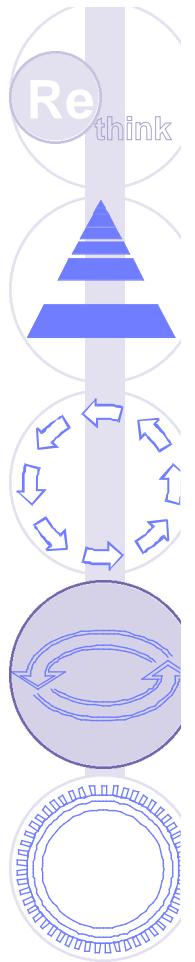
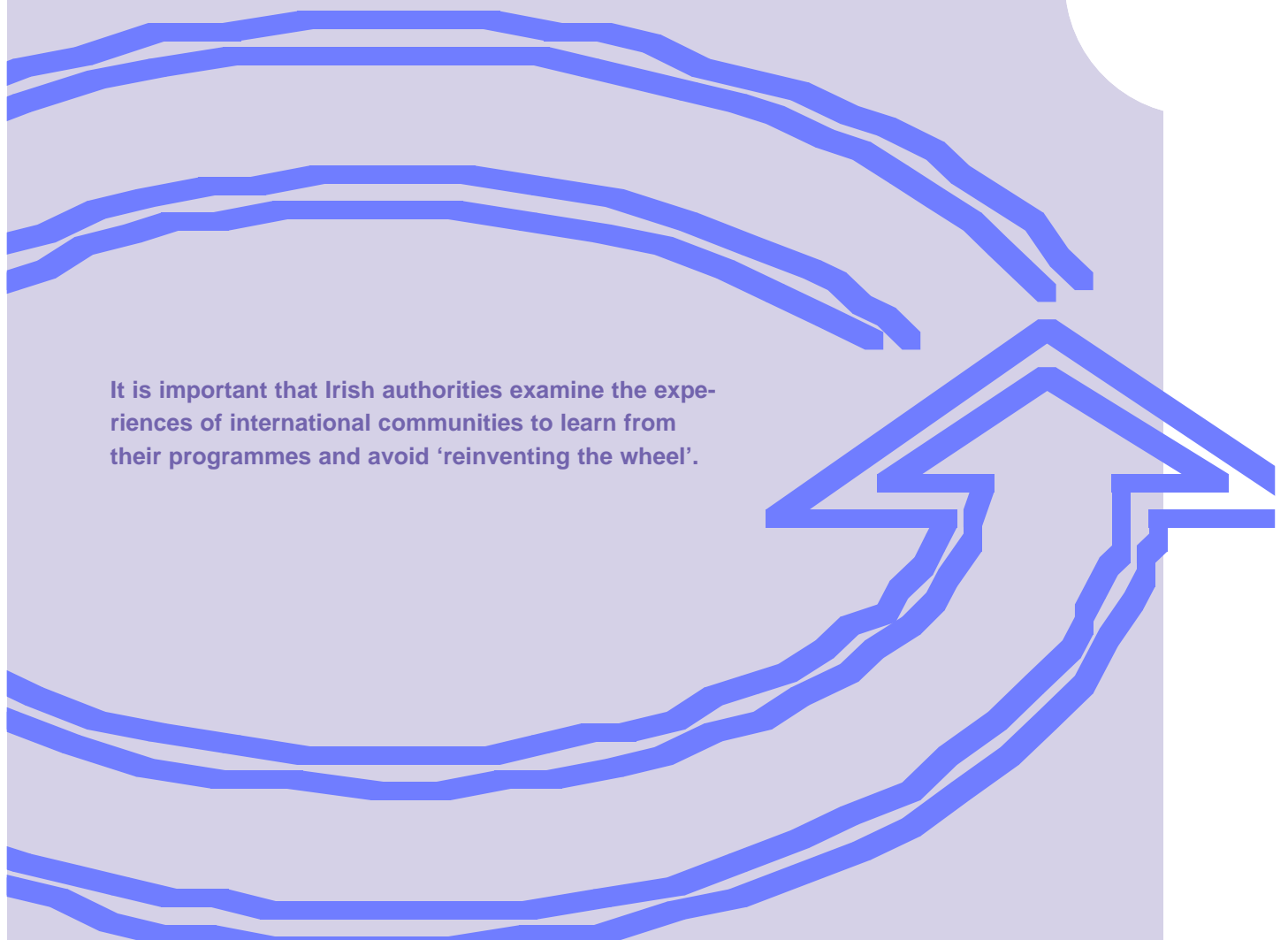


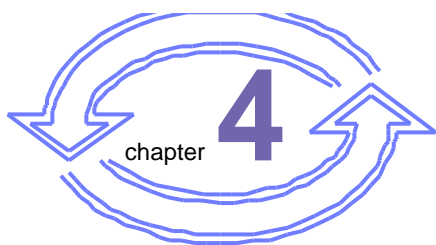
4

Resource Recovery: Material Recycling and Composting



It is important that Irish authorities examine the experiences of international communities to learn from their programmes and avoid 'reinventing the wheel'.





Resource Recovery: Material Recycling and Composting

'If waste sorting and recycling became standard practice, more than two-thirds of domestic waste could be reused or recycled'.¹

EPA, Waste Prevention: 'Solving the Growing Waste Problem', Ireland.

Local authorities in Ireland are in an advantageous position in that recycling and composting programmes have been successfully established on an international level for some time. At present, no widescale recycling or composting programmes exist in Ireland. It is important that local authorities look to the experiences of these communities to avoid **'reinventing the wheel'**. Whilst whole programmes cannot be directly transposed from one community to another, local authorities can learn from, and be motivated by other programmes while developing their own success stories. **It is such successful programmes that have inspired communities in New Zealand, Australia and the USA to develop Zero Waste to disposal policies.**

Recycling benefits

Recycling expands beyond diverting waste from disposal. It has real environmental and social benefits. In general, it reduces demand for raw materials, reduces carbon dioxide and methane emissions, and creates jobs in the process. International experience has shown that, given time, recycling can become the best economic option, as well as the better environmental option.

