk, The Hague, the Netherlands

Peter Aarts, a local authority representative for the municipality of Rijswijk with many years experience of Dutch household organic waste collection, provided a tour of the waste collection systems used for apartments in Rijswijk, a suburb of The Hague. This suburb has a population of just fewer than 50,000 people, 75% of whom live in apartments.

The collection of source-separated organic waste from all dwellings has been in operation here since 1992. The government mandated collection of organic waste from Dutch households since 1994. Due to high contamination levels of organic waste the decision to continue this segregation could be made by each individual city/region. The main findings from the tour were as follows:

- Underground collection bins have been commonly used for urban apartments since 1996. The bin capacity for the organic waste is approximately 10% of that for all other waste combined. The Bammens bins (Fig. 7.13) collect organics, residual waste, dry recyclables (not plastic) and the other type collects residual and organics (Fig. 7.14).

- The bins are located on the street and outside the perimeter of the apartment block. In recent years, contamination of the communal organic waste bins in Rijswijk has been increasing, especially at apartments. This is thought to be due to the unlockable street containers being open to the public; therefore there is no tracking system of the waste generator. The bins are also considered too big for organics.

Figure 7.13. Bammens underground organic waste bins, 3,000 l.

Figure 7.14. 240-l wheelie bins for organics and residual waste stored in concrete containers.

- The current organic recycling rate stands at 38%. Organic waste is collected weekly from both types of bin.

- Bio-bags are not used as they are expensive and the bottoms of the bags can often fall out. This also occurs with paper bags.

- Enforcement through fines and public inspection and a recent awareness and communication programme has improved household waste management.

The Dutch consultee commented that because Irish apartments usually have a curtilage or 'private area' the problems of contamination with the 'on-street' approach could be reduced. He also suggested that ground-level bins would be the preferred option at designated waste storage sheds/rooms with good ventilation and space, i.e. organic 1,300-l wheelie bins (or 'mini containers') stored in 'camouflage' houses or compartments within closed apartment complexes.

7.3.2 Boom, Flanders

With a population of about 16,000 most of the municipality's inhabitants live in apartments. Most of the organic waste collected from these apartments is stored in deep underground bins as the company who owns this bin system has a contract with the municipality to provide waste management services to any new housing development.

- Underground storage for waste has been in operation for 8 years in Boom, with 4.8 kg of household organic waste collected per week per apartment unit.

- Some bins are locked with only householders holding a key (Fig. 7.15). A deposit for the key must be given. This is believed to be an incentive and improves waste separation at source.

- There are separate bins for organics, glass, dry recyclables and residual waste. These bins are located within the apartment perimeter but accessible by the collection truck from the street (within 10 m). Organic waste is collected weekly.

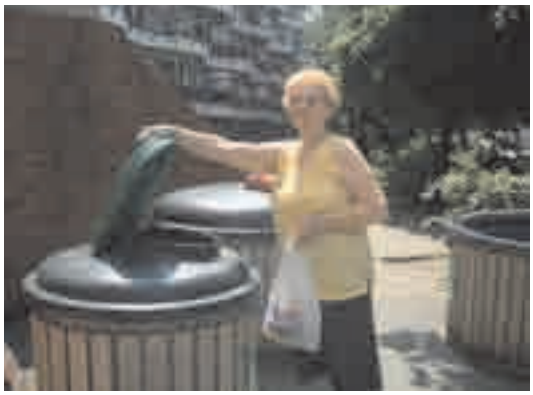

Figure 7.15. Deep collection 1,300-l organic bin.

- Regular bin inspections are carried out and the bin company will charge the management company, which then passes on the fee to the residents. This keeps contamination levels low, usually 2–3%. Plastic bags are the most common contaminant, but do not cause a problem at composting plants.

- The experience of the scheme operators is that the communal charging system has the potential to encourage people to contaminate. There are plans to bring out chipped bins to weigh the waste. Monitoring of the bins is as important for successful source separation of waste as education – residents need to be aware that their deposited waste will be examined.

8 Conclusions

8.1 Introduction

Organic waste (i.e. food and garden waste) constitutes the single largest component (~36%) of household waste. Irish waste management policy prioritises the source separation of organic household waste to divert this material away from landfill to higher treatment options. The preferred sustainable option is to biologically treat organic waste and produce a valuable reusable end product, i.e. compost.

