INDEPENDENT REVIEW OF CONTAINER DEPOSIT LEGISLATION IN NEW SOUTH WALES

FINAL REPORT – VOLUME II

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INDEPENDENT REVIEW OF CONTAINER DEPOSIT LEGISLATION IN NSW

VOLUME II

COSTS AND BENEFITS OF CONTAINER DEPOSIT LEGISLATION IN NSW


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Independent Review of Container Deposit Legislation in New South Wales

Executive Summary

Container deposit legislation (CDL) describes legislation that establishes a deposit and refund system for used containers. As part of the review of the New South Wales (NSW) Waste Minimisation and Management Act (1995), the NSW Minister for the Environment, The Hon Bob Debus, commissioned Dr Stuart White to conduct an Independent Review of Container Deposit Legislation in NSW (the CDL Review).

Container deposit legislation is an example of an increasingly important environmental management principle, known as extended producer responsibility (EPR). Dr White was, therefore, requested to investigate the broader principle of EPR with reference to international experience, including how it might be implemented in NSW. This investigation, contained in *Volume I* of this report, revealed that EPR is a strategy worth pursuing. It has the potential to deliver improved waste management and broader environmental outcomes in NSW, in an economically efficient manner.

The new Waste Act contains provisions which are consistent with the best practice elements of EPR recommended in this Review.

In accordance with the terms of reference of the Waste Act Review, *Volumes II* and *III* of the CDL Review *describe and assess the effectiveness of container deposit legislation in litter and waste management* in the NSW context. After initial investigation, the CDL Review focussed on CDL applying to post-consumer beverage containers made from materials currently recycled. The Review then examined the appropriateness of the introduction of such legislation in the NSW context by assessing:

- stakeholder and community attitudes to container deposit legislation;
- costs and benefits of container deposit legislation on both a whole of society basis and in respect to key stakeholder groups; and
- the feasibility of container deposit legislation given the current industry, institutional, and legislative frameworks.

The CDL Review found that stakeholder attitudes to CDL are highly heterogeneous, with strong support from local government and environment groups, majority support from the community, limited support from the recycling industry, and opposition from the beverage, packaging, and retail industries.

When both financial and environmental impacts were considered on a whole of society basis, the potential benefits of introducing CDL in NSW were found to significantly exceed the costs. The annualised net economic benefit of CDL in NSW in the case where recovered container materials are recycled was found to be of the order of $70-100 million per year compared to the current situation. This net economic benefit is largely due to environmental benefits that were valued by the CDL Review at $100-150 million per year. This valuation of environmental benefits is exclusive of the value of improved visual amenity due to litter reduction. Litter reduction is, however, an important benefit to be gained from CDL and has historically been a major driver for its introduction both in Australia and overseas.

In summary, the estimated value of the environmental cost of disposing of a single average beverage container to landfill, compared to recycling that container, is 8-9¢. The cost of recovering that container through a combined CDL and kerbside recycling strategy is approximately 2-3¢.

Consumers of containerised beverages were identified as the stakeholder group that would bear the largest cost burden if CDL were introduced in NSW. The beverage industry and both large and small retailers would also be likely to incur net costs under such a system. The magnitude of these costs would depend strongly on the extent to which they were able to pass them on to consumers and also on the type of CDL system established.

Local government, in contrast, would realise financial benefits from the introduction of CDL, through reduced costs of kerbside collection and through the value of unredeemed deposits in the material collected at kerbside. The timing, and extent of these benefits would depend on the timing of renewal and negotiation of recycling contracts relative to the introduction of CDL, in cases where councils use contractors for kerbside collection. It would also depend on the terms of such contracts in relation to the ownership of used container materials and the unredeemed deposits.

New South Wales has a very high recovery rate for old newsprint, at approximately 75% in 2000. The frequency and convenience of kerbside collection is a major factor in this recovery rate, and therefore it would be important to ensure that CDL did not compromise this success. The modelling and analysis that has been undertaken in this Review indicates that the introduction of CDL will ultimately improve the financial performance of kerbside recycling by reducing its costs. There would be no financial justification for any council to reduce the frequency and convenience of kerbside collection of paper as a result of the implementation of CDL.

The CDL Review estimated that there would be a net employment increase of between 1,000 and 1,500 full time jobs if CDL were implemented, depending on the option. Potential long term losses of employment are mainly from kerbside recycling, MRF sorting and garbage collection, estimated at 25 jobs, with the net increase in jobs being due mainly to employment in collection centres or retail outlets.

Other stakeholder groups likely to benefit financially from CDL due to collection and donation of deposit bearing containers are charities and some disadvantaged sections of the community.

The CDL Review concluded that NSW would obtain overall benefits from the significant improvement in the container material recycling rate and the reduction in litter that could be expected to result from the introduction of a best practice form of CDL. The Review considers that the desired outcomes of high recycling rates and reduced litter are also achievable through other regulatory mechanisms such as mandatory recovery and recycling targets. However, it notes that international experience has found deposit-refund systems to be the most effective mechanism for achieving high container recovery rates.

There are several issues that would warrant further attention prior to the development of container deposit legislation or other forms of extended producer responsibility in NSW. Primary among these are potential legal impediments. These impediments would be less likely to arise if the deposit-refund or other form of EPR system were established by industry or implemented at a national level. The current opposition of important industry stakeholders to CDL will also warrant consideration, as will an effective mechanism for the administration and regulation of the system. With careful reference to previous Australian and international experience with EPR schemes in general and deposit-refund systems in particular, it would be possible to implement an effective and economically efficient container deposit-refund system in NSW.

The overall conclusion of the CDL Review is that:

The potential benefits of, and level of community support for, significantly increased recovery of used containers are such that action should be taken to ensure that the recovery rates are

raised to a more economically optimal level based on total benefits to society. The current mechanisms for container collection and recycling are unlikely to achieve these rates and the current targets in relevant Industry Waste Reduction Plans are well below these optimum levels.

Recommendations

In regard to the implementation of the principles of extended producer responsibility in NSW, the CDL Review recommends that:

- *Policy and legislative frameworks in NSW be amended to incorporate the principles of EPR and to facilitate its effective implementation.*
- *The NSW Government seek agreement at a national level for the adoption of EPR. This would allow a more effective model of EPR to be developed for NSW by addressing constitutional and cross-border issues.*
- *Legal impediments to EPR, specifically those relating to constitutional, mutual recognition and taxation issues, be fully investigated.*
- *Product-specific EPR programs be developed that incorporate mandatory performance targets.*
- *Industry be given the opportunity to determine how they will meet the performance targets specified by product-specific EPR programs, e.g. via the establishment of voluntary schemes that provide appropriate environmental, economic and social benefits, with an understanding that mandatory schemes will be implemented if the voluntary schemes fail to achieve their performance targets.*
- *Products are selected for development of an EPR program based on analysis similar to that conducted for beverage containers in the CDL Review. This would include a comprehensive analysis of the total costs and benefits to society, including externalities, and the use of representative and deliberative processes of public participation.*

Regarding container deposit legislation in NSW, the CDL Review's recommendation is that either:

1. *Container deposit legislation be introduced that establishes a container deposit and return system with the following features:*
   - *Deposit applicable to all beverage containers made from aluminium, glass, PET, HDPE, other plastics, liquid paper board and steel;*
   - *Mandatory acceptance of used containers and refund of deposits by all retailers of deposit bearing containers. This should be subject to exemptions and/or qualifications that would prevent an inequitable burden being placed on small retailers where these exemptions would not compromise consumer access and convenience;*
   - *Should point of sale return not prove possible to implement, a depot or collection centre based CDL system should ensure accessibility, preferably requiring retailers with a threshold turnover level to provide facilities near retail outlets;*
   - *A uniform deposit level of ten cents initially with provision to alter the level of deposits on certain container types at the discretion of the Minister for the Environment;*

- *A mechanism for ensuring that those parties involved in the acceptance of used containers and refunding of deposits are adequately compensated for those service, and*
- *A mechanism for expanding the range of containers subject to a deposit.*