The three basic stages of recycling are collection, processing and reprocessing. All stages in the recycling loop are inextricably linked and are mutually dependent, and each stage of the process can present its own challenges. Barriers to developing successful recycling programmes can range from collection costs to siting facilities to developing markets for recyclable and recycled materials.

4.1 Financing Recycling

Recycling often operates on an uneven playing field, competing with other waste management practices where the full costs are not taken into account. For example, cheap landfill is often referred to as the enemy of recycling.

All levels of government need to ensure that the true costs of disposal are reflected in tip fees, and an even playing field is established nationwide to discourage shipment of wastes to a county that may have cheaper tipping fees. Recycling needs seed funding to allow it to grow and flourish. Financial assistance, support and research grants need to be distributed to commercial firms engaging in recycling, in the production of recyclable goods or products, or indeed, in waste elimination. For example, funds saved through avoided disposal costs could be transferred to recyclers. A **national body** could be established to channel funding, that could also be responsible for dealing with markets for recyclables, as well as other pertinent waste issues.

4.2 Local authorities: Ensuring Quality Materials through Source Separation

To minimise risk of contamination of materials from kerbside systems, local authorities can require source separation of materials. This is a tool available to them under the 1996 Waste Management Act.

The method of collection of materials can directly influence the success of a recycling programme as it can affect the marketability of the collected materials. Mixed collection systems can result in contaminated materials that are less marketable than cleaner materials collected under a programme where source separation is employed. **Local authority waste management plans released to date indicate that the main collection methods will be by kerbside and bring bank systems. Local authorities need to minimise the risk of contamination to ensure quality of collected materials. They also need to maximise and maintain participation in the programme to ensure quantity and regularity of material flows** (see Chapter 5.1: Public Participation).

The East Prince case study presented at the end of this chapter illustrates how mandatory source separation pro-

grammes can ensure success in recycling and composting schemes.

Source Separation: Advantages

Source separation programmes rely on residents, businesses, and public and private institutions to separate out recyclables from residual waste and place the discarded materials in separate containers. The advantages of source separation include:-

- ▶ reduced risk of contamination of materials;
- ▶ less money and time spent on handling and separating materials at Material Recovery Facilities; and
- ▶ providing an educational benefit to residents which can encourage waste reduction.

Blue Water Recycling Association, Canada.²

The standardised one-stop collection vehicle used by the Blue Water Recycling Association contributed to the development of innovative approaches to resource management which lead to diversion levels as high as 80.1%, and average households in the region disposing of less than 200kg of 'waste' per year in landfills.

The Blue Water Recycling Association is a rural based non-profit organisation in Canada, that develops and maintains facilities on behalf of, and in co-operation with, the municipal sector. The Association services approximately 257,000 people in approximately 109,000 households and it is one of the largest multi-material resource management organisations in Canada. It provides integrated waste reduction and environmental services ranging from collection and processing to marketing products and services. The Association handles over 22,000 tonnes of material annually, which represents a substantial portion of the waste stream. The Association is involved in the co-operative selling of materials with other recycling operators across Ontario. Such collaboration enables best prices to be obtained for commodities.

Co-Collection Programme

In 1995, the Association developed a new vehicle which allows for the collection of residual waste and recyclables

at the same time in three distinct compartments. The vehicle was developed after a time and motion study revealed that the average driver was spending up to 78.29% of their time driving the vehicle rather than loading it. In 1996, seven communities launched the new programme. The vehicle lowered costs, produced less pollution and less traffic than traditional kerbside collection alternatives. Proof of the environmental and economic advantages of the new collection system were evident when thirteen new municipalities switched to co-collection in 1997.

Benefits of co-collection include:-

- ◆ conserving resources by burning less fuel;
- ◆ producing fewer emissions;
- ◆ reducing noise pollution;
- ◆ decreased impacts on transportation infrastructure; and
- ◆ providing a service at a lower cost.

4.3 Siting of Recycling Facilities

All waste management plans released to date plan to increase the density of Material Recycling Facilities (MRFs), bring banks and composting facilities across the country. Whilst many composting facilities can be sited in rural areas away from densely populated areas and MRFs may be best sited in industrial zones, bring banks need to be sited close to residents to be convenient (and to minimise transport impacts).

Public attitudes towards the siting of these recycling facilities may present an obstacle. Negative responses towards such plans may be centred on concerns such as noise, traffic and the appearance of the site. Consequently, the design and appearance of the site is important and will be influential in determining people's attitudes towards recycling. In general, sites should be easily accessible, well signed and pleasant for the public to use. It is essential that regular site maintenance occurs and that banks are emptied once full. Provisions should be made on site for the deposit of non-recyclable materials to avoid littering. Noise and other nuisance problems should also be given careful consideration. This is particularly true of glass

banks which can give rise to complaints when glass is deposited, particularly late at night. Consideration could be given to the use of containers specifically designed to deaden noise, and to the erection of a sign reminding users to consider neighbouring residents. A restriction on the hours of use could also be considered. Similarly, the times that the banks are emptied should be considered from a noise-nuisance point of view.

When such neighbourhood recycling centres are being installed, it is important to ensure that the sites are made to 'belong' to the community where they are sited. The importance of community participation, '**ownership**' and **stewardship** in waste reduction programmes is discussed in Chapter 5.1. With broad community support for a programme, the community members themselves can act as advocates for recycling and composting facilities. It can also be useful to give the centre a neighbourhood identity. This can be accomplished by naming the centre after the locality or using the local authority logos. Public relations work can be the key to making the centre belong. In this regard, co-opting the involvement of interested local groups in the monitoring and maintenance of sites should be considered. For example, neighbourhood watch groups may be effective in combating any vandalism or dumping problems.