8.2 Organic Waste Generation from Apartments

The boom in house building in the last 10 years in Ireland, especially in the large urban centres, has seen a rapid increase in the number of apartments. Currently, 9% of Ireland's household dwellings are apartments, and this number is growing. These apartments currently generate approximately 32,000 t of organic waste, or 6% of the total household organic waste generated in Ireland. With increasing urban density, apartment dwellings are expected to generate over 50,000 t of organic waste by 2016 (based on predicted growth in population and the number of apartments proposed to be constructed during this period).

8.3 Issues Associated with Different Types of Apartments

A review of apartments in Ireland identified three general categories. Each has its own particular characteristics and challenges in terms of delivering effective source-separated waste management systems (Table 8.1).

For all of the classified apartments the challenge of education, promotion and awareness of waste is an ongoing one. These challenges can be further complicated by the transient nature of apartment living and increasing numbers of non-English speaking apartment residents.

8.4 International Study Tour and Literature Review

A review of the international practices and schemes**,** including a site visit to the Netherlands and Belgium, revealed the following.

- A literature review of schemes in Ireland, France, Italy, the UK, New Zealand and Australia has revealed common themes for successful organic waste collection from apartments. A summary of these is as follows:
    - Schemes are introduced by local authorities attempting to meet national recycling targets.
    - Schemes are highly publicised and promoted before they begin.
    - Small indoor and larger outdoor bins are used. Outdoor bins are stored in communal areas, usually in a designated waste storage area.

Table 8.1. Characteristics of the three apartment categories identified in Ireland.

Type	% Housing stock	Key issues
Purpose-built blocks	64	• Retrofitting of storage areas and/or bad design of waste storage areas a problem • Access difficult for RCVs from underground storage areas • The identification of waste bins, inconsistent colour coding • Dealing with management company
Converted or shared houses	26	• Storage and space for bins often an issue at these buildings • Bins may cause obstructions in the walkway and at the entrance gates • Bins often gathered together, not stored in bays/sheds
Apartments in commercial buildings	10	• With entrance/exit doors facing onto streets, these have the least amount of space for a dedicated waste storage area

- Higher recovery rates of organic material occurs with frequent collections, usually weekly for organics.
- Consultation between stakeholders is important, as is ongoing education, promotion and awareness raising for the scheme.
- To support publicity campaigns, incentive schemes can encourage participation, as can regulation and bin inspections.

8.5 International Study Tour

A study tour visit to two organic waste collection schemes in the Netherlands and Flanders was undertaken as part of the study. Source-separate collections of organic waste from apartments have been commonplace in these countries for many years. Deep storage bins (typical capacities range from 1.3 m^3 to 3 m^3) are the preferred collection methods for organic waste collection at the apartments visited. Both schemes were operating reasonably well although they are not without its problems.

The scheme visited in the Netherlands is currently experiencing high contamination levels of the organic waste collected from apartments. Bins servicing apartments are located on the pedestrian pathways outside the apartment block perimeter. The bins are not locked and are accessible by non-residents. The local authorities are attempting to tackle this problem through a new awareness campaign and improved enforcement.

In Flanders, keeping contamination levels low is also a challenge for the operators of the collection scheme examined. The waste collection company responsible for the scheme has found that where bins are locked and householders hold a key for which they must pay a deposit, there is an improved waste separation at source. Also, if the organic bin is contaminated the collection company charges a fee to the building management company, which then passes on the fee to the residents. These enforcement measures have proved successful in reducing levels of contamination.

8.6 Stakeholder Consultation

Extensive consultations with key stakeholders, including people living in apartments, management companies, waste collection companies, architects and developers, reveal that:

- There is an ever-increasing demand by residents for on-site source-separated waste facilities.
- Waste storage facilities need to be designed at the development stages and guidelines are urgently needed from the planning and waste departments of local authorities, supported by the DEHLG.
- Space is the biggest issue for waste storage, particularly if there is no garden or underground area, as bins would need to be stored internally.
- Ground-level waste storage areas are a possible preferred option as waste storage sheds/rooms with good ventilation and space.
- For bin storage, the proximity of the waste area to residents and access for both residents and waste collectors are issues.
- The communal bin system is usually used at apartments, as it is the easiest way to address space and collection-time issues. However, when charges are divided equally among all residents there is no incentive to segregate waste. A more equitable waste charging system needs to be examined; possible considerations include the use of bio-bags for households at a set price although this type of system would need to be explored further.