Or

2. *The strengthening of industry recycling targets to levels that achieve equivalent outcomes to those that could be expected to result from the introduction of CDL. These targets should therefore:*
   - *Achieve recovery rates for the recycling of used container materials of ninety percent, and;*
   - *Apply as a minimum to beverage containers, with provision for expansion to encompass other container types.*

List of Abbreviations

ABS	Australian Bureau of Statistics
ACF	Australian Conservation Foundation
ACI	Australian Consolidated Industries
AFGC	Australian Food and Grocery Council
ALGA	Australian Local Government Association
ANZECC	Australia and New Zealand Environment and Conservation Council.
ARA	Australian Retailers Association
ASDA	Australasian Soft Drink Association
BRRU	Business Review Regulation Unit
BIEC	Beverage Industry Environment Council
CSD	Carbonated Soft Drink
CBA	Cost-Benefit Analysis
CDL	Container Deposit Legislation
CRI	Container Recycling Institute
CUA	Clean Up Australia
DBC	Deposit Bearing Container
DOC	Drop Off Centre
EPA	Environmental Protection Authority
EPP	Extended Public Participation
EPR	Extended Producer Responsibility
ESD	Ecologically Sustainable Development
GAO	General Accounting Office (US)
GSR	Greater Sydney Region
HDPE	High Density Polyethylene
IQCA	Interviewer Quality Control Australia
IWRP	Industry Waste Reduction Plan
KAB	Keep Australia Beautiful
KESAB	Keep South Australia Beautiful
LCA	Life Cycle Assessment
LGA	Local Government Area
LGSA	Local Government and Shires Association
LPB	Liquid paperboard
LRA	Litter Research Association

LRRA	Litter and Recycling Research Association
MGB	Mobile Garbage Bin
MRF	Material Recovery Facility
NARGA	National Association of Retail Grocers of Australia
NCC	Nature Conservation Council
NEPM	National Environmental Protection Measure
NPC	National Packaging Covenant
NSDA	National Soft Drink Association (US)
NSW MDPA	New South Wales Milk and Dairy Products Association
OECD	Organisation for Economic Co-operation and Development
PACIA	Plastics and Chemicals Industries Association
PCA	Packaging Council of Australia
PEN	polyethylene napthalate
PET	polyethylene terephthalate
POS	Point of Sale
PRO	Producer Responsibility Organisation
PVC	polyvinyl chloride
RVM	Reverse Vending Machine
SLCA	Streamlined Life Cycle Assessment
UCM	Used Container Materials
WRCM	(Australian) Waste Recycling and Cost Model
WTP	Willingness to pay

Glossary of Key Terms

The meanings of key terms used in the report are summarised below. Several of the meanings are specialised ones for the purposes of this report.

The Act	NSW Waste Minimisation and Management Act 1995.
At home recycling	Refers to recycling taking place at home. For the current situation in NSW, at home recycling has been assumed to be kerbside recycling.
Away from home recycling	Refers to recycling of used container materials generated at public places, special events, or commercial premises (such as restaurants and pubs).
Bale	A compacted and bound cube of recycled material.
Beverage Containers	Unless otherwise stated, in this report beverage containers refers to containers for carbonated soft drink (CSD), new age beverages, still water, milk, soy-milk, beer, wine, spirits, juice, and cordial. Tea and coffee are excluded.
Brand Owner	(a) a person who is the owner or licensee of a trade mark under which a product is sold or otherwise distributed, whether the trade mark is registered or not; (b) in the case of a product that has been imported, the first person to sell that product in the importing country; (c) in respect of in-store packaging, the supplier of the packaging to the store.
Capital Costs	The costs associated with capital or investment expenditures on land, plant, equipment or inventories. Unlike labour and operating costs, capital costs are independent of the level of output.
Carbonated Soft Drink	Mineral waters (natural and artificial) and aerated waters (including sweetened and flavoured and others), canned and bottled. It excludes bulk pre-mix and post-mix concentrates, excludes still water and excludes juice.
CDL	Container Deposit Legislation (CDL) refers to a law that mandates the placing of a refundable deposit on specified types of containers to encourage the return of used containers for recycling.
CDL Review	The Independent Review of Container Deposit Legislation in New South Wales, of which this document is one volume.
Collection Centres	Facilities to collect used beverage containers and refund deposits. This includes depots and zones of convenience facilities (such as supermarkets) but excludes mandatory point of sale locations.

Collection Points	See *Points of Collection*
Consumer	Anyone who purchases a deposit bearing container under a deposit-refund system.
Container	For the purpose of this report, *container* refers to rigid, sealed packaging which preserves and/or contains beverages, food or non-food consumer products.
Container Materials	In this review the container material types considered were aluminium, glass, PET, HDPE, liquidpaperboard, and steel. In this report the term *container materials* is usually used in relation to aggregated mass flows (see *Material Flows*)
Convenience Centres	Small collection centres located in convenience zones such as supermarket carparks. The California CDL system and Option 4d and 4e in the CDL Review are based on the existence of convenience centres.
Cost-benefit Analysis (CBA)	An economic technique applied to public decision-making that attempts to quantify in dollar terms the advantages (benefits) and disadvantages (costs) associated with a particular policy.
Charities	For the purpose of this report, 'charities' refers to non-profit organisations that actively participate in the CDL system in order to raise funds. This may involve activities such as door-to-door bottle collection or operation of a collection centre.
Cleaner production	The term used to describe the systematic process a business undertakes to avoid waste production and environmental harm through better process management. Cleaner production looks at the material flows of a business from purchasing through to disposal and assesses ways that waste can be avoided and environmental impacts minimised.
Deposit bearing container (DBC)	Refers to container types that incur a deposit under the deposit-refund system being discussed.
Deposit level	The value of deposit added to the cost of each container paid by the consumer and fully refunded upon return of the empty container to a registered 'point of collection'. This value is additional to any handling fee (which is not refunded).
Deposit-refund system	A system where a payment, or deposit is made when a product is purchased and is fully or partially refunded when the product is returned to an authorised point of collection. A *CDL system* is a type of deposit refund system where containers are the subject of the deposit and the deposit is mandated in law. Containers may also be subject to a deposit under voluntary deposit-refund systems that have

	been established by industry in response to recycling or refillables targets.
Depot	A facility that has the capacity to accept large numbers of containers for recycling. If a CDL system were introduced in NSW a large proportion of these depots would be sited at existing council run facilities that currently collect a range of materials for recycling.
Distributional impacts	The net costs and benefits of a regulatory policy across the population and economy, divided up in various ways - for instance, by income groups, race, gender, and industrial sector. Distributional effects of a regulation may also span over several generations.
Ecologically sustainable development	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased (NSW EPA, 2000b p287).
Economic Costs/Benefits	In this report, economic costs and benefits are impacts considered on a whole of society basis and include financial costs/benefits as well as the economic value of environmental or social impacts.
Extended Producer Responsibility (EPR)	Extended Producer responsibility (EPR) is a policy approach in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle. There are two key features of EPR policy: (1) the shifting of responsibility (physical and/or economically, fully or partially) upstream to the producer and away from municipalities, and (2) to provide incentives to producers to take environmental considerations into the design of the product (OECD, 2000 p20).
Escheats	See *Unclaimed deposits*.
Externalities	By-products of activities that affect the well-being of people or damage the environment, where those impacts are not reflected in market prices. Many aspects of environmental degradation, such as air pollution, global warming, loss of wilderness, and contamination of water bodies, are viewed as externalities of economic transactions.
Financial Costs/Benefits	In this report, financial costs or benefits are impacts considered either on a whole of society basis or in respect to groups or individuals within the society. Financial costs and benefits do not include the value of environmental or social impacts.
Full cost pricing	The pricing of commercial goods that would include in the final prices faced by the end user not only the private costs of inputs, but also the costs of the externalities created by their production and use.