Adopt a Recycling Site

A number of councils in the UK have developed an approach whereby local community or voluntary groups agree to 'adopt a site'.³ The group then agrees to monitor and manage the site in accordance with the following guidelines:-

- ◆ to keep the site tidy;
- ◆ to publicise the facility locally;
- ◆ to liaise with the local authority or collection contractor on any problems; and
- ◆ to ensure that collection containers are emptied when required by informing the relevant body.

In return, they receive all, or a share of the proceeds from the sale of materials collected at the site. Local schools may also become involved as part of an educational project on recycling.

4.4 Local authorities, Central Government and Market Development for Recyclables

'The ability to significantly increase the recovery of recyclable commodities only works if there are markets in which to expand. Markets do not magically appear...the Government should be educating the public and providing research and development, including assistance with the growth and expansion of markets. The growing of markets is a partnership effort between industry and government.'

Peter Grogan, Manager for Market Development, Weyerhaeuser Recycling (July 1997).

Market development for recyclable and recycled materials is a complex process that calls for the careful integration of government, the public and private industry in a well-developed set of programmes and policies. Local authorities alone are limited in their impact on market development. Central government must be involved in large-scale development programmes, economic incentives, and technological support. **It is also necessary to aid burgeoning industries interested in becoming involved with recyclable materials through practical and financial incentives.** Nevertheless, local authorities are in closer contact with the public, who ultimately form all markets. Recycling is a market-driven industry; thus, if the demand exists for products made from recycled goods, manufacturers will make them. For this reason, it is essential to educate the public on responsible purchasing.

Local authorities and other government departments can play a significant role in guaranteeing markets for recycled products. For example, they can alter their procurement policies in favour of recycled products. To quote a Body Shop advertisement, '**why aren't all income tax forms, electricity bills, telephone bills, election forms, public notices, newspapers, circular and gas bills printed on recycled paper?**' Part of the UK Government's current waste strategy are plans that require the public sector to buy recycled paper as part of a pilot environmental policy to boost demand for recycled products. Government departments will be required to buy specified products with high recycled content wherever practicable. A rolling programme of research will identify suitable products to recommend.

Besides altering their procurement policies in favour of recycled products, other methods by which local authorities can assist market development include:-

- ◆ attracting recyclers to the region and promoting their facilities (**central government should also be involved in**

attracting the appropriate recycling industries to Ireland as a whole);

- ◆ encouraging manufacturers in the region to adopt a **minimum content policy** for the use of recycled material;
- ◆ involving themselves in negotiating contracts that will provide **stability for the recycling industry**, and guaranteeing a supply from each local authority themselves;
- ◆ supporting existing recycling industries;
- ◆ providing **information** on recycling contractors in the region, thereby promoting local industry;
- ◆ providing a **forum** for information exchange and technical assistance;
- ◆ regularly evaluating materials for expanded recovery;
- ◆ introducing **high disposal costs** as an incentive to recycle;
- ◆ encouraging businesses to look at waste as an attractive commodity;
- ◆ promoting **'Buy Recycled'** initiatives in the region; and
- ◆ developing a **materials exchange programme**.

Local authorities can also help to stabilise markets by:-

- ▶ negotiating **long-term contracts** with material recovery facilities;
- ▶ teaming up with surrounding councils to strengthen negotiating position with merchants, and produce **regional contracts**;
- ▶ providing merchants with a **consistent supply** of materials; and
- ▶ ensuring **stringent quality controls** over materials.

Canberra and Resource Recovery

The city of Canberra, Australia has a target to reach *zero waste to disposal* by the year 2010. According to their policy statement,⁴ the development of **Resource Recovery Estates** dedicated to separating, reprocessing and value adding materials will help solve many disposal problems and

provide employment opportunities. Also, a **Resource Exchange Network** will be established to match the unwanted outputs from one process with the need for resources in other activities. This Network will promote markets for recovered products, provide a central database of all available materials and indicate their potential reuses.

Del Norte and Markets for Problem Materials⁵

Del Norte County, California has developed a Zero Waste Plan. According to the plan, one interpretation of zero waste is that *'all materials that are landfilled, incinerated or illegally disposed of are testimonies to failure: failure to create market incentives that recognise the intrinsic value of the materials being disposed, failure to stimulate or create a viable local recovery infrastructure, failure to share the lifecycle responsibility for the disposed material with the producer, and/or failure to educate the community about the convenient ways to reduce, reuse, recycle or compost the material.'* The plan highlights eight steps to develop markets for problem materials.

1. Target Producer Partnerships

If local programmes cannot be designed cost effectively to reuse, recycle or compost a problem material, Del Norte Waste Management Authority will work with businesses which sell and manufacture these materials to either, a) completely address the concerns which are problematic with these materials, or b) take them back from their consumers. The Authority will invite producers to a public meeting to discuss the problems caused by these materials, and request their assistance in developing a system which will address these concerns.

2. Help Initiate Innovation

Voluntary initiatives that producers might undertake on a regional basis will be identified, as will existing or new businesses that can provide the desired services.

3. Expand and Diversify Existing Recovery Systems

4. If Partnerships Fail, Extend Producer Responsibility

Since households and local budgets pay for virtually all solid waste management in the county (and the USA as a whole), there is a growing displeasure with the lack of responsibility on the part of the manufacturers and distributors of products and packaging. Both the U.S. Conference of Mayors and the U.S. League of Cities have issued resolutions calling for more producer responsibility.

