Final Report

Economic Instruments for Waste Management

Prepared for

Parliamentary Commission for the Environment

November 2005

covec
expert analysis + practical advice

Covec is an applied economics practice that provides rigorous and independent analysis and advice. We have a reputation for producing high quality work that includes quantitative analysis and strategic insight. Our consultants solve problems arising from policy, legal, strategic, regulatory, market and environmental issues, and we provide advice to a broad range of companies and government agencies.

Covec develops strategies, designs policy, and produces forecasts, reports, expert testimony and training courses. Our commitment to high-quality, objective advice has provided confidence to some of the largest industrial and governmental organisations in Australasia.

Authorship

This document was written by Tim Denne. For further information email tim@covec.co.nz or phone (09) 916-1960

Disclaimer

Although every effort has been made to ensure the accuracy of the material and the integrity of the analysis presented herein, Covec Ltd accepts no liability for any actions taken on the basis of its contents.

© Copyright 2005 Covec Ltd. All rights reserved.

Covec Limited Level 11 Gen-i tower 66 Wyndham Street
PO Box 3224 Shortland Street Auckland New Zealand
t: (09) 916-1970 f: (09) 916-1971 w: www.covec.co.nz

Contents

1. Introduction

1.1. Background

This report examines the potential use of economic instruments for waste management.

Economic or market-based instruments are policy tools that affect the monetary costs or benefits of private actions, either through directly changing market prices (eg charges, subsidies) or introducing markets where previously there were none (eg cap and trade schemes). A number of market-based instruments have been introduced in New Zealand and other countries to tackle waste management and encourage waste reduction.

- Several local councils have unit-based pricing measures for waste collections, eg payments for waste management services per bag or per bin.

- Deposit-refund schemes, in which the purchase price of a product (eg a bottle of soft drink) includes a deposit amount that is repaid when the bottle is returned after use. These schemes are used in a number of countries and some voluntary schemes exist in New Zealand.

- Landfill charges used to ensure that the costs of disposal reflect the full costs of landfills over the long run, including environmental costs.

- Producer responsibility schemes which allocate obligations for achieving recycling targets to industry and can lead to the establishment of markets for fulfilling these obligations.

- Tradable permit systems have been established in the UK including
  - a cap and trade scheme (for landfilling biodegradable waste) in which the total quantity that can be landfilled is capped nationally and individual allowances to landfill tonnes of biodegradable waste are allocated and subsequently traded; and
  - a credit-based scheme (for packaging waste) which allocates targets for recycling to industry and requires proof of target achievement through holding of tradable certificates that are produced when a tonne of waste is recycled.

- Waste levies including charges on individual products.

This report describes the different possible approaches to the use of economic instruments, their expected costs and benefits in broad terms, and practical aspects of implementation. The report does not describe the theory of the use of economic instruments in any detail; this is well covered in other reports.[1] However, we provide a

[1] See for example: Covec (2004) Potential Use of Economic Instruments under the HSNO Act. For Environmental Risk Management Authority.

short note below on the key attributes of economic instruments that make them attractive to policy makers relative to other instruments.

1.2. The Waste Problem

The waste problem is identified in the national waste strategy[2] as including the environmental effects of landfill and inefficient resource use. The environmental effects of landfill include methane emissions, leachate, smell, traffic disturbance, noise and bird nuisance. These effects are taken into account in landfill planning and modern landfills have control systems for many pollutants, but residual effects remain.
Establishing new landfills is problematic for local authorities and private operators; the environmental effects noted above result in significant effects on property prices and the quality of life of nearby residents. Recent work in the UK has estimated the impact of living close to a landfill on property values. For Great Britain as a whole, the average reduction in house prices was 7% for locations of one quarter of a mile or less from a landfill. This was used to estimate costs of £1.52 to £2.18 per tonne of waste.[3]

From an economics perspective, landfill disposal is generally under-priced. Disposal prices typically take account of the running costs of the landfill but do not include either the full environmental costs of disposal nor are they based on the long run costs of disposal, that is the costs of the next landfill that is required (and this is the opportunity cost of another tonne of waste going to landfill). This means that too much waste is likely to be disposed of, relative to that recycled or avoided. In response to these issues, the Ministry for the Environment has created a spreadsheet model and guide for estimating the full costs of disposal. It is intended that this is used by local government for planning and charge setting purposes.

Even if landfill disposal is properly priced, the full costs of disposal need to be passed on to those that make decisions that result in waste arisings. This includes product purchase decisions, as well as decisions to dispose rather than to recycle. Often the costs of landfill are not faced by the decision makers or are in a different time or on a different basis, such that the incentive effect is lost.

Inefficient resource use means resources are not used in a way that maximises the potential benefits to society. This might occur where resources are sent to landfill but would have been better reused or recycled. In a market economy, resources can be expected to be allocated efficiently if the "prices are right", ie if they are equal to the full marginal costs of supply; under-pricing of landfill because it does not reflect full environmental costs can result in inefficient resource use. Recycling also can result in more efficient use of other resources, eg energy efficiency improvements; however, we assume that the primary objective of waste management policy is the reduction in volumes of waste going to landfill. Other benefits that are achieved may be important, but they are secondary to this main objective.

[2] Ministry for the Environment (2002) The New Zealand Waste Strategy: Towards zero waste and a sustainable New Zealand
[3] Cambridge Econometrics, EFTEC and WRc (2003) A study to estimate the disamenity costs of landfill in Great Britain. DEFRA.

In addition, for the development of policy, a general theoretical statement is that there is a need for at least as many policy instruments as there are policy objectives.[4] Achieving energy efficiency and other wide objectives is not the subject of this report.

1.3. Waste Management Policy Objectives

The national Waste Strategy sets out a number of objectives for waste management in New Zealand.[5] These are placed in the context of sustainable development and the objectives are described as reducing the environmental effects of waste and improving the efficiency with which resources are used. The strategy establishes principles to guide the implementation of the strategy, sets out priority actions and introduces targets for priority waste areas.

The targets include local authority requirements to develop waste management plans (see Section 1.5) and specific targets for availability of community recycling programmes and for waste diversion from landfill (eg 60% of garden waste).

In this report we do not examine these specific objectives; rather we examine the way in which economic instruments can be used to achieve the objectives. We note that, if the problem stems from the under-pricing of disposal and/or the fact that disposal prices are not passed on effectively and efficiently, it will result in too much waste being produced. There are therefore likely to be two elements to the problem: how much material is used in production (or imported) that needs to be managed at the end of its useful life and the quantity that goes to landfill.

Without addressing the issue of specific objectives (the extent to which waste to landfill should be reduced or recycling increased), we note the following comments by Robert Stavins:[6]

> *The bottom line is that no particular form of government intervention, no individual policy instrument — whether market-based or conventional — is appropriate for all environmental problems. There is no simple policy panacea. The simplest market instruments do not always provide the best solutions, and sometimes not even satisfactory ones. If a cost-effective policy instrument is used to achieve an inefficient environmental target — one that does not make the world better off; that is, one that fails a benefit-cost test — then we have succeeded only in "designing a fast train to the wrong station." Nevertheless, market-based instruments are now part of the available environmental policy portfolio, and ultimately that is good news both for environmental protection and economic well-being.*

[4] Tinbergen (1967) in: Walls M (2003) The Role of Economics in Extended Producer Responsibility: Making Policy Choices and Setting Policy Goals. Resources for the Future Discussion Paper 03-11
[5] Ministry for the Environment (2002) The New Zealand Waste Strategy: Towards zero waste and a sustainable New Zealand
[6] Stavins R The Myth Of Simple Market Solutions, The Environmental Forum. www.env-econ.net/

Economic instruments, if introduced, need to be done so in the context of sound waste policy and the setting of appropriate and efficient targets.

1.4. Key Attributes of Economic Instruments

Economic instruments are favoured over other instruments for achieving environmental objectives because they can:

- achieve targeted objectives at least cost;
- provide a means for discovering the optimal level of policy intervention; and/or
- introduce dynamic effects that provide incentives for ongoing environmental improvement.

We explore these issues below on the basis of a generic discussion and set of examples of the use of economic instruments.

1.4.1. Least Cost Achievement of Objectives

Economic instruments allow objectives to be achieved at least cost because they provide flexibility to firms and individuals in how they respond. Using the example of a simple charge on pollution, firms can choose to pay this charge or can avoid all or part of it by reducing emissions, and they can reduce emissions in whichever way they choose. We can contrast this with an emissions standard or a plant-specific consent which will generally require the same level of response from every firm, taking account of the kinds of techniques that can be used to reduce emissions.

In some instances the flexibility can be over time (when emission reductions are made) as well as space (who makes reductions). For example, a number of cap and trade schemes allow banking or borrowing of allowances. A firm might emit more this year through "borrowing" an allowance to emit from next year; it then will have a reduced number of allowances to emit next year when it might choose to install abatement equipment.

An attribute of economic instruments that is integral to its least cost performance, is the introduction of an impact at the margin. By affecting the margin we mean economic instruments have an impact on small incremental changes in a firm's (or a household's) behaviour, such as producing one more unit of pollution, which might be associated with one more unit of production. Costs are minimised for achieving a given level of emission reduction if every firm has the same incentive to reduce emissions "at the margin". It means firms reduce their costs from every successful measure they take to reduce emissions (although these measures will also have costs) and every emission reduction is rewarded the same amount, regardless of where it occurs.

In examining different approaches to the use of economic instruments, we will be looking for these two attributes—the introduction of flexibility in response, and providing an effect at the margin.

In contrasting economic instruments with command and control instruments such as the current consenting process for industrial emissions, it is important to bear in mind that these other approaches can be used more or less flexibly. The consent process can be used to achieve low cost reduction by providing flexibility and imposing different requirements for different sites, taking account of the costs of measures to limit emissions in different locations. Similarly in waste management, a market discipline and the potential for low cost achievement of environmental objectives in waste management, can be achieved through local government contracting for waste management services, including the provision of recycling. Local government contracts can be more or less efficient in the way that they operate. We explore these issues in greater detail in Section 2.1.