Handling Fee	The payment made to retailers and others for the services facilitating container return, including accepting, sorting, counting, record keeping, storing and transporting deposit-bearing containers, and refunding deposits.
Industry	Refers to those actors involved in the production, distribution and sale of packaged beverages. This includes fillers, importers, distributors, brand name holders, manufacturers and retailers.
Industry Waste Reduction Plan (IWRP)	Means an IWRP in force under Part 4 of the NSW Waste Minimisation and Management Act 1995. IWRPs set out the commitments and waste reduction targets of industry members and organisations or individuals that engage in activities relating to an industry's waste.
The Kerbside Assessment	Refers specifically to the Nolan-ITU & Sinclair Knight Merz (2001) *Independent Assessment of Kerbside Recycling in Australia*.
Kerbside recycling collection	Roadside collection of domestic waste separated for the purpose of recycling or otherwise using those materials so separated. Kerbside recycling is usually a service provided by Local Government and funded largely at present through rate collection.
Life Cycle Assessment (LCA)	An approach that studies the entire environmental effects of a product or material that occur from production to disposal. Because the CDL Review was concerned with the environmental impacts of post-consumer packaging, the life cycle was limited to waste collection through to material reprocessing or landfill. The actual use of packaging in the distribution, marketing and use of products was not included in the CDL Review's LCA.
Litter	In this report, litter refers to domestic or commercial refuse, debris or rubbish including glass, metal, plastic, cigarette butts, paper, fabric, wood, and food.
Marginal costs	The cost of producing another unit of output from a good or service. The marginal cost is derived from the variable costs - the extra labour and raw materials, for example - and does not include fixed costs, such as the capital cost of a factory.
Material Flow	The mass or quantity of a material that passes through a given point in the system per annum. For example, the mass of containers disposed to landfill each year.
Material Recovery Facility (MRF)	Waste depot at which recyclable materials are sorted and recovered in preparation for recycling or reuse. Many recyclables collected by kerbside recycling services are sorted according to material type at MRFs.
Materials	A business that converts used items into other items or materials that will be

Reprocessor	used again.
New Age Beverages	For the purposed of this report New Age Beverages refers specifically to energy drinks, sports drinks and teas and excludes juices and bottled waters.
Opportunity cost	The cost of an economic activity forgone by the choice of another activity.
Options	A number of options for the management of container materials in NSW were described and quantitatively modelled by the CDL Review. These options are described in *Section 3.2* and for the purpose of this report 'Options' refer to those described in that section.
Packaging	Any material or combination of materials designed for the containment, protection, preservation, marketing and handling of retail consumer products.
Pilfering	For the purpose of this Report, pilfering refers to the collection of deposit bearing containers from kerbside or other recycling facilities by unauthorised persons or organisations.
Points of collection or **Collection Points**	Refers to the generic term for all locations whereby a deposit can be refunded upon the return of a deposit-bearing container. It thus includes collection centres and point of sale locations.
Point of Sale (POS)	Describes a system under which all retailers of deposit bearing containers are required to act as a point of collection for used deposit bearing containers. POS may also refer to all retail outlets that have obligations under a POS system.
Polluter Pays Principle	The polluter pays principle expands private sector responsibility for the conservation of resources and pollution reduction (OECD, 1998a p2). It is the notion that those who generate or handle pollutants should bear the damage costs to the environment (Commonwealth EPA, 1992 p12).
Price elasticity	The responsiveness of quantity demanded to a change in price. It is measured crudely as the ratio of the percentage change in quantity to the percentage change in price.
Producer Responsibility Organisation (PRO)	Under a deposit/refund system, a third party, often industry-based is set up to allow producers to collectively manage and collect their used products and product containers, in addition to managing the funds of the system. Such industry based third party organisations are often referred to as Producer Responsibility Organisations (PRO).
Product	An ethic of shared responsibility for the lifecycle of the product through to and

stewardship	including its ultimate disposal.
Public Place	Public place includes beaches, parks, streets, shopping centres.
Recovery rate	The proportion of used containers returned for recycling or reuse.
Recycle	In relation to a product, means recover the product and use it as a raw material to produce another product.
Refillables	Beverage containers which can be refilled and reused without remanufacturing. The used beverage containers are usually collected and returned to the distributor for refilling. Beverage containers which can be refilled include glass, PET or PEN. Refillables are sometimes referred to as 'returnables' or 'reuseables'.
Relative costs	Refer to the difference in costs between the various options developed in the CDL review. Unless otherwise stated, the relative costs are those compared to *Option 1a*: *Landfill Only*.
Retailer	A person or organisation that sells deposit-bearing containers to a consumer.
Reverse Vending Machine (RVM)	Similar in concept to a beverage vending machine except instead of inserting money and receiving a beverage, the empty beverage container is inserted and the deposit is refunded.
Scenarios	There are five broad scenarios for recycling that were considered in the CDL Review. These were landfill only (no recycling), recycling depots only, current kerbside recycling and two CDL systems. The scenarios are considered and described in *Section 3.2*.
Secondary Packaging	Post-industrial packaging generally referring to the larger packages which contain the individual container items for storage and transport. Secondary Packaging is not usually captured in a CDL system.
Stakeholder	For the purpose of this report, Stakeholders of CDL refer to manufacturers, importers, fillers, distributors, producers, retailers, consumers, ratepayers, waste managers, local governments and non-profit organisations (charities and environment groups).
Still Water	For the purpose of this report the terms 'Bottled Water' and 'Still Water' will be interchangeable. Still Water refers to non aerated and non flavoured water.
Streamlined Life Cycle Assessment (SLCA)	Refers to an assessment of the environmental effects of a product or material, that uses the same techniques as full Life Cycle Assessment but has been truncated in terms of either the life cycle stages or impact categories considered.

(SLCA)

(CDL) Televote Survey	Refers to the Televote Survey conducted by the Institute for Sustainable Futures as part of the social research component of the CDL Review. See Volume II of this report for CDL Televote Survey and analysis of results.
Unclaimed Deposits	Often referred to as 'escheats', unclaimed deposits are those paid by the consumers that are not claimed by any person or organisation as the container has not been returned to a certified collection point. Note that unclaimed deposits do not include those claimed by Local Government for containers collected through kerbside recycling.
User Pays Principle	The user pays principle resembles the polluter pays principle, in that the users of a product or service are financially responsible for the external costs (such as environmental or social welfare). See *Polluter Pays Principle.*
Voluntary mechanisms	*Deposit/Refund Systems* can be either voluntary or mandatory. Voluntary mechanisms may include industry-based initiatives, government-based, or multi-stakeholder initiatives. They can be agreements negotiated between polluters and other stakeholders or programs developed by a government body in which individual firms are invited to participate.
Waste Audit	An examination and division of a quantity of waste into its components for measurement and analysis.
Whole of society costs and benefits	Whole of society costs and benefits consider impacts in total rather than impacts on any stakeholder group (e.g. consumers, retailers or manufactures). Whole of society costs and benefits do not include transfer payments between different stakeholder groups. Whole of society costs and benefits include some impacts that occur outside of NSW.

Section 1: INTRODUCTION & METHODOLOGY

1.1 Introduction

This report forms part of the current review of the NSW Waste Minimisation and Management Act 1995 (the Act). This legislation was introduced to ensure that waste management in NSW focussed on waste minimisation as well as the provision of disposal infrastructure. The Act aims to encourage waste minimisation through a number of mechanisms including avoidance of waste creation, reuse of materials, and recycling as well as setting waste reduction targets. Section 39 of the Act refers to the potential for introduction of container deposit legislation, and Section 42 refers to refundable deposits among other mechanisms as a means for ensuring that waste reduction targets are met.

As part of the review of the Act, the Minister for Environment NSW, the Honourable Bob Debus, commissioned Dr Stuart White of the Institute for Sustainable Futures, University of Technology Sydney, to conduct an Independent Review of Container Deposit Legislation (CDL) in NSW.

The results of the review of CDL in NSW are presented in three volumes:

- **Volume I: Extended Producer Responsibility: Principles, Policy and Practice in NSW**

  This volume provides a detailed briefing on the principles of EPR, and an overview of current international 'best practice' in its application and analysis of how these principles might affect waste policy in NSW.