Other findings are listed throughout the rest of this report.

8.7 Main Findings

The separate collection of organic waste at apartments can often be overlooked, as there can be challenging issues at these dwellings associated with the storage, presentation and collection of this material. However, national and international studies show that when key considerations are taken into account at the earliest possible stage, the implementation of source-separated organic waste collections is possible from apartments.

Successful organic waste collection is not always possible from all types of multi-storey dwellings in some areas.

The introduction of organic waste collection in apartments will help Ireland meet its targets to divert organic waste from landfill, and provide equal opportunity to those apartment residents who wish to source-separate waste as much as possible. The long-term environmental and financial gains of separating organic wastes and diverting

from landfill disposal will offset the initial start-up, implementation and scheme maintenance costs.

Guidelines should be provided at national and local levels to aid developers, architects and property management to implement organic waste collections at apartments. Further research programmes should be supported by the appropriate funding and national decision-making bodies, and a pilot scheme should be undertaken to fully assess all of the issues.

9 Recommendations

The successful introduction and implementation of organic waste collection schemes to apartments requires the input of a number of stakeholders. The local authorities and private waste collectors are the main stakeholders with responsibilities for planning, regulating and managing the household waste collection systems throughout Ireland. As a consequence, the recommendations outlined in this section are primarily directed towards the local authorities and private waste collectors and are based on the main findings of the study.

In addition there are recommended actions for other stakeholders, including:

- Environment/Waste departments of local authorities and private waste collectors
- Local planning departments
- Developers/Architects
- DEHLG/EPA
- Residents and management companies.

The recommendations apply to apartment or flat blocks in general, although every development should be assessed on its own merits. It is also recognised that certain recommendations overlap and can apply to more than one stakeholder.

9.1 Assessing Suitability of Apartments

Prior to introducing an organic waste collection to apartments, local authorities and private waste collectors are recommended to assess the suitability of each apartment complex. Each apartment complex should be taken on its own merits and assessed accordingly.

9.1.1 Suitability assessment for existing apartments

Table 9.1 outlines the main criteria that need to considered and reviewed by local authorities and private waste collectors prior to implementing an organic waste collection at an apartment complex. Additional considerations specific to an apartment block, which become apparent during discussions, may also need to be assessed. Obtaining accurate data on the apartment complex will facilitate and improve the suitability assessment.

Based on the information gathered and assessed it should be determined whether an organic collection scheme should be introduced at the apartment complex. General criteria for the most and least suitable conditions for implementing an organic waste collection scheme are also outlined in Table 9.1. If an apartment complex is not suitable, alternative arrangements should be considered and the reasons for not implementing the system documented. This quality procedure will facilitate an assessment review at a later stage and inform the design and future apartment layouts.

9.2 Guidance for Implementation of Organic Waste Collection Schemes

If an apartment is suitable for the introduction of an organic waste collection scheme the following implementation steps are recommended. These guidelines are aimed at improving the operation of the schemes and encouraging active participation from residents.

9.2.1 Awareness/Education/Promotion

The initial and ongoing education, awareness, and promotion of the scheme to the residents/tenants is essential and suitable. This is key to achieving high participation in the scheme amongst residents and to control contamination. Multilingual communication of the scheme may also be necessary through the use of simple signage in a number of languages and using visual symbols/logos. There is an ever-increasing population of foreign nationals living in apartment blocks and the introduction of a new collection scheme should be all-inclusive.

It is recommended that the local authority and private waste collectors should promote the scheme using traditional techniques including:

- Information leafleting
- Local advertisements
- Support service – specific customer support service
- Signs and notices in apartments, etc.

Table 9.1. Apartment suitability criteria.

1. Profile of the apartment complex

- Size of the apartment development, i.e. number of apartment units
- Number of residents and tenants
- Social and demographic profile of residents and tenants
- Communal space available, e.g. car-parking spaces, green areas, etc.