In Del Norte County, if public-private partnerships fail to create a recovery system within five years, a Recovery

Ordinance - to be developed through a public process - will establish a deposit, fee, fine, or mandatory programme for the proper recovery and/or disposal of targeted materials. This will be levied at the point of purchase, as is currently done state-wide for beverage containers, used oil and tyres. Such programmes would only be implemented on products which cannot be reduced or recovered, and for which the producer's response fails to adequately address their shared responsibility for reducing the concerns associated with the sale of their products.

5. Start Recovery

The Recovery Ordinance would also require those who sell materials or products, subject to the Recovery Ordinance, to cover the capital costs for local recovery infrastructure expansion associated with these materials, or to establish a

take-back system for those products and/or materials on their property or within the same shopping area.

6. Assure that Recovery is Cheaper than Wasting

Rate ordinances will be reviewed to provide incentives for waste reduction at all levels of service.

7. Assure that the Recovery Mechanism has the Capacity to Process All Recoverable Materials

8. Ban Recoverable Materials from Disposal

For materials that pose extraordinary hazards or which are readily separated for recovery, and for which the recovery system will have adequate capacity, disposal bans are one of the most effective ways to ensure achievement of zero waste.

Market development

One of the most fundamental tasks in developing a successful waste management programme is the institution of a strong market programme. Market development must be encouraged and supported with practical and real assistance, whether it be through education, waste audits, tax incentives, or mandatory content requirements.

When developing markets for recyclable materials it is important to remember that there are two different but related markets:-

- ◆ The markets for recyclable materials; and
- ◆ The markets for recycled materials.

The markets for recyclable materials are the reprocessing industries (for example, glass manufacturers, paper mills). Recyclable materials are purchased by these industries as raw materials against defined technical specifications. Reprocessors convert the recyclable material either into a recycled product that can be sold directly to the consumer, or into a secondary raw material that is used by product manufacturers to produce the final recycled product. Focus is usually primarily placed on the reprocessing industries; however, the requirements of the markets for recycled materials must always be considered, as without it the recycling loop cannot be closed.

Legislative and Economic tools

The introduction of effective legislative and economic tools by central government could facilitate the *closing of the material loop*. An example would be the full implementation of the EU Packaging Waste Directive. In tandem with this, extension of producer responsibility obligations to other priority waste streams will greatly facilitate the closing of the material loop, as when properly implemented, producer responsibility leads to an increased uptake of recycled materials. The introduction of the recent End of Life Vehicles Directive and the forthcoming Waste from Electronic and Electrical Equipment will ensure the expansion of producer responsibility obligations in Ireland.

Minimum-content standards could also be introduced. Manufacturers need to help close the loop by using the materials collected in local recycling programmes to manufacture new products. Local authorities could, for example, negotiate agreements with local, regional and national newspapers to use a minimum recycled paper content in their newspapers. This not only guarantees a market for recycled paper but also develops an environmentally responsible image for the newspaper. Such initiatives would, however, be greatly facilitated by the backing of central government. Regulations on the minimum recycled content of goods can have a significant affect on the development of markets for recycled products, whilst ensuring an even playing field

for the industry. Such measures not only increase the uptake of recycled materials, but the extra demand can reduce the costs of recycled materials through increased economies of scale in production. These initiatives are becoming more commonplace on an international level. For example, twelve US states currently have mandatory recycled content thresholds and eleven have voluntary schemes in place. A voluntary agreement with newsprint manufacturers has also existed in the UK for the past ten years. This has resulted in an increase in recycled content from 28% to 52.4%, and recently, manufacturers have stepped up their voluntary targets. They have agreed to increase the average amount of recycled content in newspapers to 60% by the end of 2001, and to 65% by the end of 2003, with the aim of 70% recycled content by 2006.

Financial Assistance: The Chelsea Centre for Recycling and Economic Development, Cambridge, Massachusetts.

To promote the practice of incorporating recycled materials into manufacturing, the Chelsea Centre for Recycling and Economic Development introduced a Recycling-Based Economic Development Grant Programme. This is intended to help communities explore ways to expand their economic base by taking advantage of the value of their municipal solid 'wastes'. At the launch of this programme, Amy Perlmutter, Executive Director of the Chelsea Centre stated, *'municipalities are virtual mines of raw materials that can be used to support economic development activities. We hope this new grant programme will encourage communities to look at their wastes as resources and bring together local recyclers, economic developers, community groups and businesses to take advantage of the opportunities they provide'*.⁶

California and Recycling Market Development Zones

California has strict landfill diversion targets, and to help local governments meet these targets California designated certain areas as Recycling Market Development Zones (RMDZs). The purpose of these was to offer special incentives to manufacturers who use recycled feedstocks in order to expand the markets for recovered materials. The San Francisco RMDZ is a joint project between the city's recycling programme, the San Francisco Enterprise Zone and the Mayor's office. The scheme offers access to state low-interest loans and technical assistance as well as a comprehensive package of local government incentives (including job training and site selection). An annual award scheme - the Waste Prevention, Recycling and Market Development and Grant Programme - is also available to non-profit and not-for-profit entities in San Francisco County. There are over 18,000 people employed in waste reduction and recycling related industries throughout the state.⁷

4.5 Tackling the Largest Component of Municipal Solid Waste

By far the largest component of the municipal waste stream in Ireland is the organic fraction. In 1998, nearly 60% of all municipal waste going to landfill was biodegradable (kitchen, garden and paper wastes). Paper accounted for 33%. Thus, the recycling of organic materials has the potential to significantly reduce waste stream volume and will make an essential contribution to meeting waste diversion targets. The main method of recovering organic materials is composting. Composting is an age-old practice, which occurs naturally in nature and involves the decomposition of organic matter through biological processes. The end result is a nutrient-rich humus.