However, despite the possibility for other approaches to policy to be relatively efficient, economic instruments have an advantage that relates to the things that cannot be predicted. For example, we might be able to design a perfect intervention that controlled waste management to exactly the right extent, taking account of costs and benefits to society, eg the optimal amount of recycling occurs. Given perfect information it could result in exactly the same outcome as a well-designed economic instrument. However, what it cannot take account of is the things that are not predictable, eg that new markets might develop that make recycling more profitable. By placing a price incentive at the margin, economic instruments can provide incentives for firms to discover solutions that were not thought of beforehand.

In waste management, contracted firms can increase revenues by finding new markets, but may not have incentives to start collecting new materials, eg extending the range of plastics that they collect from the household waste stream.

Studies that have compared the costs of environmental policy before (ex-ante) and after (ex-post) implementation, ie as predicted in policy analysis and as measured following their introduction, have shown that ex-ante cost estimates tend to be higher than actual costs in ex-post evaluations, and that this is particularly and consistently so for economic incentives.[7] However, there are cautionary tales also for the design of economic instruments. Comparative studies will often contrast idealised economic instruments with other forms of regulation that are imperfectly implemented. In practice, some of the theoretical advantages of economic instruments can be lost through poor design, including following political interference to protect individual firms and industries.[8] But ex-post analyses of economic instruments have demonstrated that, when well designed, a very high proportion of the predicted efficiency gains can be achieved.[9]

[7] Harrington W, Morgenstern RD, and Nelson P (1999) On the Accuracy of Regulatory Cost Estimates. Resources for the Future Discussion Paper 99-18

[8] Stavins RN (1995) Transactions Costs and Tradeable Permits. Journal of Environmental Economics and Management 29:133-148.

[9] Kerr S and Maré D (1997) Transaction costs and tradable permit markets: the United States Lead Phasedown. College Park: University of Maryland. In: Newell and Rogers (op cit)

1.4.2. Optimal Level of Pollution

In theory, economic instruments can be used to discover the right level of environmental intervention. Theory suggests that, if environmental damage is measurable in monetary terms, it can be used to define the level of tax that should be applied at the margin.[10] This was the approach used to define the original levels at which the UK's landfill tax was set, for example.[11]

Under such an approach, and under a number of assumptions including competitive markets and correct pricing of other resources, an optimal level of landfill disposal and recycling will result. If we assume for the moment that the environmental impacts of landfill disposal is the only problem that waste management policy is trying to address, then if we can measure the damage costs associated with landfilling waste in monetary terms, [12] and apply it as a tax, then the resulting volumes of waste that are sent to landfill and are recycled, are the volumes that are optimal for society. Here the economic instrument alongside environmental valuation, is used to define the desirable environmental outcome.

This approach to the use of economic instruments, whilst theoretically sound, has been little used in practice. The UK landfill tax is one of the only examples, and it has subsequently changed so that the tax level no longer reflects damage costs.[13]

1.4.3. Dynamic Effects

The dynamic effects from the use of economic instruments results from the introduction of incentives at the margin, as discussed above. Where every tonne of waste has a cost associated with its production, there is a dynamic incentive that applies to every tonne of waste and the value of reducing the last tonne of waste can be the same as the first. Thus, where it is possible and cost-effective to do so, a firm or household has an incentive to reduce waste arisings to zero.

In addition, economic instruments can have long run effects on investment in specific industries through reducing the profitability of firms in sectors that have significant environmental effects (high waste arisings), while leading to increase in investment in other sector with low environmental effects.

1.5. Current Roles and Duties

A key requirement for understanding the potential use of economic instruments for waste management is an understanding of the existing set of duties and obligations.

---

[10] Baumol WJ and Oates WE (1988) The theory of environmental policy. 2nd Ed. Cambridge.
[11] Davies B and Doble M (2004) The Development and Implementation of a Landfill Tax in the UK. In: OECD. Addressing the Economics of Waste pp 63-80.
[12] That is the costs associated with the smell, disturbance, unsightliness, leachate, methane and other air emissions and so on, that are not priced in the existing costs of landfill disposal
[13] Davies and Doble (op cit)

1.5.1. Local Government

Currently each territorial local authority (TLA) has the duty to promote effective and efficient waste management and must adopt a waste management strategy. It must have regard to environmental costs and benefits and must ensure that the management of waste does not cause a nuisance.

TLAs are required to develop a waste management plan and it must incorporate the following hierarchy of disposal options, listed from most desirable to least desirable:[14]

- reduction— lessening waste generation;
- reuse— further using of products in their existing form for their original purpose or a similar purpose;
- recycling— reprocessing of waste materials to produce new products;
- recovery— extraction of materials or energy from waste for further use or processing, including making materials into compost;
- treatment— subjecting the waste to a physical, biological or chemical process to change the volume or character of that waste so that it may be disposed of with no or reduced significant adverse effect on the environment; and
- residual disposal— final deposit of waste on land set apart for the purpose.

In practice, recycling is widespread but TLAs make relatively little effort, or have little effective control, relating to the other components of this hierarchy. Effectively local government manages waste at least cost or least net cost, taking account of local costs and benefits.

Recycling diverts waste from landfill and reduces the total costs of disposal. There are costs of collecting materials separately for recycling, which along with processing and transport costs are offset against the revenues received for these materials. TLAs generally contract with collection companies to manage collection for recycling and pay a net fee representing the aggregate difference between the costs of collection and processing and the value of the materials. Payments might be made per household or per volume collected. Costs for TLAs are minimised through competitive tendering.

There are additional local benefits associated with recycling, although often these are not clearly articulated either by local government or by the community. They may reflect objectives, such as a community desire to live in less of a consumer society, and result in a willingness to pay of the community to achieve greater levels of recycling than might be justified simply by comparing the full costs of landfill with the net costs of recycling.

TLA incentives for recycling can be complicated where there are user charges for waste management, either in the form of contracted-out services in which residents contract directly with private providers, or through official bags that must be purchased. Under a user charge system, local government may fully recover its costs of collection and landfill disposal. In contrast, in these same locations, recycling services are paid for

[14] http://www.mfe.govt.nz/issues/waste/waste-mgmt-planning/legal-reqs/index.html

through rates. Although, strictly speaking this still involves recovery of costs, political pressures to reduce rates are greater than pressure to reduce user charges.

Under user-funding, when an additional tonne of waste goes to landfill, the TLA faces no increase in its costs; the user (household) pays. However, if more waste goes to recycling the TLA may face additional costs for subsidy, albeit that this cost might be deferred until the next contracting round. Providing additional revenue to support recycling is a net cost, and cannot be justified in budgetary terms on the basis of savings in landfill disposal costs. The TLA has an incentive here merely to have in place a recycling system but may have little incentive to make it a successful one.

However, to the extent that the TLA acts as a representative of the local community, then regardless of the approach taken to funding disposal, the incentive is clear—recycling saves the costs of landfill disposal and the community should be willing to pay for waste to be recycled up to the marginal costs of disposal.

Where collection and disposal is paid for through rates, there is no such perverse incentive in place. Diversion to recycling has an obvious benefit in reduced costs of disposal and, where applicable, in meeting additional community expectations. However, rates-based funding of waste collection does not provide incentives to households, a discussed in Section 2.2.3. The alternative is to introduce user charges for recyclables also. This removes any disincentive effect on local government, but reduces the incentive to recycle.

1.5.2. Industry

Some industries have private incentives to recycle and, in some instances the value of materials is sufficiently high that recycling schemes exist with out intervention. Examples include scrap steel, some returnable bottle schemes (eg Swap-a-crate) and previous industry-led schemes to recycle aluminium containers.

There may also be reasons for recycling that go beyond what is financially rational. Industry, as brand-owners, collectors, retailers and materials processor, is a signatory to the Packaging Accord, along with local government. As such it has agreed to the achievement of recycling targets for packaging materials and to a number of actions to achieve this. However, the targets are voluntary and the obligations on individual firms are not articulated in a way that gives them any real meaning.

That said, the glass industry is currently in the process of developing a voluntary contribution to assist in the achievement of recycling targets, in the context of the recent decision by O-I[15] (formerly ACI) to reduce the amount that it pays for cullet. However, there are weak incentives on the glass industry to make much of a response, especially when they are acting independently of action by other packaging firms (eg plastics users).

[15] O-I is the group name for Owens Illinois, USA

2. Policy Options

2.1. Focus of Policy

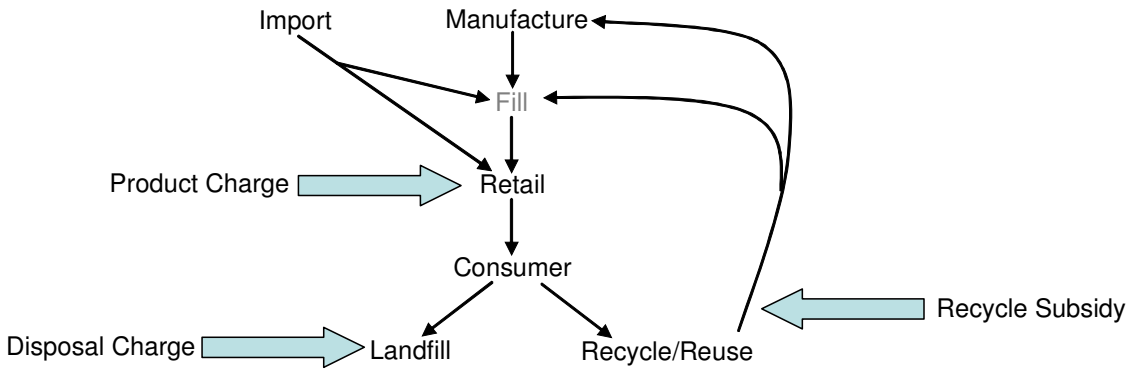
Figure 1 shows a generic and simplified product cycle from manufacture or import of a product through to retail, consumption and final disposal or recycling/reuse. It includes a fill step that applies specifically to packaging. Broad options for policy intervention using economic instruments include:

- disposal charges that can internalise the environmental costs associated with waste disposal and provide incentives for recycling/reuse, or for reduced waste production through minimising throughput of materials or pre-treatment;

- product charges which charge products according to their waste content, or potentially their recyclability. This provides incentives to limit waste arisings, eg purchasing smaller products, or making products more recyclable;

- recycling subsidies which reduce the costs (or provide net revenues) for recycling/reuse, relative to landfill.