Most suitable: Small–medium size. Active residents' committee with good awareness of waste management. Adequate space and options of locations for a waste storage area or, if a new development, sufficient consideration given to planning waste storage facilities
Least suitable: Large-scale complex. Residents unaware of current waste management procedures. Non-existent or inactive residents' committee. Old buildings where there may be difficulty retrofitting adequate waste storage facilities

2. Current waste management arrangements

- Is there source separation of recyclables on site at present?
- Public or private collection service
- Pay-by-use in place

Most suitable: Good system of waste separation already in place, easy for residents to use and understand, colour-coded bins. Waste collectors have experience of collecting organic waste or have looked at the possible issues associated with the introduction of such systems. An effective system of waste charging where individuals are charged on the weight/volume of the waste they consign to disposal
Least suitable: Unsegregated waste management system in place. Flat-rate charge for waste disposal. Uncooperative waste collector and property management company

3. Waste storage area

- What are the current arrangements for the storage of waste on site?
- How is the waste storage area currently accessed?
- Can the current waste storage area accommodate extra bins?
- Are there health and safety issues with the current arrangements or if organic bins are introduced?

Most suitable: See Sections 9.2.2–9.2.4
Least suitable: Inaccessible. Inadequate space. Unscreened or unfenced. Insufficient bins. Insufficient collection frequency

4. Building design

- Does the building design facilitate the introduction of a separate collection of organic waste?
- Are there access constraints at the complex for residents or waste collection vehicles?
- Is there space within the footprint of the apartment complex for an alternative waste collection area?
- Is the waste storage area accessible to the general public?
- Can bins be easily moved to a convenient location on collection day?
- Could underground storage bins be introduced?

Most suitable: See Sections 9.2.3–9.2.5
Least suitable: Inappropriate and inadequate waste facilities. Restricted vehicle and resident access

5. Stakeholder consultation

- Is there a Management Company in place on site?
- Is there a full-time caretaker on site who looks after the waste bins?
- Is there an active residents' committee (if one exists)?
- Who is the waste collector and does it have any concerns with providing an improved collection service?
- Are there any existing waste issues on site between the management company and the residents to date?

Most suitable: See Section 9.2.1
Least suitable: Little engagement between stakeholders. Inadequate awareness, promotion and education of the scheme. Insufficient support for residents' queries or suggestions. No caretaker and an inactive residents' committee

Note: With regard to Section 5 of Table 9.1, the National Property Service Regulatory Authority was established at the end of 2006 to regulate the practices of property management companies. The regulation of this sector of the property industry should help to increase communication and transparency between the property management company and apartment residents.

In addition, it is recommended that the local authority and private waste collectors should consider undertaking a programme of door-to-door communication to fully explain the nature of the scheme to participants. This educational approach could also be addressed by organising educational workshops for residents. Linking in with existing resident committee or community-based groups is also recommended to encourage participation, etc. It is also essential that management companies be engaged with early on in the process.

9.2.2 Organic waste bin/bag type

Based on the research carried out for this study, the following organic bins and bags are recommended for residents/tenants:

- Kitchen caddy (approximately 7 l) and perhaps biodegradable bags to residents/tenants free (at least at beginning of scheme). The associated costs of providing materials need to be assessed.
- Guidance notes on what to put in the bin, how often to empty it, and where to put it in the kitchen should be included. Information stickers can be put on the bins to reduce waste paper.
- If considered cost-effective over the duration of the scheme it may be appropriate to also supply odour-reducing micro-organism flakes in indoor storage bins (see Chapter 7).

9.2.3 Waste storage areas

- Communal bins are the most appropriate option for apartments with more than ten units. Different combinations of bin sizes can be used to provide adequate capacity for residents. The bin capacity for organic waste should be approximately one-tenth, (according to study tour consultees) of that for all other waste combined. Therefore, an extra bin for organic waste could be included as illustrated in Fig. 9.1, 240-l capacity for food waste provided along with 1,100-l bins for mixed dry recyclable and residual waste.
- An underground car park is not a preferred waste storage area in which to store organic waste, for a number of reasons, including health and safety, access and potential odour and vermin.
- Waste storage areas should be adequately vented to minimise odours and potential vermin/flies.
- Ground-level bin storage bays/sheds should be adequately fenced or screened off to reduce visual impact.
- Communal external areas on ground level are preferable although other issues such as access and security should be considered.
- Purpose-built deep collection waste bin systems may be appropriate in certain circumstances. These alternative bins are above and below ground with about two-thirds of the bin's capacity stored underground. These types of bin units have been seen to work successfully especially where space constraints are an issue. A space footprint of 5 m^2 can provide enough storage capacity for four different