Paper Recycling

Although paper can be composted along with other biodegradable wastes, it is preferable, if possible, to recycle it as recycled fibre is an important material for the paper industry. The use of recycled paper enables savings to be

made on primary natural resources. A ton of paper made from 100% wastepaper, instead of virgin fibre, saves 17 trees, 7,000 gallons of water and 60 pounds of air-polluting effluents, 4100kwh of energy, three cubic yards of landfill space and money which would otherwise be used for waste-disposal costs.⁸

Alternative methods of recycling paper

Where paper or card cannot be recycled to its full potential because of a lack of demand, its low quality or because of contamination with compostable material, it can be shredded and composted along with other compostable wastes, under the right conditions. Paper can also be recycled for various uses such as for animal bedding or insulation for buildings.

Paper Recycling: A Source of Innovation

Newsprint as animal bedding⁹

Pennsylvania, U.S.A.

Newsprint is one of the eight materials targeted for recycling under Pennsylvania's Act 101 of 1988. Whilst Pennsylvania's newspaper industry is committed to using newsprint with higher recycled content, newspaper is also used as cellulose insulation, in composting, for ethanol production and also for animal bedding. The state's potential market for animal bedding for dairy cattle has been estimated at 500,000 tons per year.

Penn State University tested newsprint for use as animal bedding in the mid-1960s and concluded that newspapers, properly prepared, could make satisfactory bedding for dairy cattle. Since then, numerous state dairy farmers, beef producers, horse owners and poultry farmers have used newspapers for bedding under various conditions.

Concerns about toxicity

Penn State has concluded that newsprint is safe for animal bedding, even when bedding is consumed by the animals. Fields fertilised with used newsprint bedding also show no ill effects. Penn State tested soil from four fields in Snyder County where paperbedded manure had been applied for over eight years; results showed no build-up of heavy metals. Tests on field soil in Potter County showed lower levels of heavy metals from newsprint bedding than from conventional straw bedding.

Fertiliser

Newsprint contains organic matter that makes it equal or superior to other kinds of bedding for fertilising soils. The paper in the manure mixture decomposes rapidly when spread on fields. When mixed with watery substances, paper disintegrates into pulp fibres, so newsprint bedding readily mixes into manure slurry. Used bedding is easily transported in conventional waste handling systems.

Recycling newspaper into insulation

Brunswick, Australia¹⁰

The ebb and flow in the newspaper recycling industry prompted the Brunswick City Council's Electricity Supply Department to set up a scheme to collect old newspapers and return them to homes as insulation. The Newspaper for Insulation Project was jointly funded by the Environment Protection Authority's Waste Minimisation

and Recycling Grants Programme and the Electricity Supply Department. The pilot project offered a discount of 25% on cellulose insulation for residents who collected their newspapers to be reprocessed into roof insulation. It was hoped that the discount would attract people to install insulation who would normally feel it was too expensive. Cellulose insulation is as effective as other types of insulation in keeping a home warm in winter and cool in summer. When newspaper is turned into a loose 'fluff', it has a fire retardant added in accordance with strict Australian standards.

Newsprint to wallboard¹¹

Port Hawkesbury, Nova Scotia, Canada.

This company adds newsprint to its manufacturing process to produce Fiberock, a wallboard. The recycled wallboard was recently used in the construction of Nova Scotia's newest recycling facility.

Composting

Composting is the most common method of recovering organic materials. The three main types are home, community and centralised composting. Each provides the overall objective of diverting significant amounts of waste from disposal and all three can work alongside each other in a complementary fashion. Composting, especially home and community, is also an extremely useful tool to raise awareness about waste issues and how individual action can make a difference. The Earth Works case study presented at the end of this chapter illustrates the effectiveness of a holistic approach to organic recycling involving all sectors of the community.

Composting Benefits

Composting is one of the cheapest and easiest waste-resource management methods. It has far more benefits than simply diverting waste from disposal. While composting can significantly reduce many of the traditional problems associated with landfill, such as leachate, methane emissions, odour and vermin, it is also an important way of returning essential nutrients to the soil thereby conserving peatlands and promoting sustainable agriculture.

Home Composting

Ireland is predominately rural and a high proportion of homes, in both urban and rural areas, have gardens. The potential for intensive home composting is therefore high. Home composting has additional benefits over the other composting methods which include:-

- ◆ saving on local authority costs as less materials are presented for collection. Pollution and energy costs associated with collection are also reduced;
- ◆ minimal ongoing expenditure after the initial capital outlay to purchase the bin; and
- ◆ no market is required for the end product.

New York Composting Study

A study commissioned by New York City's Department of Sanitation indicated that people who were inclined towards gardening or outdoor work could easily see the benefits of home composting. A pilot programme conducted simultaneously indicated that the recycling rate also increased amongst participants suggesting that attention to waste issues stimulated residents to recycle more. Eight months after receiving their bin, 92% of project participants were still composting and over 70% said that they would definitely recommend the programme to family and friends, whilst 24% said that they would 'probably' do so. Focus group discussions revealed that **the programme got composters to think more about their waste in general, an effect that the Department values as it continues to educate the public about waste prevention, reuse and recycling.**¹²

Community Composting

As is the case with home composting, community composting encourages communities to take responsibility for their own waste. Unlike home composting, community composting avoids the expense of providing or subsidising each household with its own composting vessel. Local authorities can however support communities in their efforts by providing facilities and expertise. In comparison with centralised composting, community composting can have various advantages. Less fossil fuel is used in transport as the materials are moved smaller distances. Also community ownership of the scheme means that local markets are more likely to be found for the product.

Community Composting in Action

Campus Composting at the University of Wisconsin-River Falls

Programmes established by two professors at the University of Wisconsin-River Falls showed that campus-wide composting made a significant impact on diverting food residuals from landfill. This programme suggested that vital components for a successful programme include:-

- ▶ top administrative backing;
- ▶ operational supervisors as part of the planning team;
- ▶ addressing issues of sanitation and odour to alleviate concerns about health department violations in the kitchens and cafeterias;
- ▶ an on-going means to address any and all concerns;
- ▶ an advocator for the programme until it becomes routine to the community; and
- ▶ continuous education measures.¹³

Worm Composting, Crampton Buildings, Dublin.