Figure 1 Product Cycle and Focus of Policy



Some of these instruments can be operated in parallel. For example, a deposit refund scheme is essentially a combined product charge and recycling subsidy. Other instruments provide incentives to establish broadly similar effects; thus extended producer responsibility schemes provide incentives for firms to introduce charges on products and recycling subsidies to ensure that targets are met. Tradable permit schemes, such as the UK's Landfill Allowance Trading Scheme, introduce a requirement to hold allowances for tonnes of waste disposed of. Economically it is equivalent to a disposal charge and can provide incentives for product substitution and output reduction.

We use these broad descriptions as the basis for organising the discussion below. However, we begin by examining scope for correcting current distortions in the waste market as a pre-requisite to the introduction of economic instruments.

2.2. Correcting Current Distortions

One of the first steps in improving the efficiency and cost-effectiveness of waste management is to correct existing distortions in the system, rather than necessarily starting with the introduction of additional policy instruments. Other countries have followed a similar pattern.[16]

2.2.1. Collection Contracts

The recent problems with glass recycling in New Zealand have exposed some current deficiencies in the system of local government contracting for waste management, including recycling.

The background to the glass problem is an emerging imbalance of supply and demand for glass cullet. As a result of the success of collection schemes established throughout New Zealand, clear glass cullet supplies to O-I's processing plant in Auckland exceeded its capacity. This was partly the result of O-I's open door policy that paid a fixed sum for all glass delivered that met quality requirements; this set a price expectation in the market that encouraged supply. It is also related to the difference in the mix of glass colours that are on the New Zealand market from that mix that O-I can use; New Zealand manufacture is weighted towards green glass (which can also use brown cullet in manufacture), while glass imports are weighted towards clear. O-I is currently capacity constrained in production, so cannot increase cullet use significantly—it can increase consumption of brown cullet but has excess supplies of clear cullet and is close to or at capacity for green.

In 2005, excess cullet has been stockpiled and subsequently shipped to Australia at a net cost to O-I. At the same time, because of the rising strength of the New Zealand dollar, and thus its lower costs for purchasing alternative raw materials, O-I's willingness to pay for cullet has reduced.[17] O-I announced its intention to reduce the price paid for cullet from $92/tonne for all colours to $75/tonne for green and amber glass—reflecting the costs of manufacture from alternative raw materials—and to $10/tonne for flint (clear) glass—a price that was intended to limit supplies.

It was feared that, as a result of these reductions in price, collection companies that relied on revenues from glass packaging would go out of business. A support package was put together in the form of a levy paid by industry that provides funding for income support to collection companies and to compensate O-I for its net costs of excess

[16] In the UK, for example, prior to the introduction of landfill tax and other instruments to encourage recycling, an existing distortion that needed to be corrected was the split in responsibilities between local and county councils. Local councils were responsible for waste collection but county councils for disposal. Because local councils were not charged for the waste delivered, they bore the costs of recycling but received no benefit. The benefit was received by the county council. A system of recycling credits was introduced to reward local councils and other recyclers for the benefits of recycling (reduced requirement for landfill space); it was a means for a transfer payment from one to the other in the absence of an effective charging mechanism.

[17] Glass cullet is a substitute for other raw materials including silica sand and limestone. The price that O-I is willing to pay for a tonne of glass cullet reflects its costs of manufacturing glass from these other raw materials.

cullet management. The support package has been introduced for the short term only and has a number of drawbacks which make it unsuitable as a long run measure. It provides no incentives for new markets for glass recycling, for example, and may in fact be discouraging their establishment. It provides support for companies, not for recycling.

The need for the support package reflected the fact that local government contracts, which are agreed for several years, did not include variances for the price of glass cullet, nor did contract price reflect the risk of glass cullet price reductions. This was understandable; the price had been fixed for a while and there had been no market signal for a change in price. But for the holders of the collection contracts, the incentive to collect glass changed. They received a subsidy from councils for operating the collection and recycling scheme that was fixed at a level that reflected the expected need for a subsidy, but did not reflect the council's full willingness to pay for collection and recycling. In many instances local government (or the community) would be willing to pay more, because of the savings in landfill costs.

This might simply be poor contracting (in retrospect, given the market expectation of a fixed glass price) and presumably could be addressed in the future through contract variances or hedge contracts designed to limit risk to contracting parties.[18]

However, the wider issue that the glass problem has demonstrated is that there is no marginal incentive on collectors in many existing contracts. Local councils (or local communities) receive a benefit per tonne (or volume) of material collected for recycling. Collectors receive a benefit for another tonne because it increases their revenues from sales of materials, but this is offset by costs of collection and processing. The subsidy that is paid often operates as a fixed contribution, eg per household that is provided with a collection service. Depending on whether the marginal costs of collection are covered by marginal revenues, this approach may provide little or no incentive to improve the effectiveness of collection; the incentives may be merely to operate a collection system for the required number of households but collectors might be better off if less material is collected.

This would be improved if local government subsidies for recycling were paid per tonne of waste diverted, rather than on a fixed basis per household. This introduces budget uncertainty for local government that otherwise is borne by the collector, but it provides the right incentives to collect materials for recycling.

As Margaret Walls notes, optimal contracts involve the balance of risk and the provision of incentives.[19] She points out that, if the contractor has little choice in what materials are collected, incentive contracts (ie those that pay on the basis of amounts collected for recycling or which allow contractors to obtain all the revenues from sales) would result

[18] Hedge contracts might be based on some underlying expected price for materials with mechanisms for sharing the upside or downside risk between parties if actual prices are significantly different.
[19] Walls M (2003) How Local Governments Structure Contracts With Private Firms: Economic Theory and Evidence on Solid Waste and Recycling Contracts. Resources for the Future Discussion Paper 03-62.

in a substantial risk premium, because of supply risk. There are also risks associated with swings in the markets for materials collected, as experienced recently in New Zealand, and under-priced currently in NZ contracts.

Currently MfE is in the process of developing model contracts as suggested approaches for use by local government. This work needs to address the appropriate distribution of risk between the contracting parties, given supply and market uncertainties. Efficient contracting is not the subject of this report, but will be an important underlying feature on which to introduce economic instruments.

2.2.2. Disposal Contracts

There are also problems with some disposal contracts, as highlighted in the New Zealand Waste Strategy.[20] Under some contracts TLAs pay for a given amount of waste disposal even if the amount delivered is less. This reduces the revenue risk for contractors but provides no incentives to TLAs to reduce waste.

2.2.3. User Charges for Waste Collection and Disposal

Where households are not charged for waste collection and disposal in proportion to their waste output, incentives on households to minimise their waste output or to recycle, are reduced. That said, many recycling schemes have been established in parts of New Zealand in which there is no user charging system, and recycling occurs for a combination of reasons including convenience and personal motivation to recycle.

User charges for waste can and have been introduced in New Zealand in the form of payments for official rubbish bags, where the charge covers the costs of the bag itself and the costs of collecting and disposing of the waste.

Empirical evidence is of reductions in waste going to landfill as a result of introduction of user charges; US studies have shown an average reduction of 28% with a range of 25% to 50%. [21] European studies have similarly shown reductions in household waste that ranged from 15% to 50%.[22] In New Zealand, Waitakere City Council estimates waste going to landfill declined 28% since the introduction of unit pricing.[23]

The responses that resulted in these outcomes included[24]:

- increased recycling;
- source reduction, although the evidence is less clear;

---

[20] Ministry for the Environment (2002)
[21] Miranda ML, Bauer SD and Aldy JE (1996) Unit Pricing Programs for Residential Municipal Solid Waste: An Assessment of the Literature. US EPA.
[22] ACR (1999) in: Salmons R (2002) A New Area for Application of Tradeable Permits: Solid Waste Management. Chapter 6 in: OECD Implementing Domestic Tradeable Permits. Recent Developments and Future Challenges.
[23] Moore T (2002) in: Tait PR (2004) Unit-pricing: Minimising Christchurch Domestic Waste. Masters of Commerce and Management Thesis, Lincoln University.
[24] [24] Miranda ML, Bauer SD and Aldy JE (op cit)

- waste compaction—a significant response when charges are based on volume at the kerbside;
- undesirable diversion, including households dumping waste in facilities for commercial waste (eg street rubbish bins), littering, backyard burning, dumping (eg on the road side) and including waste in recycling bins.

The specific impacts of unit pricing on increased recycling may be small however. A review of existing literature noted that the price of disposal is not a significant determinant of household recycling effort.[25] The authors suggested that the costs of disposal were relatively small and provided little incentive. They suggested that the convenience of recycling programmes was a much more significant incentive factor.

The negative aspect of user charges for waste are the incentives provided for undesirable diversion of waste, as noted above. The same incentives are provided by the introduction of disposal charges, as discussed below.

Such behaviour can be limited by introducing penalties for this undesirable behaviour or through subsidising desirable behaviour, eg recycling.

One issue is whether recycling, too, should be subjected to user charges. This, along with user charges for waste collection/disposal, provides greater incentives for waste minimisation (ie reducing purchases) but also reduces the relative incentive to recycle. Through passing on to households the real costs of landfill disposal while not doing the same for recycling, provides too great an incentive to recycling so that too much may be recycled and, in contrast, too little avoided. In practice, however, the mechanism is often introduced alongside local or national targets that wish to encourage greater diversion of waste to recycling, regardless of whether this is some measured optimum or not.

Thus the theoretical perspective is that user charges for recycling should be introduced also, in practice this is unlikely. The perverse incentives that this split in approach (user charges for collection for disposal but not for recycling) introduces for local government are discussed in Section 1.5.1.

2.3. Disposal Charge

2.3.1. Description

Theory suggests that the optimal environmental policy instrument is a tax or charge equal to marginal damage costs. In other words, if the environmental damage associated with one more unit (eg a tonne or a cubic metre) of waste can be estimated, it should be levied on each unit of output. A disposal tax or charge can be used as a means for ensuring that the full costs of waste disposal are paid when waste is sent to landfill or to other final disposal option (such as incineration).