Figure 9.1. Suggested bin capacity ratio for residual, mixed dry-recyclable and organic waste (not drawn to scale).

waste bins and serve 50–80 apartments. The servicing of these bins is relatively straightforward. The bin unit or internal bag is lifted out of the ground using a mechanical hoist arm attached to the waste collection vehicle. The bin or bag is held over the collection vehicle and the waste emptied into the vehicle. The emptied bag or bin is then fixed back into its position and the bin secured.

9.2.4 Access

- **For residents:** the proximity of bins to doors, walkways and gate entrances should be considered. Bin storage areas should be located close to the residential thoroughfare of the complex to encourage maximum participation.

- **For waste collectors:** bins should either be wheeled to the apartment entrance gate on an allocated day for kerbside collection or, preferably, the bin storage area should be located as close as possible to the road entrance to facilitate waste collection vehicles. The use of underground car parks as storage areas provides considerable difficulties, as bins have to be wheeled out to the collection point.

- Deep collection storage bins, if employed, must be located within 10 m of the roadway to allow for collection of waste by the RCV; RCV access to these bins is an important consideration. Again the method of bin emptying varies but generally the bin itself or the internal bag can be emptied using the methods described above in Section 9.2.3.

9.2.5 Health and safety

- Bin storage rooms need to have adequate ventilation to facilitate air circulation and minimise potential odour emissions.

- If security is a concern, residents could be given a key to access the bin storage room, or alternatively, for their bins. Access to waste storage rooms or sheds should only be by residents and the management company.

- The property management company should maintain the waste storage area in a clean, well-lit and secure condition.

- It is recommended that a waste storage area have a water supply (to clean bins) and adequate drainage for water run-off and spillages.

9.2.6 Collection frequency

Weekly collection frequency is preferred for apartments. Fortnightly may be possible, but close scrutiny of performance is needed, especially in the start-up phase. If alternate weekly collections are adopted, the waste collector could consider having the mixed dry recyclable and organic bins collected on the same week. This helps remind people to put bins out for the ‘recycling week’.

9.2.7 Other considerations

A device to record the amount of organic waste each resident disposes should be considered. This would incentivise residents to participate in source separation and would reduce contamination, similar to the pay-by-weight scheme for householders. In some international waste collection systems residents are provided with a ‘credit-card’ device, which when scanned at the bins, records the weight of waste deposited. This is an area for further research in the Irish context.

9.3 Planning Authorities

At the planning stage the planning departments in local authorities can have a significant influence on new apartment complex developments by requiring the developers to provide adequate waste storage area(s) for the residents.

Planners should engage with the development designers to consider the waste management services for the new complex by ensuring that the following are considered at the planning stage in the design:

- Location of the waste storage area

- Extent of the storage area to satisfy the 3-bin system

- The potential use of deep collection storage bins

- Access to the waste storage area for residents and collection vehicles

- Health and Safety issues particularly odour

- Use-related charging (e.g. pay-by-weight) incentives for tenants/residents.

Planning authorities should ensure that (waste-related) planning conditions imposed on developments are delivered and designed as approved.

9.4 Developers/Architects

Developers and architects need to be aware of the requirements that a local authority has in terms of waste management. It is recommended that the local authority is consulted at the earliest stage in planning and designing the development and the issue of waste collection services is discussed in detail.

Developers and architects should be aware of the regional waste policy, particularly in terms of source separations for householders. Apartment blocks should not be excluded from the objectives of waste policy because of the nature of these buildings. Simple and effective solutions can be designed into the development to address all of the issues identified.

Three simple schematic designs possible for waste collection at apartments are included at the end of this chapter (Figs 9.2–9.5, Designs 1–3) and show possible solutions for segregated waste collection at apartments, including organic waste.