- **Volume II: Cost-Benefit Analysis of CDL in NSW**

  This volume provides the methodology used, and the results of modelling undertaken to determine the costs and benefits of the introduction of CDL in NSW.

- **Volume III: Consultation and Social Research on the Introduction of CDL in NSW**

  This volume discusses the social research undertaken to determine the views of members of the NSW community to the introduction of CDL in NSW.

1.1.1 Report Structure

This volume, describes the cost and benefits of introducing CDL in NSW and is set out as follows:

Section 1 introduces the aims and scope of this volume and outlines the rationale for the methodology used.

Section 2 provides an overview of international and Australian CDL systems and describes the current waste management and recycling legislative framework in Australia, and specifically in NSW. It also provides an overview of the current consumption and disposal of containers in NSW.

Section 3 discusses the methodology used in carrying out the cost-benefit analysis (CBA). The scenarios used, and the results of the analysis are presented in this section.

Section 4 outlines implementation issues by discussing various mechanisms by which CDL could be implemented and the potential outcomes and impacts of each. Section 4 also discusses issues which need to be considered should CDL be introduced in NSW.

Section 5 discusses alternatives to CDL, placing it in the broader framework of other economic instruments.

Section 6 contains the recommendations and conclusions based on the analysis undertaken in Volume I of the CDL Review.

1.1.2 Aims of the Review and Terms of Reference

The Terms of Reference for the Independent Review of CDL in NSW are shown below. The sections in the Report (which directly relate to each item answer) are listed in *italics*.

To assess CDL's environmental, economic and social costs and benefits to the community and industry, including:

- its potential absolute and relative contribution to waste reduction (see *Sections 3.3.1 and 3.3.2*);
- its potential contribution to litter reduction (see *Section 3.3.4*);
- likely infrastructure needs in support of the CDL system (see *Section 3.3.5 and Section 4*);
- the estimated infrastructure establishment & operation costs (see *Section 3.3.5*);
- the potential financial impact on the beverage industry (see *Section 3.6.2 and 3.6.3*);
- the community's willingness to pay (see *Section 3.6.4 and Volume III*);
- its potential impact on kerbside recycling (see *Section 3.6.1*)

Additional considerations are to:

- describe and analyse different potential models for implementation of CDL in NSW (*see Section 3.2 and Section 4: Implementation Issues*);
- identify the potential role of supermarkets, council facilities and existing waste or recycling facilities as points of collection (*see Section 3.2 and Sections 3.6.1, 3.6.2 and 3.6.3*);
- determine the relationship between CDL and broader Extended Producer Responsibility (EPR) *(see Section 1.3*), and;
- examine how CDL could impact on or be impacted by other waste minimisation initiatives, including the National Packaging Covenant (*see Section 4.2*).

1.1.3 What is Container Deposit Legislation?

Container Deposit Legislation (CDL) is legislation that mandates for a refundable deposit on certain containers to encourage their return for reuse or recycling. CDL systems require manufacturers to take responsibility for the returned containers by refilling, recycling or disposing of them. There are various mechanisms by which containers can be returned to retailers under a CDL system, such as designated collection centres, point of sale, reverse vending machines, or through the existing waste or recycling collection system.

In some countries, there is a voluntary deposit-refund system on containers. These systems are established by industry without legislation that specifically mandates for a deposit. Voluntary deposit-refund systems are often established in response to recycling or reuse targets that have been set by governments or where manufacturers recognise cost advantages associated with refillable containers.

CDL or voluntary deposit-refund systems are currently in place in South Australia, in 11 states in the USA, most Canadian provinces, and in several European and Asian countries. Several states in Australia are currently investigating the introduction of CDL.

The policy objectives commonly related to CDL are:

- litter reduction, (e.g. South Australian Container Deposit Legislation 1975);
- landfill reduction; (e.g. German Packaging Ordinance 1991).

In the past, CDL (deposit-refund) systems have been introduced in order to meet the above policy objectives (particularly litter reduction) as well as to provide financial savings to manufacturers. Additionally, in some countries CDL is used as a tool to increase the use of refillable containers (see *Section 2.4: Refillables*).

More recently some states have introduced CDL systems to satisfy the societal objectives of waste reduction and producer responsibility (Lindhqvist, 2000 p82). Concepts such as Ecologically Sustainable Development (ESD), Extended Producer Responsibility (EPR), User-Pays, Polluter Pays, and Life Cycle Assessment (see box) have changed the focus of waste management away from reduction of landfill demand alone.

Thus, discussions of CDL need to take a broader perspective than in the past. It is no longer appropriate to consider only the costs and benefits of litter reduction and landfill minimisation associated with CDL. Social, environmental, and broader resource issues must be taken into account. Also under consideration is who should take responsibility (economic, liability, ownership, or physical responsibility) for reducing the environmental impacts of products during their full life cycle.

The last major studies into CDL were conducted in NSW over a decade ago. Since that time there have been significant improvements in the availability of data on waste, litter and recycling. A range of analytical tools such as Life Cycle Assessment and more refined social research techniques for exploring community attitudes and preference have also been developed.

The CDL Review addresses the questions and issues raised by stakeholders (via submissions and interview process), and citizens (who will also be consumers) (in *Volume III: Consultation and Social Research*).

Figure 1.1-1 illustrates a generic system of CDL identifying the main stakeholder groups involved in the container product chain (i.e. producers, users, collectors and recyclers).

Life Cycle Assessment (LCA)

LCA is an approach that determines the environmental impacts of a product from prior to manufacturing (cradle) to after its disposal (grave). A life cycle approach to waste management considers all aspects of a product's life cycle: resource use, materials selection, product design, production processes, storage, packaging, distribution, consumption, treatment, and disposal. See ***Section 3.4: Environmental Costs*** for an explanation of the way in which LCA has been applied in the CDL Review.

Polluter Pays

The Polluter Pays principle expands private sector responsibility for the conservation of resources and pollution reduction (OECD, 1998a p2). It is the notion that those who generate or handle pollutants should bear the damage costs to the environment (Commonwealth Environment Protection Agency, 1992 p.12).

Extended Producer Responsibility (EPR)

EPR is defined as a "policy approach in which a producer's responsibility (physical and/or financial) for a product is extended to the post-consumer stage of a product's life cycle." OECD, 2000 p.20) EPR is an extension of the Polluter Pays principle, with an expanded definition of 'polluter'.

One of the goals of EPR is to identify the actors and actions with the greatest ability to reduce environmental impacts of the product chain. The core of EPR is who pays for, not who physically operates, the waste system. EPR transfers some of governments' and taxpayers' costs and/or physical responsibilities for waste management, to producers (OECD, 2000 p.20).

EPR has been the leading principle underlying take-back programmes such as CDL, which require retailers, distributors and producers to take-back (e.g. packaging) after consumer use of products (OECD, 1998b p.5). The role of EPR is described in detail in ***Volume I.***

Figure 1.1-1 illustrates a generic system of CDL identifying the main stakeholder groups involved in the container product chain (i.e. producers, users, collectors and recyclers).