[25] Jenkins RR, Martinez SA, Palmer K and Podolsky MJ (2000) The Determinants of Household Recycling: A Material Specific Analysis of Recycling Program Features and Unit Pricing. Resources for the Future Discussion Paper 99-41.

If set at a level that is equal to the measured damage costs, it would ensure that the full costs of disposal were paid. Also, a disposal charge provides incentives for a wide range of options that would reduce the need for waste to go to landfill. It has two effects in theory:

- input substitution—providing incentives for substituting materials to more recyclable content;

- output reduction—incentives for less material in production thus producing less waste, or to recycle, eg through changing the price of landfilling relative to recycling.

Economic theory suggests that the ideal economic instrument for waste management would be a disposal charge equal to marginal damage costs.[26] This treats environmental issues as market failure because of impacts on the environment that are not priced in the market. Where these can be identified and valued (at the margin), a charge equal to the level of damage will result in an optimal response—the right level of waste avoidance, reuse, recycling and final disposal.

This would suggest, to the extent that under-pricing of landfill is the environmental problem of concern, that a landfill charge is the only instrument required. However, there are a number of issues that need to be borne in mind:

- the potential for unauthorised tipping as an externality of increased disposal costs; and

- information, institutional and other barriers to landfill alternatives.

A charge on disposal provides incentives to private individuals to find lower cost disposal routes including unauthorised tipping (dumping) of waste. This has costs to society at large not borne by the waste tipper. In addition, information and institutional barriers (eg that costs of disposal are not seen by consumers when making purchase decisions) can mean either that the disposal charge is not fully effective and is less than an ideal instrument, or that it needs to be implemented in association with other instruments.

Where there is a possibility of unauthorised tipping, or these other barriers to optimal outcomes exist, analysts have suggested that the ideal instrument is a combination of a product tax and a recycling subsidy.[27] This combination can provide the desired incentives for input substitution and output reduction that a disposal charge might only produce in theory.

[26] Baumol WJ and Oates WE (1988) The theory of environmental policy. 2nd Ed. Cambridge.
[27] Walls M (2003) The role of economics in extended producer responsibility: making policy choices and setting policy goals. Resources for the Future Discussion Paper 03-11.

2.3.2. Current Landfill Pricing in New Zealand

Typically landfill charges cover only a part of the full costs incurred during the life of a landfill.[28] This issue had been raised earlier by the Parliamentary Commissioner for the Environment.[29] It noted that many councils charge solely on the basis of landfill operating costs, ignoring factors such as the cost of the land, mitigation of environmental effects, unplanned closure, corrective actions, site rehabilitation and aftercare.

The New Zealand Waste Strategy contains the objectives that:

- by December 2003 local authorities will have addressed their funding policy to ensure that full cost recovery can be achieved for all waste treatment and disposal processes; and

- by December 2005, operators of all landfills, cleanfills and wastewater treatment plants will have calculated user charges based on the full costs of providing and operating the facilities, and will have established a programme to phase these charges in over a timeframe acceptable to the local community.

2.3.3. UK Landfill Tax

The UK landfill tax is a useful international example as, in its original specification, it came close to the theoretically ideal instrument.

The UK introduced a landfill tax in 1996. When it was introduced the rates were based on estimates of the environmental externalities associated with disposing of waste at landfill. [30] There are two tax rates: a standard rate, originally set at £7 per tonne, for "active" wastes; and a lower rate of £2/t for "inactive" wastes. While the lower rate has remained at £2/t since inception, the standard rate was increased to £10/t in 1999 and an escalator was introduced under which there were a series of five annual £1/t increases from April 2000 to April 2004. The standard rate for active wastes rose to £15/t in April 2004 and has now been raised further to £18/t from 1 April 2005 and the intention is to raise it to £35/t by 2010.[31] Through introducing the escalator, and breaking the link to measured damage costs, the landfill tax has become more of an incentive-based or "behavioural" tax, designed to reduce landfill disposal[32].

Annual tax revenue is £607 million (2003/04), net of contributions to the Landfill Tax Credit Scheme, of which over 95% is 'active' waste revenue.[33] This is offset by a 0.2%

---

[28] Ministry for the Environment (2002) Landfill Full Cost Accounting Guide for New Zealand.
[29] PCE (1993) Solid Waste Reduction Initiatives.
[30] Davies B and Doble M (2004) The Development and Implementation of a Landfill Tax in the UK. In: OECD. Addressing the Economics of Waste pp 63-80.
[31] http://www.businesslink.gov.uk/bdotg/action/detail?type=RESOURCES&itemId=1074404201 (http://tinyurl.com/84m4b)
[32] Strategy Unit (2002) Waste Not, Want Not. A strategy for tackling the waste problem in England. www.number-10.gov.uk/su/waste/report/downloads/wastenot.pdf
[33] National Audit Office (2005) 2004-05 Her Majesty's Revenue and Customs. Section 2: Landfill Tax and the Landfill Tax Credit Scheme.

reduction in employer National Insurance Contributions, a tax used to raise revenue for health and social security purposes. This tax offset is consistent with using revenues to reduce distortions, as discussed in Section 2.3.7.

Since the introduction of the landfill tax, there has been a 60% reduction in the volumes of 'inactive' waste sent to landfill sites, whilst the volume of 'active' waste sent to landfill has remained broadly unchanged. The latter is explained by the fact that the costs of landfill, including landfill tax, remain low compared to alternative methods of treatment/disposal. Moreover, landfill disposal costs represent a relatively small proportion of business operating expenses.

Of those countries which have a landfill tax, the UK currently has the lowest tax rates for active waste (Table 1), apart from France (which has an escalator of 1 Euro per tonne per annum) and Finland which is proposing large increases. As the UK also has relatively low gate fees, the overall cost of landfill remains low compared to other countries.

Table 1 Landfill Tax Rates and Prices

Country	Tax rate (£/tonne)	Landfill prices (£/tonne)
Austria	18 - 54	36 – 82
Belgium	3 – 14	43 – 51
Denmark	28	13 – 21
Finland	9	-
France	4	-
Italy	0.6 – 16	-
Netherlands	8 – 40	47
Sweden	17	-
UK	2 – 13	13 – 23
Czech Republic	11	-
Norway	25 – 50	-
Switzerland	6 - 20	56 - 65

Source: Strategy Unit (2002) Waste Not, Want Not. A strategy for tackling the waste problem in England

2.3.4. Effectiveness

The effectiveness of disposal charges in diverting waste from landfill has been varied. Denmark and the Netherlands introduced landfill charges earlier than other countries, have relatively high rates of tax, and have low dependencies on landfill for waste management.[34]

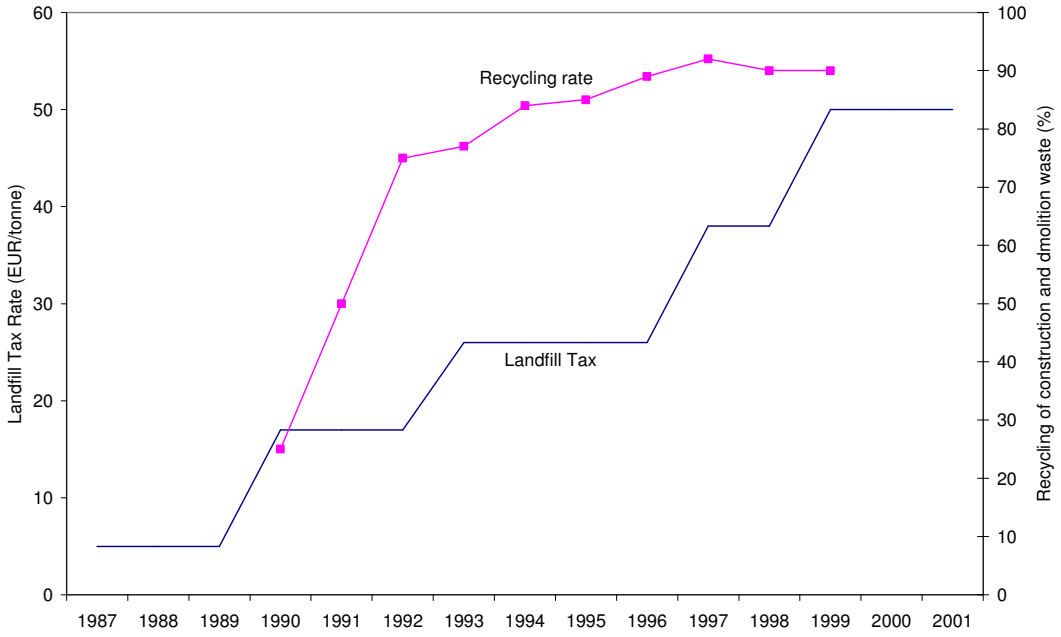
A study of the effects of the landfill tax in Denmark suggests that it has led to "a remarkable increase in the recycling of construction and demolition waste",[35] although the report notes that other measures were introduced alongside the tax including

[34] Integrated Skill Limited (2004) An Assessment of Options for Recycling Landfill Tax Revenue. Final Report for HM Treasury.
[35] Jacobsen H and Kristofferson M (2002) Case Studies on Waste Minimisation Practices in Europe. European Environment Agency.

technological and institutional solutions.[36] Landfill of construction waste is now very expensive but recycling (especially of concrete, bricks and asphalt) is very low cost.

Figure 2 shows the landfill tax rates (and the corresponding recycling rates). Whereas recycling rates have increased with tax rates, the introduction of a range of other measures alongside the landfill tax means that conclusions on effectiveness cannot be easily drawn.

Figure 2 Landfill Tax and Recycling Rate for Construction and Demolition Waste in Denmark



Source: Jacobsen H and Kristofferson M (2002) Case Studies on Waste Minimisation Practices in Europe. European Environment Agency

Revenues collected from the UK landfill tax suggest that there has been a significant reduction in the amount of inert waste going to landfill.[37] And the impacts on construction and demolition waste have been particularly significant.[38] There has been less of an impact on quantities of active waste going to landfill, or at least an initial drop that has not been sustained, despite the higher rate of tax and the introduction of the escalator. However, researchers note the difficulty of measuring the impact of the instrument, partly because of the paucity of data and the absence of a pre-tax baseline set of waste statistics. The landfill tax has been introduced alongside a number of other

[36] These included subsidies for cleaner technology and recycling projects, establishment of local government sorting schemes, virgin material taxes, regulations on use of waste material in construction, rules on selective demolition so that waste materials (bricks, concrete) are not mixed at source.