9.5 National Funding Bodies and Decision-Making Authorities

Support should be given at national level for the incorporation of organic waste collection from apartments into relevant policies and programmes. Support and funding for further research from the relevant authorities should be provided, e.g. a pilot scheme study could be carried out specifically for organic waste collection from apartments. Guidelines should be provided to outline further examples for and tease out practical implementation issues and give more solid advice to both planners and developers.

9.6 Management Companies

Management companies have an obligation to provide the best possible facilities to source-separate waste as much as possible. The participation and co-operation of this stakeholder is essential for the success of the scheme. Continuous and ongoing assessment of the progress of the scheme, as well as maintaining communication with residents and the waste collector is recommended.

9.7 Residents

Residents have a responsibility to make themselves aware of the waste facilities provided and active residents' committees should engage with property management and waste collectors and make them aware of any possible problems that may be occurring or suggest ways to improve the current waste management situation.

Figure 9.2. Design schematic for a purpose-built apartment block with surface car parking.

Figure 9.3. Design schematic for a purpose-built apartment block with underground car parking.

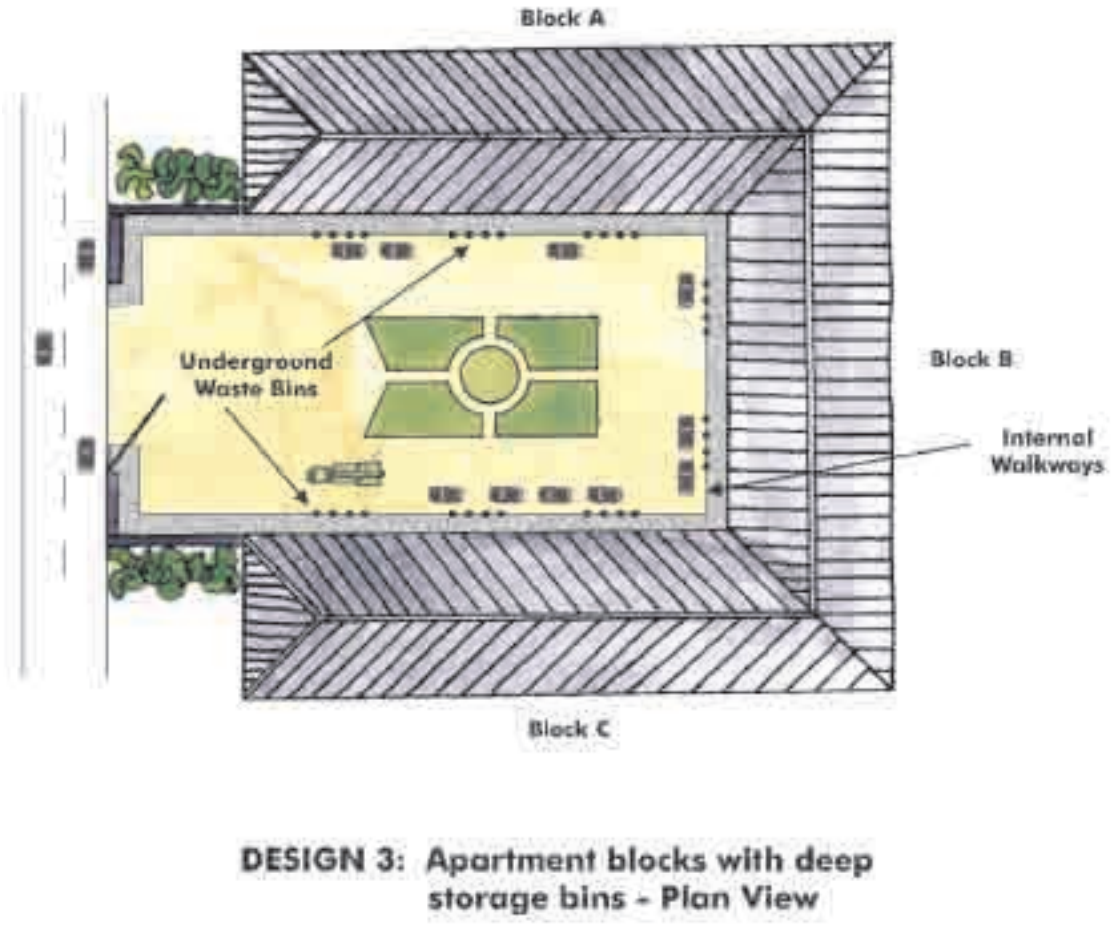

Figure 9.4. Design schematic for a purpose-built apartment block with underground deep collection waste bins – plan view.