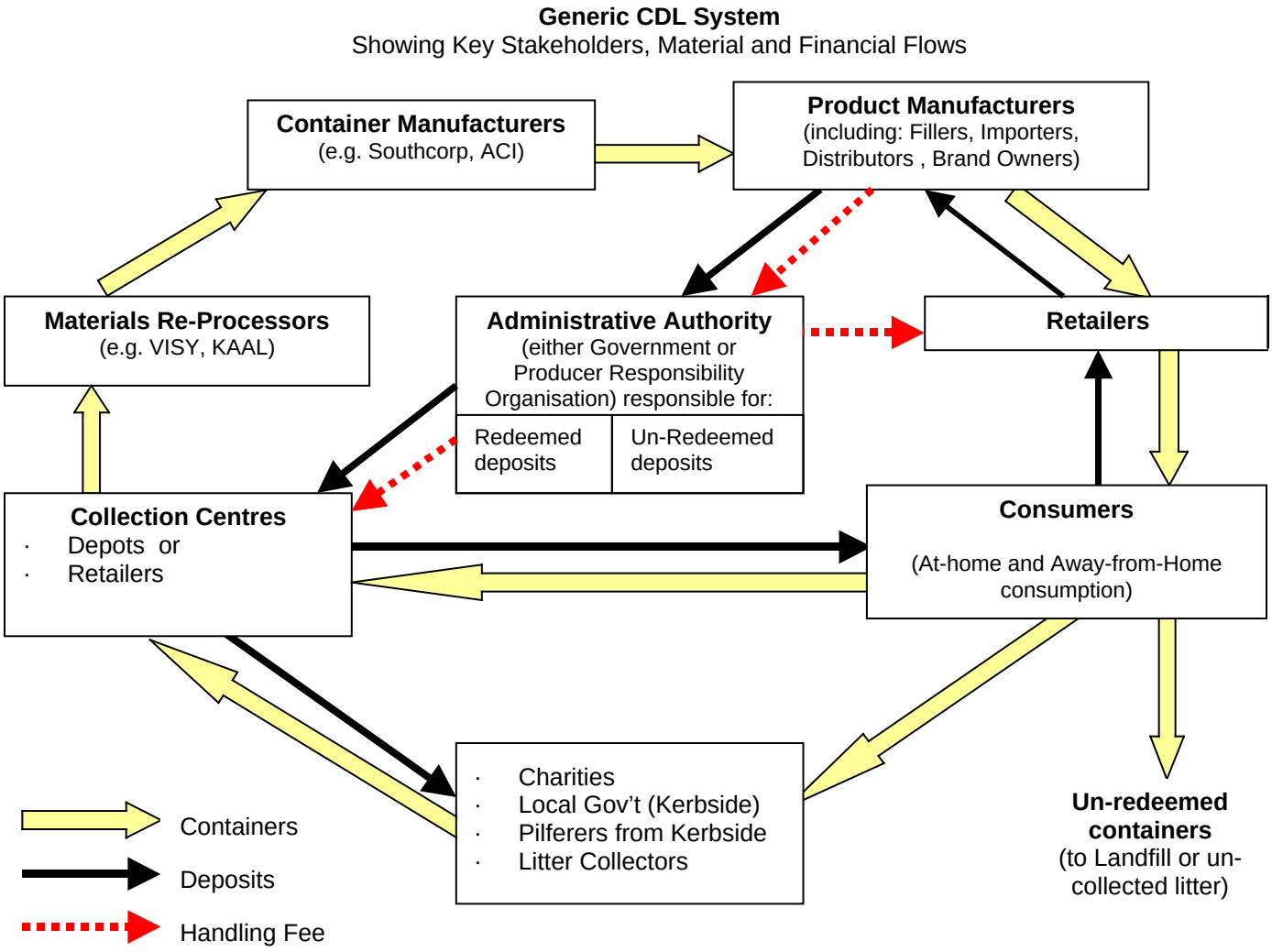

Figure 1.1-1: Generic deposit and refund system for containers showing key stakeholders and flows of deposits, handling fees and containers.

1.2 Methodology

This section describes the method that was used by the Independent Review of Container Deposit Legislation in NSW (CDL Review) to determine the costs and benefits of CDL. Methodology for other components of the review, namely discussion of extended producer responsibility and social research is presented in *Volume I* and *Volume III* respectively. The overarching framework of the CDL Review and the relationship between the three volumes is presented in *Figure 1.2-1*.

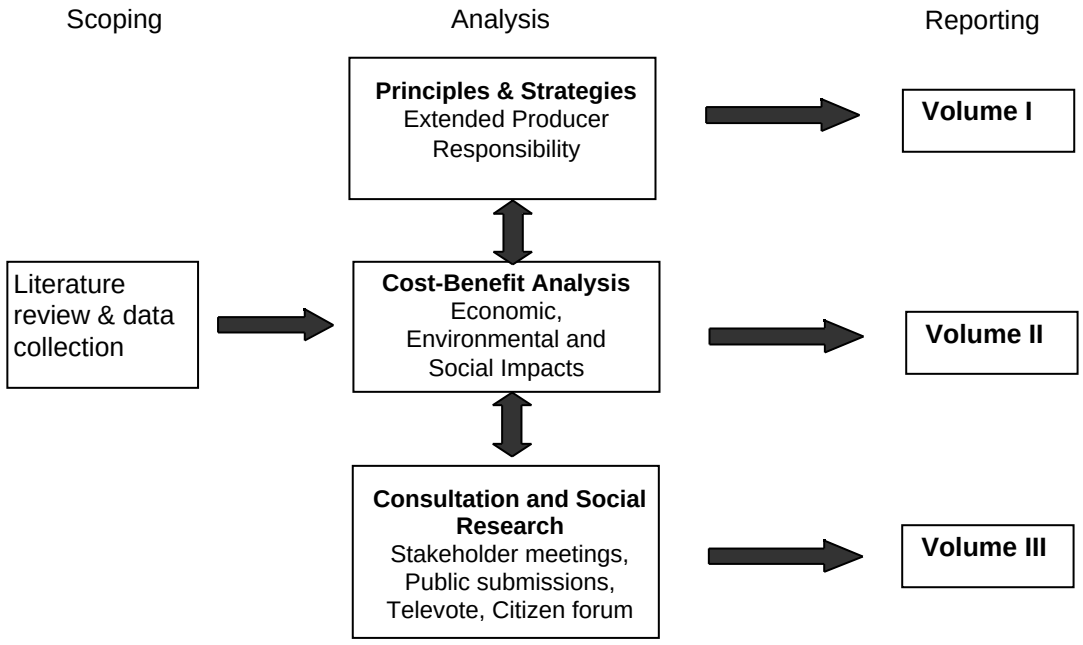

Figure 1.2-1: Overview of CDL Review methodology and outputs.

1.2.1 Overview of Method Used to Determine Costs and Benefits

The CDL Review adopted an approach in which the economic, environmental and social aspects[1] of the recovery and reuse of used beverage containers are investigated, and where possible, quantified. This distinguishes the approach from previous investigations in which, for example, emphasis has been placed solely on the social aspects, such as community concerns regarding litter, or on the economic aspects, such as a reduction in consumer surplus arising from reduced beverage sales.

The assessment of costs and benefits consists of a formal cost-benefit analysis that has been supplemented by the discussion and estimation of several impacts that could not be quantified with sufficient reliability for inclusion in the formal cost-benefit analysis component.

The formal cost-benefit analysis (CBA) involved three steps:

1. Analysis and description of the flows of used containers within the NSW economy;
2. Development of a comprehensive set of scenarios for the introduction of CDL based on different levels of convenience and deposit value including estimation of return rates for the different scenarios based on empirical data; and
3. Analysis based on a whole-of-society perspective, including environmental costs and benefits, along with a consideration of the impacts on various stakeholders.

These three steps are described briefly below. Further detailed method can be obtained from the relevant sections of this volume and its appendices.

[1] An approach which determines the economic, environmental and social impacts of activities of organisations has, in recent times, become known as the 'triple bottom line' approach.

1.2.2 Container and Material Flows

The CDL Review undertook a detailed analysis of the number of containers consumed in NSW, both by number of containers for each product type, and by weight of container materials. The results of the modelling of container numbers based on the consumption of the key product types has been reconciled with the available production data for container materials.

The major categories of beverage products analysed include:

- Beer
- plain and flavoured milk and soy milk
- still water
- spirits
- cordials
- soft drink
- juices
- wine
- new age drinks, including containerised tea, sports drinks and energy drinks

These categories include packaging made from:

- aluminium
- polyethylene terephthalate (PET)
- liquidpaperboard and aseptic (foil lined) packaging (LPB)
- glass
- high density polyethylene (HDPE)
- steel cans

Non-beverage food and non-food container packaging has also been analysed, although data on production of commodities or product packaging is less accurate. Non-beverage container packaging (rigid or semi-rigid sealed containers) incorporates a large range of product categories, including, for example:

- canned food
- food in jars
- detergents and other cleaning products
- motor oil
- canned pet food
- food in plastic containers
- shampoos and other personal cleaning products

Steel cans are one packaging category that is significantly affected by the non-inclusion of food containers. A small proportion of steel can production (estimated at less than 4%) is for the beverage market, and represents fruit or vegetable juice.