[37] Advisory Committee on Business and the Environment (2001) Resource Productivity, Waste Minimisation and the Landfill Tax.

[38] ECOTEC (2000) Effects of Landfill Tax—Reduced Disposal of Inert Waste to Landfill

instruments, including local authority-led recycling schemes and the government's producer responsibility regulations for packaging.[39]

2.3.5. Applying a Landfill Tax in New Zealand

Landfill fees are paid by local authorities and companies for trade waste. In some areas, landfills are owned by the local authorities and the costs are simply an internal transfer.

A landfill tax would be paid on waste delivered to a landfill. It could be levied per tonne or on a volume basis based on the size of the truck or some calculated amount, using a weight times some (weight to volume) conversion factor.

The Ministry for the Environment has created a spreadsheet model and guide for estimating the full costs of disposal. It is intended that this is used by local government for planning and charge setting purposes.

Legal Issues

According to Section 22 of the Constitution Act 1986, any economic instrument that can be classified as a tax must be authorised by Parliament.[40] The definitions of a tax under New Zealand law are that it is:

- compulsory,
- for public purposes; and
- enforceable by law (you can be prosecuted if you do not pay).

Regardless of whether something might be defined as a fee or charge, if there is no relation between the amount paid and a service provided, and it meets these other criteria, it is defined as a tax.[41]

A recent Treasury working paper stated that there is no generic legislation in New Zealand (or even adequate provisions within the Resource Management Act or RMA) giving the support structure needed for many types of economic instrument, so measures such as fishing quota, aquaculture management areas and carbon credits have required specific legislation.[42] Introducing legislation is a lengthy process.

One potential option is the use of financial contributions under Section 108 of the RMA. Financial contributions can include payment of money to mitigate adverse effects on the environment of an activity. However, these mechanisms are relatively untested in practice. It means that charges that seek to do more than recover costs, and indeed most other economic instruments discussed in this report, may require new legislation.

---

[39] ECOTEC, CESAM, CLM, University of Gothenburg, UCD and IEEP(CR) Study on Environmental Taxes and Charges in the EU.

[40] Bullen S, Jacobsen V, Palmer G and Scrimgeour F (2000) The Use of Economic Instruments for the Control of Air Quality in Auckland: A Scoping Study. Prepared for the Auckland Regional Council. Arthur Andersen Chen & Palmer

[41] ibid

[42] Guerin K (2004) Theory vs Reality: Making Environmental Use Rights Work in New Zealand. New Zealand Treasury Working Paper 04/06.

Auckland TLAs (North Shore City, Waitakere City, and Rodney District Councils) have introduced new waste bylaws which, amongst other things, allow for the introduction of levies as part of the licence conditions for waste collectors and operators of waste management facilities. The levy would be applied to waste collected (as a proxy for waste sent to landfill—some allowance may need to be made for waste that is subsequently diverted away from landfill in order not to disincentivise such activity). The levy would be applied under Section 544 of the Local Government Act 1974 which allows councils to allocate the costs of implementing a waste management plan "in such manner as the territorial authority considers will effectively and appropriately promote the objectives of the plan" and "in a way that establishes economic incentives and disincentives that promote any or all of the objectives of the plan". The legality of the introduction of levies is currently being challenged. If legality is confirmed, the councils expect to determine the size and operation of the levies in the first half of 2006.

2.3.6. The Risk of Unauthorised Tipping

As noted above, the introduction of the theoretically ideal instrument—a charge on disposal to increase costs to their full social costs—would have externalities of itself, because it provides incentives to private individuals to find lower cost disposal routes including unauthorised tipping (dumping) of waste. This has costs to society at large not borne by the waste tipper. There is little empirical evidence of unauthorised tipping in response to increased landfill disposal prices or unit charging for collection and disposal; this does not suggest that it does not occur, just that it has been little studied. A recent OECD report had numerous references to the issue, for example, but these were largely theoretical and anecdotal.[43]

Where there is a possibility of unauthorised tipping, analysts have suggested that the ideal instrument is a combination of a product tax and a recycling subsidy. These introduce the same incentives as a disposal charge for product substitution and output reduction, without the downside risks (see Section 2.3.1).[44]

2.3.7. Efficient Use of Revenues

Environmental charges produce revenues. The use that is made of the revenues involves a separate decision from the decision to introduce the charge. In practice, often some, at least, of the revenues are retained to achieve environmental objectives related to the objectives of the charge, eg some portion of the UK's landfill and aggregates tax revenues are allocated to related projects.

- Landfill site operators who contribute to organisations "with objects concerned with the environment, enrolled under the Landfill Tax Credit Scheme", may claim a credit of up to 6.8% against their annual landfill tax liability.[45]

[43] OECD (2004) Addressing the Economics of Waste.
[44] Walls M (2003) The role of economics in extended producer responsibility: making policy choices and setting policy goals. Resources for the Future Discussion Paper 03-11.
[45] HM Customs & Excise. www.hmce.gov.uk/news/bb-0904.htm

- Some of the revenue from the Aggregates Levy is contributed to a Sustainability Fund used to finance programmes to minimise demand for primary aggregates, promote environmentally friendly extraction and transport, and reduce the local effects of aggregate extraction.[46]

Such targeted use of funds, referred to as hypothecation, can remove some of the economic efficiency gains from using the instrument.

As noted above, if a charge is imposed at a level equal to the marginal damage cost, the resulting market behaviour is optimised. The theoretical best use of the revenue collected is to correct some other market distortion, either in the form of a subsidy, where this is the best market correcting approach (and it is argued that a recycling subsidy plus product charge is an ideal instrument), or to replace income raised through a distortionary tax, eg a tax that has been levied to raise revenues rather than to correct a market failure/externality. Taxes are distortionary when they are levied on goods or services, or on income, in a way that changes behaviour from what it would have been in the absence of the tax.[47] For example, taxes on labour mean that, to attract workers, wage rates need to be higher than they would be otherwise, and firms employ less labour and use more other resources. Using revenue from environmental taxes to reduce such taxes results in the so-called double-dividend of corrective taxes or charges. There is one social dividend (benefit) from correcting the externality; there is a second social dividend from reducing other taxes (or from correcting another market failure). This approach has been championed in a number of countries, most notably via the call in European Community President Jacques Delors' 1993 White Paper on growth, competitiveness, and employment, for a shift in the burden of taxation within the EU from "goods" to "bads".[48]

Consistent with this, when the landfill tax was introduced in the UK, it was accompanied by a 0.2% reduction in employer national insurance contributions (NICs); and the aggregates levy was accompanied by a further 0.1% cut.[49]

In contrast, when, as a result of the additional revenue raised, the government spends more, the test, from an economics perspective, is—is this additional expenditure well-

[46] Environment Protection Economics Division (2003) Mid Term Evaluation of the Aggregates Levy Sustainability Fund. Department for Environment, Food and Rural Affairs. www.defra.gov.uk/environment/waste/aggregates/pdf/mte.pdf

[47] And note, environmental taxes or charges will often try to be distortionary as distorting behaviour is part of the means to achieve environmental objectives. Also, if the market is currently distorted away from an ideal outcome because prices are incorrect, eg because environmental costs are not internalised, then taxes that distort the market through correcting these prices are desirable and economically efficient.

[48] White Paper on growth, competitiveness, and employment: The challenges and ways forward into the 21st century. COM(93) 700 final. Brussels, 5 December 1993

[49] Employees pay 11% of income between £4,615 and £30,940 per year, and 1% of income above this limit. Employers pay 12.8 % on all earnings above £4,615 a year. The link is somewhat confused over time as NICs have subsequently been raised to pay for additional government expenditure on the National Health Service. There is an efficiency gain if, because of the Landfill Tax and Aggregates Levy, other taxes are lower than otherwise they would be. This is almost impossible to test.

being enhancing? In other words, do the benefits to society outweigh the costs?[50] Even where additional spend is justified, there are arguments for separating the expenditure from the revenue raising tools. More specifically, revenue raising is uncertain, which means too much, or too little can be spent on the new activities. Similarly, reductions in distortionary taxes can be done to too great or too little an extent. The reduction in national insurance contributions associated with the UK's landfill tax, for example, has consistently been greater in value than the amount raised by the tax[51].

The unpredictability of revenues from environmental taxes is compounded by the incentive effects that they have. The principles of good taxation for revenue raising purposes, which relate to the low levels of distortion (eg by taxing goods with low price elasticity of demand—those for which a change in price will have little impact on demand such as observed with cigarettes and petrol) can be at odds with the objectives for environmental taxation, which can be to distort, ie to change patterns of consumption.

Hypothecation has been suggested as a means to limit the impacts of the economic instrument on specific sectors. For example, the tax reduces firm revenue and profitability and this can be partly compensated through lump-sum or some other compensation. The efficiency (and environmental) impact of the instrument remains, provided the compensation is not on the same (marginal) basis as the original instrument. For example, if there is a landfill charge or tax on each tonne of waste sent to landfill, lump sum compensation (ie redistributing the tax revenues to those firms that had paid the tax) would not reduce the price impact, or the incentive effect of the instrument; although note, this requires that the redistribution to individual firms is not dollar for dollar, or the incentive effect is lost—ideally the compensating amount should not vary with the tax paid by an individual firm. It would simply enable levied firms to retain profits.[52] In a similar vein, in Denmark, simultaneously with the introduction of a pesticides tax, property taxes were lowered for agriculture properties.

There is a dynamic effect of the economic instrument that is lost through lump sum compensation. If a firm has greater environmental effects than others, an economic instrument can make it less competitive in the short run through affecting its marginal costs of production (and firms price and compete on their marginal costs); and note, this is a desirable impact on competitiveness. However, if levels of profit do not change because of the compensation, there is no disincentive to investment in the industry, which there would be if uncompensated. If an industry has greater environmental effects than others, one of the efficiency improvements that an economic instrument can provide is to reduce the long term profitability and thus the likelihood of investment relative to other industries.