Crampton Buildings is the oldest residential complex in Temple Bar, Dublin and is home to over 80 people in 54 apartments. After deciding to take responsibility for their own waste, the residents developed a community composting scheme using a vermicomposting system. They obtained grant aid from Dublin Corporation to acquire the necessary equipment.

Vermicomposting is a system which uses worms to convert organic waste to compost. The end product is enriched by the presence of large amounts of 'worm casts' or 'castings'. In a paper published in the journal *BioCycle* (April 1997) comparing the advantages of vermicomposting against ordinary composting, the authors found that:-

- ◆ organic wastes can be broken down rapidly by earthworms;
- ◆ it produces a stable non-toxic material with a high economic value as a soil conditioner;
- ◆ low, medium and high-tech systems all work and are available;
- ◆ as with composting, vermicomposting reduces the bulk of waste dramatically - by around 90%;
- ◆ using worms also reduces populations of pathogenic microorganisms;
- ◆ the use of worms increases nitrogen mineralisation;
- ◆ worms may bring about a greater decrease of bioavailable heavy metals;
- ◆ there is evidence to suggest that the final product may contain hormone-like compounds which accelerate plant growth; and

- ◆ on an industrial scale, trials of vermicomposted pig slurries and agroforestry by-products compared with composted versions showed that the nitrification was 50-65% higher using worms, and a 35-55% decrease in bio-available heavy metals within 2 months. There were also indications that human pathogens may not survive vermicomposting at all (faecal coliform bacteria, salmonella).

Centralised Composting

While home and community composting can be a very effective approach, other options are required to deal with larger volumes of organic waste. Most important to the success of a centralised composting scheme is the ability to ensure a quality product. Failure to control the quality of the compost directly affects its marketability. Ensuring source separation of collected material will minimise the risk of contamination (see Section 4.2: Local Authorities: Ensuring Quality Materials through Source Separation).

Uses for Finished Compost

Compost can be used as a conditioner to improve the texture and moisture retention properties of soil. In addition, compost adds valuable nutrients and micronutrients to soil to promote healthy plant growth.

Potential uses include:-

- ▶ home gardening;
- ▶ greenhouses;
- ▶ nurseries;
- ▶ cemeteries;
- ▶ landscaping;
- ▶ golf courses;
- ▶ topsoil substitutes;
- ▶ farmland;
- ▶ recreation facilities;
- ▶ landfill applications;
- ▶ land and mine reclamation;
- ▶ roadside and median strips;
- ▶ office and industrial parks; and
- ▶ sod and turfgrass farm application.

Composting Commercial materials

Many commercial enterprises such as restaurants and supermarkets produce large amounts of potentially compostable materials that are mostly unrecovered in Ireland at present. Apart from requiring source separation of these materials for collection or encouraging on-site composting, local authorities can encourage these enterprises to develop their own schemes such as the following supermarket initiative in the UK.

Supermarket composting in the UK

A new scheme has been established to tackle the problem of supermarket food waste in the UK.¹⁴ The Green Recycling of Organic Waste from Supermarkets (GROWS) project aims to establish a cost-effective and environmentally sound solution for the 375,000 tonnes of biodegradable waste produced by supermarkets every year in the UK.

The project is coordinated by the Organic Research Agency, with the support of a grant from Biffaward. Waste is to be collected weekly from 29 supermarkets and composted at an organic farm where the end-product is to be used on the farm as a soil improver. The initial trial is expected to process approximately 1,000 tonnes of organic waste and when complete it will be used as a blueprint for the extension of the system across the UK.

New Composting Technology: VCU®

A recent development in the field of organics recycling which may be of interest to local authorities is the VCU® (vertical composting unit).

The VCU® was developed primarily in New Zealand, and then independently trialed and appraised by the Australian Environmental Protection Authority (AEPA) for the New South Wales government. The AEPA trials demonstrated the potentials of the VCU® in overcoming many of the problems associated with composting putrescibles and biosolids and also highlighted the reduced capital and operational costs of the system.

Australia and New Zealand are currently developing Zero Waste strategies. Such strategies centre on developing zero waste to landfill and incineration. Central to this is the recovery of organic waste, with suitable collection systems allowing for the recovery of all other streams.

AVCU® system has been operating in Sheffield, UK since early 2000. It has been processing a variety of waste streams including bread processing waste, onions, scotch egg processing waste, greenwaste, source separated MSW, and more recently, abattoir blood and tannery fleshings. There are a number of sites to be commissioned in the UK in 2001, with the first multi-chamber site to be located in the North West processing over 6,000 tonnes per year of source separated MSW and greenwaste.

The latest unit to be commissioned in the Southern Hemisphere is by the New South Wales government for Lord Howe Island, a World Heritage site. After a worldwide tendering process, they identified the VCU® as the best solution to deal with all fractions of their organic waste stream, including putrescibles, sewage sludge, paper, cardboard and green waste.

About the VCU®

The VCU® in vessel composting system is a weather sealed vertical composting chamber that works on static flow principles. **It overcomes the traditional problems of processing organic waste, especially putrescibles, in that it creates no odour or leachate and it removes insect and vermin issues. Additionally it creates temperatures over 75°C which ensures pasteurisation. It can operate on a very small footprint which means that it can be utilised in urban areas.** It has the ability to process all forms of organic waste into a pasteurised and

pathogen free compost product. The organic materials that it can process include:-

- ◆ greenwaste and wood wastes;
- ◆ putrescible food and meat wastes;
- ◆ source separated and screened MSW;
- ◆ sewage sludge and biosolids; and
- ◆ paper and cardboard.