The modelling undertaken for this review was based on beverage containers only, with sensitivity testing to determine the impact of including non-beverage containers. This is because:

- beverages represent the majority of containers produced, estimated at more than 85% of all containers, and;
- the food and non-food containers are harder to characterise. Therefore including estimates of the containers numbers and materials will reduce the robustness of the overall findings.

The calculation of container numbers and container material weights for the beverage categories was based on the latest available data on production of commodities from industry representatives, Australian Bureau of Statistics, other government agencies, market research agencies, and media reports. Projection to 2003 has been undertaken in order to compare scenarios based on the assumption that the Industry Waste Reduction Plan targets will be met. Where this projection was seen to be dependent on the trends in consumption and packaging mix, assumptions were made regarding these values based on available information, or trends were extrapolated based on current per capita consumption levels.

The CDL Review obtained a detailed understanding of the flow of containers in the NSW economy by:

- defining the scope and boundaries of the type of container packaging and the system boundaries;
- acquiring data and undertaking calculations based on available information and best estimates;
- presenting and documenting the results.

The data used for estimating and understanding the flow of containers includes statistical data on the consumption of soft drink, beer, wine, milk and other commodities as well as a range of information sources on recycling and disposal rates for used containers, including audits of recycling and garbage. Further details of the sources of information used and the results of this analysis are provided in *Section 2.8: Container Consumption Data* and *Section 2.9: Material Flows*. Data for the largest categories of commodities (e.g. beer, soft drink, milk) are generally of a higher quality and more accurate than for smaller categories (e.g. still water, spirits).

1.2.3 Scenario Development

Scenarios were developed to test the costs and benefits of a number of options for implementing CDL in NSW relative to the current system of collecting used containers and also relative to a hypothetical scenario involving no recycling. These scenarios were designed to test a range of assumptions about the cost effectiveness of various techniques of diverting used containers from landfill. The scenarios included:

- no material being recovered and recycled. All container material and paper waste is disposed of to landfill (referred to in this report as Option 1a – Landfill Only);
- paper only recovered through a kerbside recycling program and through existing commercial arrangements (referred to in this report as Option 1b – Paper Kerbside);
- kerbside recycling and non-residential recycling levels consistent with estimates of levels being achieved in 2000 (referred to in this report as Option 3a – Current Kerbside);
- kerbside recycling and non-residential recycling levels consistent with levels that will need to be achieved for industry organisations to meet their obligations under the relevant Industry Waste Reduction Plans (IWRPs) and provisions of the National Environmental Protection Measure (NEPM) (referred to in this report as Option 3b – Kerbside 2003 IWRP);
- several options for the implementation of CDL which involve the establishment of collection centres or depots in NSW, with the options differing in the relative convenience of these collection centres (Options 4a-4e);
- implementation of CDL in which retailers are required to take back used containers at the point of sale (Options 5a & 5b).

Each scenario required the estimation of the recovery rate of containers through: point of sale, collection centres or depots, and kerbside recycling as well as an estimate of the number of containers being disposed of to landfill. These estimates were based on data from NSW, South Australia, and internationally as reported in available literature.

Recovery rates for containers in scenarios with CDL in place were dependent on the convenience of the system of return, the level of the deposit, the material type, as well as a range of local factors. The first three factors were considered in the estimation of recovery rates for the different scenarios, and sensitivity testing allowed for consideration of the uncertainty arising from these estimates.

1.2.4 Cost-Benefit Analysis

A key objective of the CDL Review was to assess the costs and benefits of implementing CDL in NSW. As with most public policy issues that have environmental and social consequences, the costs and benefits are not always appropriately expressed in financial terms. However, in the case of this Review, there were several relevant categories of costs and benefits for which it was possible to make financial estimates with sufficient reliability for conclusions to be made. These include:

- the cost of establishing an infrastructure for CDL and the operational cost associated with its introduction;
- the decrease in cost of waste disposal to landfill;
- the increased financial and environmental cost of transport associated with taking containers back to collection centres or retailers (under a point of sale return system);
- the decreased financial and environmental cost of household garbage collection and kerbside recycling;
- the decreased environmental cost associated with the life cycle impact of the manufacture of virgin materials and the recycling of used materials for container packaging, and;
- the decreased cost of litter collection by councils.

There are two key differences associated with the cost-benefit analysis employed in this Review and those used by many earlier investigations.

Firstly, the cost-benefit analysis differentiated between economic efficiency from a whole of society perspective and distributional impacts on stakeholders. In calculating costs and benefits from a whole of society perspective, net costs and benefits across all stakeholder groups are considered, and transfer payments between them are ignored. For example, the value of the deposits, and particularly the value of the unclaimed deposits[2] is often included in the cost-benefit analysis. This is inappropriate when trying to determine the overall economic merit of a proposal. It is a cost to consumers who pay deposits but do not return the container, but it is not a net cost to society as a whole.

Secondly, the reduced costs of landfill and litter are based on the marginal cost of landfill and litter, not average costs. In other words, the CDL Review has estimated the reduction in cost that would be likely to result from a decrease in disposal of waste to landfill at the margin, rather than on average. Many of the costs of litter management and waste disposal in landfill sites are fixed costs, and therefore do not vary with the amount of waste disposed of or littered. For example, litter collection costs include the cost of a truck and driver, which may not be reduced in direct proportion to the percentage litter reduction associated with CDL.

[2] Often referred to as 'escheats' and variously retained by the beverage fillers or by a government agency.

1.3 Boundaries and Limitations

The CDL Review has made every attempt to obtain the most recent and reliable information on which to base its recommendations. However, it is never possible to obtain all the necessary information for a complex cost-benefit analysis in reliable form. Assumptions were necessary in order to fill gaps left by incomplete information. The CDL Review has used conservative assumptions in respect to the benefits of CDL to NSW in most places. Sensitivity analysis of key assumptions has also been undertaken. The sensitivity analysis found that the conclusions with regard to the costs and benefits of CDL would not alter, even under significant variation in input assumptions.

That being said, there remain significant limitations to cost-benefit analysis as a tool, particularly in regard to valuing social and environmental impacts. The key limitations in this regard for the CDL Review are discussed below. Also discussed below are issues that the Review was unable to address adequately within the timeframe allowed for the review.

1.3.1 Selection and Valuation of Environmental Impacts

It is not possible to consider all life cycle impacts across all impact categories in any single analysis of environmental costs and benefits. The CDL Review attempted to select impact categories that were consistent with other important studies on the topic of recycling in NSW (Nolan-ITU/SKM, 2001; Grant et al., 2001b). However, the relatively minor differences in input assumptions between the CDL Review's environmental impact assessment and those of the other studies have resulted in significant differences in the valuation of impacts. The CDL Review's valuation has been consistently more conservative in regard to the benefits of recycling than other studies.

1.3.2 Valuation of Visual Amenity

Improved visual amenity through reduced presence of beverage container litter is often considered a key benefit of container deposit-refund systems. Unfortunately, the CDL Review was unable to obtain a sufficiently reliable estimate of the value of improved visual amenity that could be expected from the introduction of CDL in NSW. Visual amenity was not, therefore, included in the formal cost-benefit analysis of CDL.

1.3.3 Valuation of Consumers' Time

Increased inconvenience and demands on consumers' time is sometimes considered the major disbenefit of container deposit-refund systems. The extra time, in addition to that already allocated to kerbside recycling, that consumers use in participating in deposit-refund systems can be valued at the cost of paying a third party to perform the tasks involved. This was done in *Section 3:3.7: Cost of Consumer Travel* and *3.6.4: Impact on Consumers*. However, this value was not included in the formal whole of society cost-benefit analysis because it does not account for the fact that many consumers are willing to pay (by donating time) for improved recycling outcomes and participate in the CDL system for reasons other than financial motivation.