[50] This is a necessary but not sufficient reason for intervention which should also be justified on the basis of market failure.
[51] HM Treasury and Department for Environment, Food & Rural Affairs (2002) Possible changes to the Landfill Tax Credit Scheme: Consultation Paper.
[52] It does over-reward the industry and over-encourage investment, if continued over the long term.

Our starting point is that the reason for introducing economic instruments is because they internalise external costs or provide incentives for reducing environmental impacts. The revenues raised are an effect of their use and the best use of these revenues needs to be separately analysed; most likely the most efficient use will be in reducing the need to raise revenues through other instruments, rather than for environmental purposes.

2.4. Tradable Permits

Whereas environmental charges give some price certainty but often uncertainty of outcome, transferable or tradable permits provide certainty of outcome but uncertainty of price. They come in two basic forms: cap and trade and credit-based systems.

Cap and trade schemes set an overall limit on some activity or output, eg tonnes of waste going to landfill. The aggregate limit is divided into numerous individual allowances, eg allowances to dispose of a single tonne of waste. Allowances are allocated initially (either sold or given to firms, individuals or local authorities) and can be traded. Under a cap and trade scheme for landfill disposal, any person that disposed of waste might be required to hold allowances equal to the quantity of waste disposed.

The price of these allowances is set in the market and, under a well-functioning market would be expected to equal the marginal costs of allowance supply. This is the costs of the most expensive steps taken to limit waste going to landfill. This is because the response of firms with obligations to hold allowances is to dispose of waste and hold allowances to cover this activity, unless there are options available to them that are lower cost, eg recycling of the waste. Under an efficient market all the least cost recycling (or waste avoidance) steps will be taken up to the point where the total number of allowances available is equal to the total amount of waste that remains and must be landfilled.

Requirements for developing such a cap and trade scheme include:

- the cap, eg a targeted total amount of waste than can be landfilled;
- a unit of trade, eg an allowance to dispose of one tonne;
- a system for initial allocation of the allowances. This might include giving them to current waste producers or selling them. The approach taken has distributional effects (winners and losers) but is not expected to affect the final market price of allowances or the activities taken to reduce waste;
- penalties for those with insufficient holdings of allowances—these must be significantly more than the expected price of allowances;
- a compliance period, ie a time over which the holding of allowances must equal the waste disposed of, eg annually, monthly etc; and
- a tracking system so that allowance holdings can be compared with requirements.

Credit-based systems are alternative approaches that encourage desired activities or outcomes rather than placing a limit on undesirable outcomes. Allowances are not distributed initially; rather, they are created.

An example of a credit-based scheme is the UK packaging recycling system discussed in Section 2.7.1. It is based around tradable recovery notes, generated when a volume of waste is recycled. These are used to demonstrate compliance with an obligation on firms to achieve targeted rates of recycling.

Below we describe a recently introduced cap and trade scheme—the UK's landfill allowance trading scheme for biodegradable waste.

2.4.1. UK Landfill Allowance Trading Scheme

The UK's Landfill Allowance Trading Scheme (LATS) started in April 2005.[53] Under the LATS, landfill targets are set for each country of the UK (England, Scotland, Wales and Northern Ireland). They limit the quantity of biodegradable municipal waste (BMW) that can be sent to landfill consistent with the requirements of the EC Landfill Directive. The targets are:[54]

- by 2010 to reduce the amount of BMW going to landfill to 75% of that produced in 1995;
- by 2013 to reduce the amount of BMW going to landfill to 50% of that produced in 1995; and
- by 2020 to reduce the amount of BMW going to landfill to 35% of that produced in 1995.

Individual allowances that allow the disposal of one tonne of BMW are allocated to waste disposal authorities (WDAs which are county councils). Each allowance applies to a specific year and allowances are issued for every year up to 2020. The initial allocation is based on a historical amount of waste sent to landfill—the percentage contribution of each WDA to total BMW in 2001/02, times the target quantity for the specific year.

WDAs can trade their allowances with other WDAs. They can also bank or borrow them, ie WDAs can keep (bank) unused allowances from one year and use them in a future year, or they can borrow allowances from a future year, thus allowing them to dispose of more this year while requiring them to reduce the amount going to landfill in future years to a greater extent. The requirement to reduce the amount going to landfill more in the future is an aggregate requirement. For any individual WDA they can simply purchase more allowances from other WDAs, but if, in aggregate there is a net transfer of allowances from the future, the total future requirement will be greater. Experience in other trading schemes is that trading over time can be a very significant source of cost reductions.

[53] www.defra.gov.uk/environment/waste/localauth/lats/

[54] The Directive allows member states which landfilled over 80% of their municipal waste in 1995 to postpone the targets by up to four years. The UK Government is making use of this four year derogation. The target years for member states for which the derogation does not apply are 2006, 2009 and 2016.

The ability to bank is unlimited under the scheme but borrowing is limited to 5% of the following year's allowances and is not allowed in the target years and the years immediately prior to target years.

A penalty for non-compliance with the LETS (ie quantities landfilled above that allowed via the holding of allowances) is set at £150 per tonne (cNZ$375/t) of BMW. This was based on an assessment of the most costly established method of diversion from landfill and set at approximately twice that amount.

Economically the LETS will function in very much the same way as a disposal charge. Provided that there is a liquid market for allowances, ie there are numerous sales and it easy to find buyers and/or sellers, then WDAs will view allowances simply as a cost of landfilling rather than a binding physical constraint. However, where there are definite outcomes that are to be achieved, using a cap and trade scheme rather than a charge is a way to ensure that the target is met, provided that the penalty system is adequate.

To ensure that the requirements are met, or that they respond efficiently to the price of allowances, WDAs are likely to introduce programmes to encourage composting of BMW.

2.4.2. Analysis

A cap and trade scheme for waste going to landfill can have the same economic effect as a disposal charge but, through starting as a quantity obligation, can ensure that targeted levels of waste diversion are achieved. This introduces cost uncertainty as the price of allowances would reflect the costs of the measures taken to change behaviour, and this would include overcoming information barriers that currently limit the potential effectiveness of disposal charges.

Placing the obligation on local government would be likely to lead to the costs of allowances being passed on in disposal prices and in local subsidies for recycling.

It is difficult to see how this approach could be applied directly to industry. It could operate for industrial waste—all disposers would need to hold allowances equal to the quantities disposed of, but waste that enters the household waste stream cannot subsequently be allocated to individual firms responsible for its arise. And introducing requirements higher up the chain, eg at the point of sale, provides no incentives for recycling.

Placing the obligation on landfill operators ensures that the incentives are passed on to all those delivering waste and landfill prices would rise to cut off supplies. For the household waste stream, the incentives for additional recycling would fall on local government via community pressure to reduce disposal costs and through incentives placed on collection companies that could avoid disposal costs through diverting waste.

It may not result in incentives for input substitution as can be achieved with a product charge (see below).

2.5. Product Charges

Product charges are levied on products before they enter the waste stream, but on the basis of their expected impacts once they enter the waste stream. They aim to internalise the costs of disposal in the product itself, providing incentives to use more recyclable materials or to reduce product mass.

Product charges used in other countries include those listed in Table 2.

Table 2 International Use of Product Charges

Product	Country
Automotive air conditioners	Canada
Batteries	Canada, Denmark, Portugal, Sweden
Beverage containers	Belgium, Finland, Norway, Sweden
Building materials	Denmark
Light bulbs	Denmark, Korea
Lubricating oil	Finland, France, Italy, Norway, Spain
Packaging	Belgium, Germany
Pesticides	Belgium, Denmark, Norway, Sweden
Plastic and paper bags	Italy, Iceland, Denmark
Tyres	Taiwan, Canada

Source: EcoNomos Ltd (2003) Review and Evaluation of the Use of Economic Instruments in Municipal Solid Waste Management. Report to Environment Waikato.

Product charges can internalise the external costs of waste to some degree. On the basis of average effects of individual products, eg the proportion of a product type that is landfilled, the charge can pass on these costs. But it takes no account of the behaviour of individuals that might be required to pay the charge, whereby the charge may bear no relationship to the true marginal impact. For example, if 90% of householders dispose of a product to landfill following use, imposing an average cost (eg 90% of the costs of disposal of that product) will undercharge those that send it to landfill and overcharge those that recycle it, and for the latter group, provide no incentives or reward for desirable outcomes.

However, to the extent that rates of recycling depend more on the convenience of recycling, rather than the avoided costs of disposal costs, then product charges through incentivising producers to manufacture items that are more recyclable, can be effective in leading to greater rates of recycling.

In Sweden a packaging tax was used to support an existing deposit refund scheme. The tax was levied once on new containers, so that those already in circulation avoided the tax.[55] A similar approach applies in Finland. However, it is difficult to separate out the effectiveness of these schemes because of their implementation in parallel with other mechanisms.

Discussions of the ideal instrument suggest the use of a product tax and a recycling subsidy to provide incentives for input substitution and output reduction (Section 2.3.1).

[55] ECOTEC, CESAM, CLM, University of Gothenburg, UCD and IEEP(CR) Study on Environmental Taxes and Charges in the EU.

2.6. Recycling Subsidies

Recycling is subsidised in New Zealand by local government. This operates as a contracted fee paid by local government to collection companies for operating a local collection and recycling scheme. The revenues for the subsidy are raised through local body rates.

The subsidy represents the difference between the costs of collection and the aggregate revenues received for the materials collected.

Payments to collectors are made typically on the basis of the number of households covered. Under such contracts, collectors bear the risks associated with what is collected and from volatility in end use markets.

There is a range of ways in which contracts can be set up by local government to pay out a subsidy payment to contractors. Ideally they would include elements that ensured payments were made at the margin for quantities recycled, reflecting the value to the local authority (or to the community) in reduced landfill disposal costs. Currently, MfE is working with local government to develop better systems for waste contracting.

An alternative approach is for recycling subsidies to be paid by industry. This is explored below in the form of producer responsibility systems and deposit refunds.

2.7. Producer Responsibility Systems

Extended producer responsibility (EPR) schemes embody the notion that producers should be made physically or financially responsible for the environmental impacts of their products at the end of the products' life.[56] It has been adopted as a means for relieving local government of some of the financial costs of waste management and introducing an incentive for waste reduction through reducing resource use in products.