The compost products from the VCU® meet the Australian Standard AS4454 Grade A compost. (There are no set standards in the UK as yet although the Composting Association is setting guidelines.) Source separated organics with low contamination levels can be processed into a quality compost. Organics highly contaminated with inerts can be processed to ensure pasteurisation and pathogen kill before use as a landfill cover or as a land reclamation medium.

The efficiency of the VCU® is due to the low energy usage of the system which stems from a number of factors. It has a stratified temperature profile which provides distinct zones of microbiological activity that subject waste materials to degradation by a highly diverse microbial population. The high temperature in the upper pile is generated by the metabolic activity of the microorganisms below. Rather than dissipating this energy to atmosphere, as is the case with most systems, the energy is harnessed and used to draw air through the pile. The system is therefore passively aerated, so that the pile only draws as much air as it needs. Passive aeration has another advantage in that odourless gases generated in the pile are filtered by microorganisms before they reach the exhaust outlet.

The VCU® does not require any mechanical input during the processing period. Waste moves down through the chamber by the force of gravity. The chamber is insulated and the temperature uniform from core to wall and therefore the pile does not need to be agitated to expose all material to high temperatures. The VCU®, therefore, requires no external energy for heating, bio-filtration, material locomotion or agitation. This results in significantly reduced operating costs. Chamber sizes range from 5m³ (processing 700kg per day) to 1000m³ (processing 160 tonnes per day) and beyond.

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Case Study: East Prince, Prince Edward Island, Canada.¹⁵

The East Prince region of Prince Edward Island opted for residential source separation of all MSW as a key component of its waste management strategy. In 1997, the programme reached a diversion rate of 65.5%.

The East Prince area of Canada's smallest province, Prince Edward Island (PEI), has a population of approximately 35,000 people. Summerside is the largest municipality in the area and has a population of 14,500.

In 1992, although very few waste diversion efforts were in place in the region at the time, the East Prince Waste Management Committee accepted a mandate to provide a waste management system that would reduce 'landfillable' waste by approximately 70%. As a result, a waste management programme known as 'Waste Watch' was born. East Prince opted for residential source separation of all MSW as a key component of its waste management strategy, and **it was also decided not to accept compostable organics or marketable recyclables at the landfill.**

Waste Watch started as a small pilot project of 100 households. The participating residents were asked to sort their 'waste' materials into three streams: recyclables, compostables and residual waste. In only 26 weeks, 31 tons were diverted from landfill, representing a diversion rate of 62.8%. A survey indicated that 94% of the participating residents would recommend the programme to their neighbours and thus a decision was made to expand the programme. A second pilot programme was established serving a wider population which had a similar success rate. As a result of the success of the pilots, the committee issued a tender for a comprehensive waste management facility that would include both composting and a new landfill. In December 1994, the East Prince Waste Management Facility (EPWMF) was officially opened. **To coincide with the opening, Waste Watch was expanded to include over 10,000 households, 1,000 businesses and 1,000 cottages, which represented about 25% of the province's population. Total diversion rates (residential and commercial) reached 65.5% in 1997.**

Recycling and Organics Collection

Under the residential programme, recyclables are placed into two separate blue bags, one for paper products and the other for glass, metals and plastics. Compostable materials are placed into a green 240-litre (63-gallon) wheeled, aerated SSI Schaefer cart. Compostable materials accepted include food waste (vegetative, plus meat, bones and fish), non-recyclable paper, boxboard and garden trimmings. Any residual waste is placed into a similar unventilated black cart. The carts eliminate the need for garbage bags, and also provide a means of **enforcement** as it allows collectors to observe what is being thrown into each cart. If residents have not sorted their materials correctly, the collectors submit a report. Initially, these reports provided valuable information about the progress of the programme, from which public education materials were created and distributed as required.

Green cart collection is biweekly, with waste collection on the alternate week. Recyclables are collected monthly. Collection was tendered to private companies and several contracts were awarded to collect waste and organics. Another contract was awarded for recyclables collection, processing and marketing. The contractor owns the recyclables and sorts them further at its facility before marketing them. All collected materials, except recyclables are brought to the provincially owned East Prince Waste Management Facility (EPWMF). The facility is comprised of a composting section, landfill cells and a scrap metal pile. There also is a drop-off area for tyres, a bring bin for recyclables, a shop that sells reusable goods and a household hazardous waste building (for residential drop-off).

Economics

The East Prince Waste Management Commission (the successor to the East Prince Waste Management Committee) administers the programme. The commission is made up of government appointed volunteers. Both the commission and the programme

are funded through monies collected from the residential tax bill. Currently, residents pay \$109.9* per year for the collection service and a five-year lease cost of \$19.99 per year for the waste and compost carts. After the five years, the carts are the property of the residents. The total charge is added as a line item to the resident's property tax bill. Metals/white goods, recyclables, tyres, silage wrap and household hazardous waste are accepted free of charge. As there are many **seasonal residences** in the region, a blended rate policy was adopted to make the system equitable for seasonal residence owners.

Participants in the **commercial sector** pay for the programme through tip fees when they unload sorted materials at the site. The tip fee for sorted refuse is currently \$36 per metric ton for organics and waste.

This source separation model saved greatly on site capital costs. The initial cost of the 'waste' management facility was approximately \$4 million, which included the composting facility, landfill cell, the household hazardous waste building and all equipment.