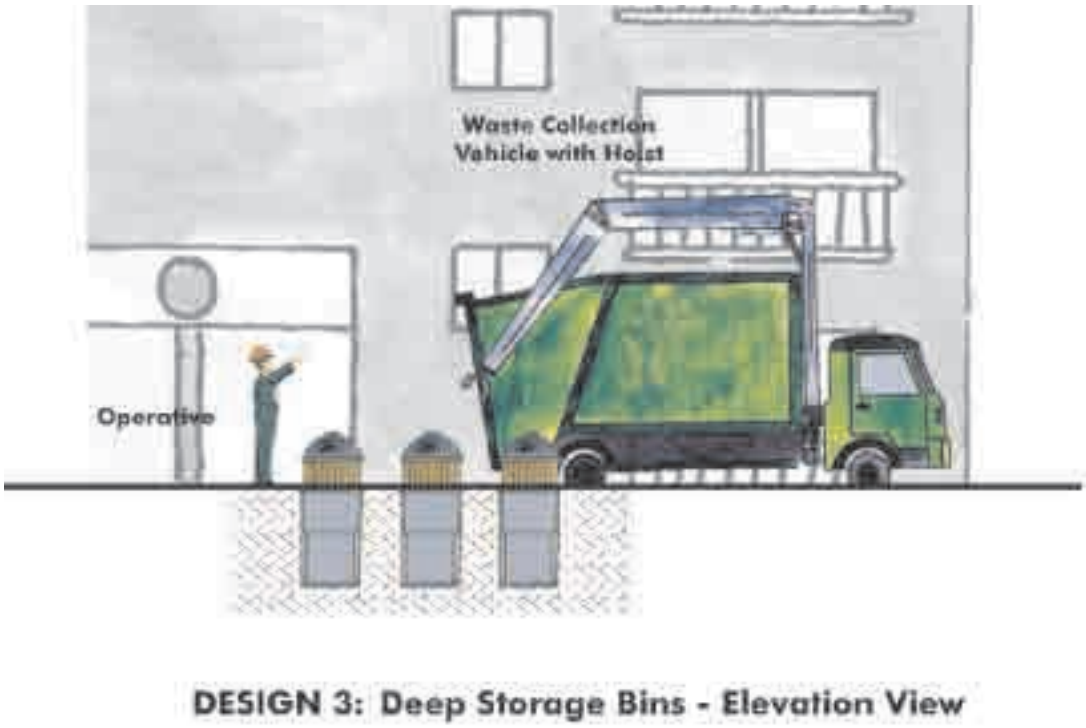

Figure 9.5. Design schematic for purpose-built apartment block with underground deep collection waste bins – elevation view.

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Acronyms

AD: Anaerobic Digestion

ABPR: Animal By-Product Regulation

BMW: Biodegradable Municipal Waste

CSO: Central Statistics Office

DEHLG: Department of the Environment, Heritage and Local Government

ELCRP: East London Community Recycling Partnership

EPA: Environmental Protection Agency

EU: European Union

ERDTI: Environmental Research, Technological Development and Innovation

MDR: Mixed Dry Recyclables

MSD: Multi-Storey Dwelling

OECD: Organisation for Economic Co-operation and Development

RCV: Refuse Collection Vehicle

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail.

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

Environmental Research Technological Development and Innovation (ERTDI) Programme 2000-2006

The Environmental Research Technological Development and Innovation Programme was allocated €32 million by the Irish Government under the National Development Plan 2000-2006. This funding is being invested in the following research areas:

- Environmentally Sustainable Resource Management
- Sustainable Development
- Cleaner Production
- National Environmental Research Centre of Excellence

The Environmental Protection Agency is implementing this programme on behalf of the Department of the Environment, Heritage and Local Government.

Environmental Protection Agency
Regional Inspectorate, McCumiskey House, Richview, Clonskeagh Road, Dublin 14, Ireland
Telephone: +353 (0)1 268 0100 Fax: +353 (0)1 268 0199 Website: www.epa.ie
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