We include EPR as an economic instrument because it establishes the basis for market development; firms are given incentives to find least cost means to achieve targets and will often introduce economic instruments (charges and subsidies) to achieve them.

Practical examples of the use of EPR have come particularly from Europe, starting with the German Packaging Ordinance and followed by the French EcoEmballage and extended to a trading programme in the form of the UK's PRN scheme. These are described briefly below.

2.7.1. International Experience

Germany

Germany's Packaging Ordinance, originally introduced in 1991 to require manufacturers to take back transport packaging (eg crates, drums, pallets and

[56] Walls M (2003) The Role of Economics in Extended Producer Responsibility: Making Policy Choices and Setting Policy Goals.

polystyrene containers), now requires that all types of consumer packaging used to contain and/or transport goods from the point of sale to consumption, must be taken back by manufacturers for recycling or reuse.

The requirements of the Packaging Ordinance can be met through obligated firms joining compliance schemes. The most well known are the Duales System Deutshcland (DSD) for consumer packaging and the Resy system for used paper and corrugated board shipping containers.

The DSD is a non-profit organisation that collects, sorts and recycles post consumer packaging from households and small businesses. Manufacturers pay a fee (based on weight and material) to the DSD that entitles them to label their products with the Green Dot. The DSD organises separate collection schemes for materials that are labelled; these include kerbside and bring[57] systems. Materials are sorted under contract to DSD and shipped to recycling facilities. The fees paid to DSD are set in a way that covers the costs of collection, sorting and other treatment prior to sale to recyclers.

It is estimated that the introduction of the Packaging Ordinance has led both to the achievement of national recycling targets and to a reduction in the quantity of packaging used; an estimate of the reduction in use in 2000 found an 18% reduction from what was estimated to have happened otherwise.[58]

The system has led to very large investments in recycling capacity, including sorting and processing facilties, estimated at €20 billion in Germany and €10 billion in France for its EcoEmballage system (see below).[59]

France
The French system drew on the German experience but did not introduce specific recycling targets, retained local authorities as the collectors of waste and allowed incineration with energy recovery as an option. Eco Emballage was created by industry to subsidise the additional costs of collection and sorting of recyclables.

UK
The UK system drew on these systems further. National targets for recovery and recycling are distributed to individual companies in the packaging chain that meet minimum thresholds for turnover and amount of packaging handled. Compliance with these regulations was initially achieved either internally within firms or through membership of compliance organisations; but more recently markets in compliance certificates have developed enabling firms to comply without joining a compliance scheme.

[57] Bring systems require the waste to be brought to a separate location rather than picked up from the household or firm Examples include community bottle banks.
[58] Quoden J (2004) Effects of the Introduction of an EPR Management System on the Economy. In: OECD. Economic Aspects of Extended Producer Responsibility.
[59] Quoden (op cit)

There is an overall obligation for recovery (70% in 2008)[60] and, to achieve this, obligations for individual materials are allocated to those who:

(i) manufacture raw materials for packaging (6%);
(ii) convert raw materials into packaging (9%);
(iii) pack and fill packaging, or use packaging to wrap goods (37%);
(iv) sell packaging to the final user (48%).

Using these numerical obligations, for a packer/filler, for every tonne of packaging that it uses, the obligation is to recover 70% x 37% = 25.9%. To demonstrate compliance with these obligations companies must hold evidence in the form of Packaging Waste Recovery Notes (PRNs). The most common way to comply with these requirements is for firms to pay a compliance organisation to coordinate the achievement of the obligations and to provide PRNs. Currently there are 19 compliance organisations.[61] They charge a management fee and invoice separately for PRNs. The price of PRNs is set in the market and represents the difference between the costs of recycling, including the purchase of materials from collectors, and the value of the processed materials. For their part, firms contracting with compliance schemes provide detailed information on quantities of packaging handled and therefore the size of the obligation to be fulfilled.

Registered recyclers (processors of materials) can produce PRNs when they process a tonne of material, eg recycle a tonne of glass cullet. Although it was not the original intention of the regulations, PRNs have become tradable commodities. Rather than becoming directly involved in recycling or joining a coordinated compliance scheme, PRNs can now be purchased online.[62]

2.7.2. Economic Analysis

EPR systems typically work with pre-defined targets for recycling, requiring some components of industry to subsidise the costs of recycling so that these targets are met. The selection of targets is therefore critical if seeking to achieve an optimal level of recycling, regardless of who undertakes or funds that recycling. Mostly targets are set independently of any analysis of the costs of achievement. Although there is a need to establish targets through taking account of the costs and benefits, here we examine the economic efficiency of instruments in achieving these targets.

The disposal charge which aims to target the waste problem directly has two effects:[63] an output reduction effect and an input substitution effect. Although in a theoretically ideal world, it is the ideal instrument, it is criticised because it has incentives for undesirable dumping of waste, and because incentives may not be passed back to

[60] This is the target for business and is greater than the national target (60%). The difference is because the business target does not cover small and medium-sized businesses.
[61] http://www.defra.gov.uk/environment/waste/topics/packaging/pdf/compliance-schemes.pdf
[62] See for example, www.t2e.co.uk/
[63] Walls M (2003) The Role of Economics in Extended Producer Responsibility: Making Policy Choices and Setting Policy Goals. Resources for the Future Discussion Paper 03-11.

consumers or manufacturers in product prices, eg product prices or consumer demand will not reflect recyclability or the converse, waste disposal liability.

EPR systems can achieve these two effects of the theoretical disposal charge also:

- an output reduction effect is targeted through providing requirements to recycle rather than to dispose of waste; and

- an input substitution effect is targeted via the obligation placed on industry that relates to the quantity and type of material used (expected waste).

This combination of effects, equivalent to that provided by a product tax and a recycling subsidy, is regarded as the ideal instrument where there is a possibility of unauthorised tipping and where the price of disposal is not efficiently passed on to waste producers including households and firms (Section 2.3.1).

2.7.3. Effectiveness

The effectiveness of EPR systems relate to the penalties for non-compliance and the practical potential for developing markets for recycled goods. International schemes have achieved high rates of recycling, although the German DSD scheme was criticised for leading to significant exporting of materials in the absence of domestic markets. And the UK PRN system has had initial shortfalls partly because of the lack of maturity of recycling markets.

In theory any level of target can be achieved, although they may require considerable investment in market development.

These lessons are clear for New Zealand also. Consideration needs to be given to the achievability of targets, and time needs to be provided (and financial incentives) for the development of markets.

2.7.4. Reconciling Local Government and Industry Obligations

One complicating issue with the introduction of EPR schemes is the way in which they interact with local government funding of recycling.

Reconciling the obligations of the two parties is complicated firstly by the fact that they cover different geographical areas. Industry might have an obligation to ensure a targeted level of recycling is achieved but at a national level. Local government wishes to achieve recycling locally, where it is consistent with efficient waste management.

There would be no obligation requiring industry to participate in a recycling scheme in any specific location, whereby a shared obligation may provide no value. From a local authority perspective, it could be regarded as pure happenchance whether industry, if local government funding was withdrawn completely, would fund recycling in any individual location. In practice, and depending on the framework developed for implementation, the net costs of recycling locally might determine industry's

involvement, ie they might provide some funding where it was clearly least cost to do so, eg close to end use markets. However, if this develops into competitive bidding for industry support it could drive the level of industry support to close to zero.

To explain—local government has an incentive to support recycling to limit landfill disposal costs and to meet community expectations. Its costs of providing recycling are reduced where industry provides support, however, in most instances industry funding would not lead to additional recycling, only to reduced local government costs. If there are more potential recipients of industry support than there is potential funding (all local authorities want to recycle but industry will only fund that which meets national targets), then local authorities compete with other local authorities for available funds. If local authorities are willing to pay for recycling with zero funding from industry, competitive bidding for industry funding would drive down bids to close to zero.

In practice, for a system to operate in which two parties are obligated or incentivised to achieve a shared goal, and the level of effort (cost) is initially uncertain, the participation of one or more parties may need to be fixed to some extent. In Germany this is achieved through industry paying for the full costs of collection and recycling for products labelled with the green dot. In the UK, the system works somewhat awkwardly with local government contributing funding at a pre-specified level but the amount provided being balanced by the value of PRNs in the market.

The role of local government and the appropriate level of funding that it might provide, is an important detail in the design of an EPR scheme.

2.8. Deposit Refund Schemes

2.8.1. Description

Deposit refund schemes (DRSs) involve the payment of a deposit when a product is purchased. The deposit is repaid when the product is returned after use. This system provides a strong financial incentive for returning products to a centralised facility to better ensure product reuse, safe disposal or recycling.

It is similar to an EPR scheme, although it imposes greater rigidity in terms of where material is returned following use. This adds to its costs relative to broader EPR schemes, which have been the favoured new instruments internationally.

2.8.2. New Zealand Experience

In New Zealand during the 1970s beer, soft drinks and milk were packaged in glass, refillable, returnable containers. A voluntary deposit system was common throughout the country.[64] These were very largely phased out during the 1980s. A deposit refund scheme for lead-acid batteries operated also, alongside a battery recycling scheme, but

[64] ZeroWaste New Zealand (2002) Extended Producer Responsibility: Container Deposit Legislation Report

this was discontinued because of competition from lower cost imported batteries. Currently a very limited number of voluntary schemes exist.[65]

- Living Nature, a natural skincare company based in Kerikeri, operates a voluntary deposit refund system offering a 20 cent refund per container returned. Glass bottles are washed and reused and the plastic bottles are washed and passed on to the local recycling operation in Kerikeri.

- Voluntary returnable bottle schemes, that do not include deposits, eg
  - 8% of the packaged beer market is covered by the Associated Bottle Company (ABC) that operates the 'swap-a-crate' system for 745ml beer bottles. Breweries lease bottles from the ABC who wash them for reuse.
  - Mainland Products provides milk in reusable bottles, for home delivery and dairies in the South Island only.
  - A handful of local breweries around New Zealand operate a voluntary return system, for bottles, including Beerworks in Wanaka.

2.8.3. International Examples

Deposit refund schemes have been used internationally to incentivise after-use return of products including:

- Beverage containers;
- Batteries;
- Light bulbs;
- Oil;
- Car hulks.