Keys to success

- ◆ **Mandatory source separation** was a major contributor to the programme's success. Every resident and commercial enterprise must source separate and as a direct result the community has become much more conscious of environmental issues.
- ◆ Over one million **tourists** visit the region each year, and a **good public relations and education programme** has been valuable in ensuring tourist participation in the programme. Operators of tourist-related enterprises have assisted by explaining the programme and the experience has been that many tourists are familiar with recycling programmes and find it easy to adapt.
- ◆ A challenge to the implementation of Waste Watch was the **business sector**. Despite an advisory service, many businesses were not willing initially to conform to the programme's standards. Education and enforcement have proven essential with this sector. One of the most effective policies was to apply surcharges. When a mixed load enters the site (commercial or residential) either the material can be re-sorted correctly or the payment is increased to 2.5 times the normal tip fee.
- ◆ As with many waste management systems, there were various **challenges with materials such as household hazardous wastes, paint, silage wrap, and nappies**. The Commission continually works on improving disposal options for these materials. Pilot programmes such as paint recovery days have helped to encourage proper disposal. Another on-going pilot involves areas composting disposable baby nappies.

Case Study: Earth Works¹⁶

Port Colborne, Ontario, Canada.

The Earth Works programme was designed to work as a unified system to deal with all forms of organic waste generation in the City of Port Colborne. Launched in the spring of 1993, the programme was designed to measure the impact of various low-cost organic waste diversion activities in reducing the amount of organic waste going to landfill.

Port Colborne is a town of approximately 20,000 people, and whilst the majority of people have access to gardens, there are also a number of multi-unit dwellings. The Earth Works programme was designed to create a complete and alternative system to handle the organic or 'wet' component of the waste stream. The system is characterised by lower capital and operational costs than conventional wet/dry (ie. organic/dry recyclables) systems.

The main components of the programme include:-

- ◆ **free backyard or on-site composting units** for all suitable residential, industrial and commercial establishments;
- ◆ construction and operation of an **outdoor windrow composting system** capable of handling all types of organic material; and
- ◆ development and maintenance of a **community-based promotion and education system** to help sustain local interest and involvement in the Earth Works programme.

The **residential** part of the programme focused on home composting and establishing a seasonal garden waste collection to help divert amounts of material that were too large to manage on site. The **industrial and commercial** part concentrated on source separation of organics.

Results

Residential

- ▶ 26-28% of the residential waste stream was diverted.
- ▶ 80% of single family homes had one or more composters.
- ▶ Composting diverted 100-200kg per household/year at next to no municipal cost.

Industrial and Commercial

- ◆ 93% of organic waste generators source separated their organics.
- ◆ Participating businesses diverted 89% of their organic waste stream.

Lessons Learned - The Residential Sector

The programme showed that once residents are provided with the right tools and support, most households will participate in home composting programmes. Providing and distributing the composters for free proved successful. The majority of people use their composters and the take up rate proved to be much higher than for programmes that charge for the units.

1. People will keep participating

It was demonstrated that, provided residents were given follow-up support after the initial distribution, they not only continued to use their composters but, in fact, increased their usage.

2. Home Composting is cheap

Compared to waste disposal and recycling, home composting proved to be cheaper than other waste management methods, even with no subsidy from the Province.

3. Follow up visits by Compost Doctors are key

These follow up visits were key to maximising participation. Most residents encountered minor problems after setting up their composters, but these problems were effectively resolved through the follow up visits.

4. Use Compost Doctors wisely

Compost Doctors can serve a broader function than simply trouble shooting composting problems. They can also answer questions on other waste issues such as reduction, recycling and changing regulations.

5. See Residents through the first harvest

Make sure support continues up to and including the first harvest.

6. Repeat the message

Repeat messages are essential when promoting a new habit or skill. For example, 'How To' information was provided through brochures, Compost Doctor visits, displays, notices and newsletters.

7. Face-to-Face Communication

As new behaviours are often best conveyed in person, maximum use was made of face-to-face interactions through the door-to-door deliveries, public displays and follow up visits.

8. Consider those already composting

An initial concern was that residents who had already purchased composters would be annoyed now that they were being distributed free of charge. To counter this, Earth Works offered them a rebate or a second composter. Most opted for the second composter.

Lessons Learned - The Industrial and Commercial Sector

Almost all businesses that were approached were willing to participate in source-separation of organics, either through a municipal collection, or through a service provided by their private sector hauler. The following initiatives served to bolster participation.

1. Face-To-Face visits

An initial reaction from many businesses that were approached was that source separation would be time consuming and may lead to problems; therefore, taking the time to explain the programme to business proved essential.

2. Audits helped increase participation

On-site audits were provided free of charge, which helped give businesses the confidence that the programme would work for them.

3. Give participants a positive profile

Businesses that participated were provided with a positive community image through 'We Compost' window stickers, articles in newsletters and an award programme.

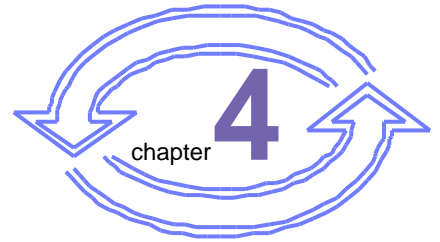
Economics

- ▶ The total annual costs for the entire organics scheme (home composting, garden waste and commercial collection and composting), including amortised capital (excluding land cost for the central facility), operating, administration, commercial and garden collection and promotion were estimated to average \$50* per tonne in 1996.
- ▶ The cost of the home composting programme and capital costs for the units was \$270,000, or \$45 per unit. This includes composter purchase, distribution, rebates, start up promotion and administration. In the second year, ongoing costs, including programme administration and Compost Doctors was \$2.40 per distributed unit. **The average cost for the home composting component of the programme was \$32-\$45 per tonne. This compares with \$101 per tonne for the collection and disposal of residual waste.**
- ▶ The cost for the centralised composting site was \$40 per tonne.

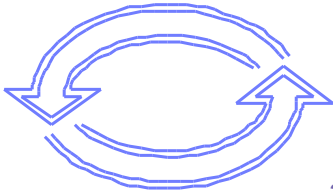
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