1.3.4 Sensitivity to Changes in Product Mix

The CDL Review did not extensively explore the effect of changing the mix of products to which container deposits were applied. This effect was not explored partly due to lack of adequate consumption and recycling data for non-beverage product types. The limited material and product specific analysis that was conducted by the CDL Review suggests that:

- net benefits could be expected under a CDL system for each individual container material studied in this Review, and;
- significant benefits could result from the inclusion of steel food containers in deposit-refund system.

1.3.5 Net Present Value versus Annualised Costs

The financial costs and benefits calculated in the CDL Review were calculated on an annualised basis over a twenty-year time frame. The use of annualised values rather than net present value may result in a lower estimate of the impact of initial capital expenditure for the first few years of the twenty-year timeframe. However, the use of net present value was not believed to be appropriate given the level of uncertainty surrounding the actual timing and pace of implementation and uptake of any potential CDL system.

1.3.6 Potential Market Distortion Caused by Deposit

The CDL Review did not undertake a thorough micro-economic analysis of the potential economic impact of differential pricing of substitutable products that might result from the introduction of CDL. This was because the results of the cost-benefit analysis conducted as part of the CDL Review suggest that:

- when total costs to society as a whole are considered, the current price of products sold in containers is below the economic optimum (where the economic optimum accounts for externalities associated with container production), and;
- the increase in cost resulting from the introduction of a CDL system (approximately 2-3¢ per container) is less than the economic value of the externalities associated with containers that are landfilled rather than recycled (approximately 8-9¢ per container).

1.3.7 Impacts of Increased Return Rates on the Market for Recyclables

The CDL Review did not undertake a thorough investigation of the ability of the current infrastructure and market for recyclables in NSW to absorb the increased mass of recyclable container materials that would be generated by a CDL system. This issue was not investigated in detail because preliminary research (published reports and stakeholder interviews) suggested that the capacity of both the market and infrastructure, particularly for glass[3], would be sufficient for the increased volumes involved.

[3] Nolan-ITU/SKM (2000 pF8)

Section 2: THE CURRENT SITUATION

Section 2 summarises the key findings of the literature review that was undertaken as part of the CDL Review. It includes:

- an overview of the types of CDL systems currently operating internationally and in South Australia;
- a description of the current legislative framework in NSW and Australia for waste management and recycling;
- relevant information on refillable containers, littering, and motivations for recycling;
- an overview of the current recycling system in NSW and an outline of some of the targets currently set for the recycling of containers, and;
- a quantitative description of the current NSW consumption of container packaging, by both product and material type.

2.1 International Experience

2.1.1 Introduction

This section provides a description of CDL systems in operation internationally, particularly systems currently operating in the United States (US), Canada, Europe, and Israel.

2.1.2 United States

Ten states and one local municipality in the United States have adopted beverage container laws (i.e. CDL) that mandate a refundable deposit on containers for beverages such as soft drinks and beer. These laws were all passed between 1971 and 1986 and a number have since been amended to extend the range of containers included. In order to better reflect the variety of beverages sold, some programs now include fruit drinks, coffee and tea, sports drinks, distilled spirits coolers, pre-mixed spirits drinks, wine, and liquor. The state of Maine made their law simpler, and less likely to need amendment as new types of drinks emerge, by including all beverages except dairy products and unprocessed cider. About 30% of the US population have container deposit laws in their area (Lindhqvist, 2000 p. 84).

2.1.2.1 Overview

Appendix A provides an overview of the container deposit laws in the various states and their system requirements. The experiences of the various states are helpful in considering ways in which CDL can be implemented to maximum effect. Some of these experiences can be seen in the column on unique features in *Table 2.1-1*.

2.1.2.2 Unique features within US CDL systems

State	Unique Features
California	· Actually a buy-back system, not a true deposit-refund system, as deposit is not specified or paid for separately from the product. · Containers are returned to licensed collection centres not retailers. · A collection centre buying back all containers covered by the law must be established within a 0.8 km radius around a retailer with annual sales above US$2 million (AU$3.8 million). · Unclaimed redemption payments go towards program administration, grants to non-profit organisations, recycling and education programs, and reimbursement to municipal governments for the containers collected at kerbside. · Convenience Incentive Payments are available for start-up costs for low volume collection centres.
Columbia, Missouri	· Only existing local (county) container deposit ordinance in the US.
Connecticut	· Establishes a "dislocation fund" to aid workers who lose their jobs because of the law. · Handling fee varies with container type.
Delaware	· Exempts aluminium cans from the deposit system.
Iowa	· Includes wine and liquor containers. · The first $US100,000[1] (annually) in unredeemed deposits from liquor containers was allocated to the Department of Public Health for alcoholic treatment programs (repealed in 1987). · Deposit containers banned from landfills beginning in 1990. · Retailers can refuse to accept containers if they have an agreement with a licensed collection centre.
Maine	· A dealer may refuse to pay a refund value on beverage containers if a licensed collection centre is located within a certain radius of the retail store. · Distributors who initiate deposits have the obligation to pick up containers returned to retailers and licensed collection centres. · Aseptic packages were banned in 1990. The ban was repealed in 1994. · The escheat provision, under which the state collected 50% of unredeemed deposits to support waste management programs, was repealed in 1993 because over-redemption threatened fund security. · There is now a fine of $US100 per container, or $US25,000, whichever is greater, for tendering for redemption of containers purchased out of state.
Massachusetts	· Wholesalers are required to file monthly reports with the Department of Revenue regarding deposits received and refunds given. · The escheat amendment passed in 1989 (implemented in 1990) made all unredeemed deposits the property of the states as of 1990.
Michigan	· 75% of unclaimed deposits go to state funds, 25% to retailers for handling fee.
New York	· Requires reporting of containers sold and redeemed by bottlers and beer distributors.
Oregon	· Only US deposit law with no handling fee.
Vermont	· A dealer may refuse to accept deposit containers if a licensed collection centre is conveniently located to retailer and the retailer receives agency approval to stop accepting the containers.

Table 2.1-1: Unique features within each of the US CDL systems

[1] $US 1.00 = $AU 1.90 (Feb, 2001**)**

2.1.2.3 California CDL system

The CDL system in California operates under the *California Beverage Container Recycling and Litter Reduction Act* (AB2020) which was enacted in 1986. This was introduced 15 years after kerbside recycling was first introduced to the State. A unique feature of that system, in comparison to others in the US, is that the containers are returned to certified collection centres as opposed to retailers. A beverage container recycling goal of 80% was established, and if the return rate for any type of container falls below 65% an increased refund value can be applied.

AB2020 is funded through redemption payments made by beverage distributors to the California Department of Conservation for each beverage container sold. For each container sold or offered for sale, 2.5 cents (US) is paid. Any beverage container over 24 ounces is considered equivalent to two containers and a five cent redemption payment must be made.

The payments are deposited into the *California Beverage Container Recycling Fund* (Fund). Refunds are made to consumers from this fund as a *California Refund Value* (CRV) when empty containers are returned to a certified collection centre.

The California system operates a 'convenience zone' recycling infrastructure that is based in grocery store parking lots. A convenience zone is the area within half a mile (0.8 km) of a supermarket, or a zone designated by the Department of Conservation in areas with no supermarkets. A supermarket is considered a convenience zone area if it is a full line, self service retail store with gross annual sales of $US 2,000,000 or more, and sells dry grocery, canned goods, or non-food items and some perishable goods.

Unclaimed deposits within the system are used to fund the administration of the system, kerbside collection systems, grants for non profit organisations, recyclers, and special projects (Hill, 1997a). A handling fee of 1.7 cents (3.3¢ Aus) per container is paid to qualified collection centres in supermarket parking lots. The maximum handling fee that can be processed for any centre is $2,000/month. *Figure 2.1-1* shows the flow of payments under the beverage container recycling program.