The classic DRS is the returnable bottle and a number of schemes operate in the US (Table 3) and Europe.

Deposit refund schemes provide strong incentives for recycling or reuse, and typically are effective in achieving objectives set. However, in comparison with other mechanisms that combine a charge on producers and a subsidy for recycling, deposit refund systems have a number of effects that reduce their cost-effectiveness.

- The retailer used for purchases may be different from that for returns. Sales of beverages, and other products likely to be included in a DRS, are increasingly sold in supermarkets. In contrast, if returns are made by children, these will often be to local shops.

- Where the incentive for returning products is higher than the value of the material, inefficient return behaviour can result. For example, it is rational for individuals to pay up to the value of the deposit to return a product; this results in vehicle trips being made simply to return

[65] ZeroWaste New Zealand (op cit)

- Traditional deposit refund schemes require returns to retailers, which may be a suitable destination where products, eg glass containers are reusable, but if they are not then returns to retailers involve additional handling prior to transporting to recycling facilities.

Table 3 US State Beverage Container Deposit-Refund Systems

State	Since	Containers covered	Deposit,	% Returned	Handling Fees
California	1987	Beer, soft drinks, wine coolers, mineral water	<24 oz, 2.5¢ >24 oz, 5¢	Aluminum 88% Glass 76% PET 50% Overall 84%	Per container processing fee
Connecticut	1980	Beer, malt, soft drinks, mineral water	Minimum 5¢	Cans 88% Bottles 94% Plastic 70-90%	Beer, 1.5¢; Soft drinks, 2
Delaware	1982	Non-aluminum beer, malt, soft drink, mineral water <2qt	5¢	Insufficient data	20% of deposit
Iowa	1979	Beer, soft drinks, wine, liquor	5¢	Aluminum 95% Glass 85% Plastic 70-90%%	1¢
Maine	1978	Beer, soft drinks, wine, wine coolers, liquor, juice, water, tea	Beer, soft drinks, juice: 5¢. Wine, liquor: 15¢	Beer, soft drink 92% Spirits 80% Wine 80%	3¢
Mass.	1983	Beer, soft drinks, carbonated water	5¢	Overall 85%	2.25¢
Michigan	1978	Beer, soft drinks, canned cocktails, carbonated and mineral water	Refillables: 5¢; Nonrefillables: 10¢	Overall 93%	25% of unclaimed deposits
New York	1983	Beer, soft drinks, wine coolers, carbonated mineral water, soda water	5¢	Wine cooler 63% Soft drink 72% Beer 81%	1.5¢
Oregon	1972	Beer, malt, soft drinks, carbonated mineral water	Standard refillables: 3¢; Others: 5¢	Overall 85%	None
Vermont	1973	Soft drinks, beer, malt, mineral water, liquor	Soft drinks, beer: 5¢ Liquor: 15¢	Overall 85%	3¢

Source: Colby College (www.colby.edu/economics/faculty/thtieten/ec476/EE-5.pdf)

A more general form of a deposit refund is a combined product tax and recycling subsidy. This can either be pursued in the form of the EPR system, as discussed above, or separate instruments. Of note, where industry has been obligated to achieve recycling targets, and presumably has the incentive to do so at least cost, it has not used deposit refund schemes to achieve them but has adopted a broader form of product charge and recycling subsidy.

2.9. Voluntary Approaches

The discussion of the different economic instruments above has, in all cases, assumed that the government, at central or local level, acts to introduce the measures. The New Zealand government has shown some interest in pursuing EPR systems through

voluntary means, ie industry taking on responsibility for achieving targets and introducing voluntary levies and subsidies. There are considerable constraints to such an approach.

Fundamentally companies are profit maximisers. While there is evidence of industry taking steps to reduce its environmental burden, in broad terms, where this is not in response to a regulatory requirement, it can be expected to be:

- in pursuit of longer run profit maximisation, eg part of a marketing strategy;
- because of a wider set of managerial objectives, eg personal beliefs of management which can not be expected to be broadly shared, certainly not by publicly listed firms with responsibilities to share holders; and/or
- a short measures to avoid government regulation, ie just enough to stop government from regulating.

Voluntary measures will thus tend to be small in scale, ie the level of burden that will be accepted voluntarily would be expected to be small. They will also tend to be applied inconsistently across industry—there will be free-riders that do not act and those that act to different degrees, eg reflecting different markets (and thus consumer interest in positive environmental image), different personal views and different expectations of government's likelihood of regulating. This means the cost burden is spread inefficiently.

Consistent with these views, the OECD in a review of voluntary approaches to environmental policy noted that there are few cases where voluntary approaches have improved the environment beyond a business-as-usual baseline.[66]

In waste management, as discussed above, some measures have been taken voluntarily in New Zealand, including the recent levy established by the glass industry to address a supply-demand imbalance in glass cullet recycling. But these steps are likely to be short term, particularly because of the perceived impact on competitiveness of a levy that applies to glass but not to other materials.

It is possible that limited additional steps can be taken under voluntary regulation. However, if the level of cost burden to be borne by industry is significant, and thus if it is to make a significant difference to the burden faced by local government, there will be a need for government to act.

[66] OECD (2003) Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency and Usage in Policy Mixes

3. Conclusions

The waste management problem in New Zealand can be characterised as the environmental effects of landfill disposal. Because the full costs of landfill disposal are not reflected in disposal prices, and disposal prices are not passed on efficiently to decision makers or at decision points, volumes of waste are greater than is optimal.

The theoretically ideal instrument for waste management would impose a charge on landfill disposal to ensure that disposal costs reflected their full costs to society in the long run. In an ideal world these costs would be passed on to industry and households resulting in two effects: incentives for input substitution (different materials used in product manufacture so that they produce less waste or are more recyclable) and for output reduction (less waste produced and/or more recycled). However, landfill is not fully priced, and even if it were, it might not provide incentives efficiently because waste producers (households and industry) do not always face the full marginal costs of disposal. In addition, there is a potential for undesirable dumping of waste that might be encouraged.

In the light of these limits to the effectiveness (and efficiency) of the ideal disposal charge, an alternative is to provide separate incentives for input substitution and output reduction, for example through a charge on products and a subsidy for recycling. Options for introducing such an effect include:

- a separate product charge coupled with ongoing local government subsidising of recycling; or

- extended producer responsibility (EPR) schemes that introduce obligations on industry to achieve recycling and which operate in practice through the establishment of a "voluntary" charge and subsidy mechanism to achieve compulsory obligations.[67]

A tradable permit scheme for landfill, as recently introduced for biodegradable waste in the UK, has similarities both to EPR schemes and a disposal charge.

- It is similar to an EPR scheme in the sense that it clearly distributes a national obligation to individual parties. The obligation is specified in the form of a cap on undesirable activity (landfilling) rather than a targeted level of desirable activity (recycling) as is typically used in EPR schemes. It provides incentives to find the least cost means to achieve the target. It distributes the obligation to local government and it is difficult to se how it could be distributed to individual firms in the same way.

[67] It is voluntary in the sense that industry has flexibility as to how it meets its obligations. International practice suggests that it is likely to choose to introduce a charge system to fund recycling subsidies but these are voluntary charges as the option is for each obligated firm to fulfil its obligation on its own, eg by collecting and recycling the waste.

- It is similar to a disposal charge as, economically, it will function in the same way. If there is a sufficiently liquid market for allowances, the requirement to hold allowances will be viewed simply as a price of landfill disposal, albeit that the price is determined by the costs of the steps taken to divert from landfill.

It may be a more effective way to ensure that the costs of landfill disposal are passed on—the quantity obligation requires that incentives are introduced. Despite the UK experience, it is a more difficult instrument to use where targets are set for individual waste streams, because of the requirement for monitoring materials entering the landfill.

Advancing the introduction and use of economic instruments to achieve waste management objectives requires clarification of the nature of the problem and who should pay. More specifically whether the issues are of national or local concern, and whether the burden of waste management costs should be passed on to waste producers to a greater extent rather than being borne, initially at least, by local government.

A product charge introduced to encourage waste reduction, on top of the existing system of local government funding of recycling, has the advantage of allowing local communities to take account of their local value of (willingness to pay for) recycling. However, in the context of national targets for recycling, more will be paid in some areas and less than others than would occur in a national system (such as an EPR scheme) that can achieve national recycling targets cost-effectively.

Advancing this requires an understanding of whether recycling and waste management objectives should be set nationally or locally. More specifically, are the issues at stake local or national in nature? If the waste management issue is chiefly concerned with the external costs of landfill, then these are local issues that will result in a local willingness to pay. If however, they relate to wider issues of inefficient resource use, then they might be appropriately tackled at the national level. The issues are inter-related: under-pricing of landfill locally results in inefficient national resource use.

A practical difficulty that stems from defining the problem as local in extent is that it limits the option of passing costs on to industry, consistent with the polluter pays principle and cost internalisation; local government has no effective means of imposing a product charge, for example. A national level product charge, with revenues retained by central government (or distributed to local government in a way that does not relate to quantities recycled), coupled with local subsidies on recycling, may be the most efficient approach.

The government has noted its desire to shift the costs of recycling further to industry and ultimately consumers, while reducing the cost burden on local government and households as ratepayers. EPR systems do this by introducing clear obligations for industry and providing incentives for industry to introduce product charges and recycling subsidies.

If EPR is to be pursued, there is a need for clarity on the respective roles, and thus the relative cost burden, of local government and industry. In other countries, Germany has

passed the cost burden for recycling fully to industry while France and the UK have retained a local government role in recycling collection. There is no straightforward best approach to this, but it is an important design decision that needs to be made by the government. In addition, within industry, the cost burden needs to be passed on in a way that relates to the relative costs and benefits of recycling. This includes the appropriate setting of targets amongst materials (and whether they should be all-material or single material targets) and ensuring that the costs borne by industry reflect the costs specific to the material handled.

The government has made clear its intention to pursue EPR as a future direction for waste policy, and this is consistent with the principles for an efficient economic instrument. It is also likely that the government will need to regulate to make EPR happen. There is very limited scope for voluntary action to achieve a significant shift in the cost burden towards industry and away from local government. The design issues noted above need to be clarified as a first step.