Kerbside systems that collect deposit (redemption) bearing containers receive the California Refund Value (CRV) for the materials collected. The amount paid to each operating area is based on a statewide average proportion of deposit bearing to non-deposit bearing containers in the commingled containers that are collected. The average proportion is determined based on auditing at periodic intervals. Individual kerbside programs can receive an amount higher than the statewide rate by receiving an individual rate from the Department of Conservation. Any system that has an individual rate cannot be surveyed by the Department to determine the statewide average rate (*California Beverage Container Recycling and Litter Reduction Act, 1987*).

Data provided on the California collection system is comprehensive, as distributors are required to report on all sales and redemptions in order to allocate money from the Container Recycling Fund. This allows better analysis of the effects of the program on reducing flows to landfill (see *Table 2.1-2*).

Material	Produced	Overall recovery rate	Total recycled (tonnes)	Depots	Depot recovery rate	Kerbside	Kerbside recovery rate	Landfill	% to landfill
Aluminium	153,938	80%	123,150	104,678	68%	18,473	12%	30,788	20%
Glass	715,612	60%	429,367	347,787	49%	81,580	11%	286,245	40%
PET	65,066	65%	42,293	34,257	53%	8,063	12%	22,773	35%

Table 2.1-2: Flows of aluminium, glass and PET containers in California

Source: Brown, Cheryl. Recycling Specialist, California Department of Conservation, Personal Communication, 20/12/00.

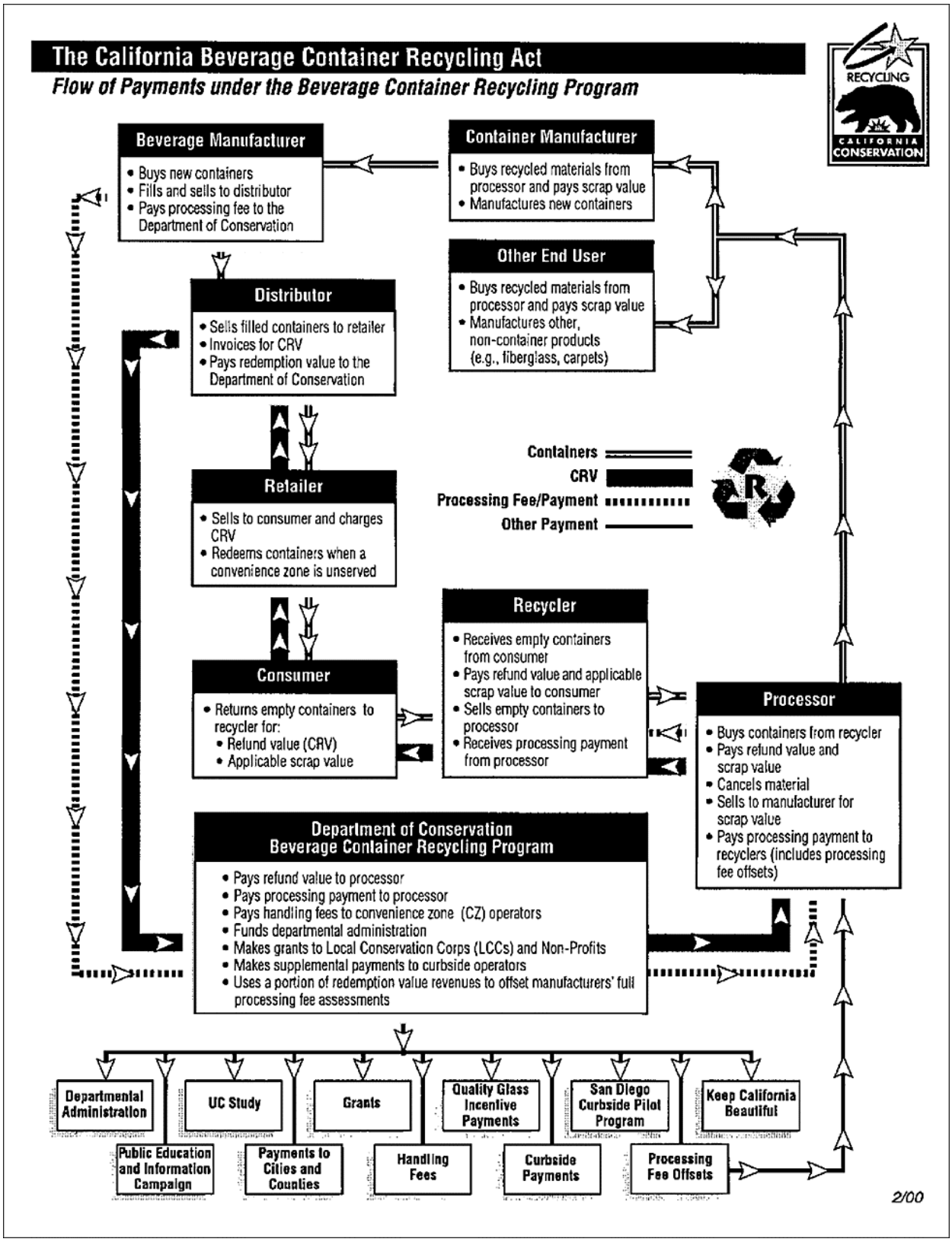

Figure 2.1-1: Flow of payments established under the California Beverage Container Recycling Act.

Source: http://www.consrv.ca.gov/dor/webcon.pdf

2.1.2.4 Michigan CDL System

The CDL system in Michigan operates under the *Michigan Beverage Container Act*, which was enacted in 1976. This was introduced 15 years after kerbside recycling was first introduced to the State. A unique feature of the Michigan CDL system, in comparison to other US systems, is that the legislation contains an unclaimed deposit (escheat) provision whereby 75 per cent of unredeemed deposits go to a state fund, and 25 per cent go to the retailers as a handling fee.

Michigan's CDL system relies exclusively on return to retailers (point of sale) and there is no provision for the return of containers to collection centres. *Figure 2.1-2* shows the flow of containers in the Michigan system.

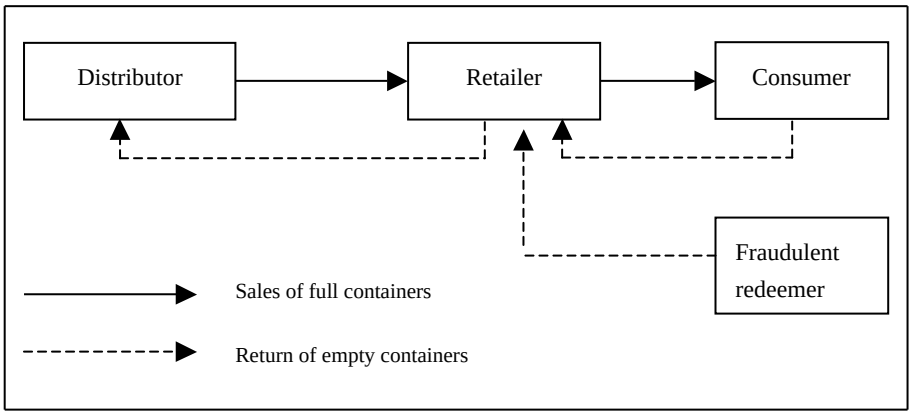

Figure 2.1-2: Flow of containers through the Michigan CDL system

Source: Stutz & Gilbert, (2000), ***Michigan Bottle Bill, A Final Report to: Michigan Great Lakes Protection Fund***, p5 [Online] Available: http://www.deq.state.mi.us/ogl/michigan_bottle_bill.htm [16/04/01].

The operating costs of the CDL system are incurred by the retailer until the containers are collected by the distributor. The costs borne by the retailers can vary considerably depending on whether the containers are sorted manually or by the use of a reverse vending machine. After picking up the sorted containers from the retailers, the distributors are required to process the containers and sell them into the recycling market (Stutz & Gilbert, 2000 p7). *Figure 2.1-3* shows the flow of payments in the Michigan CDL system.

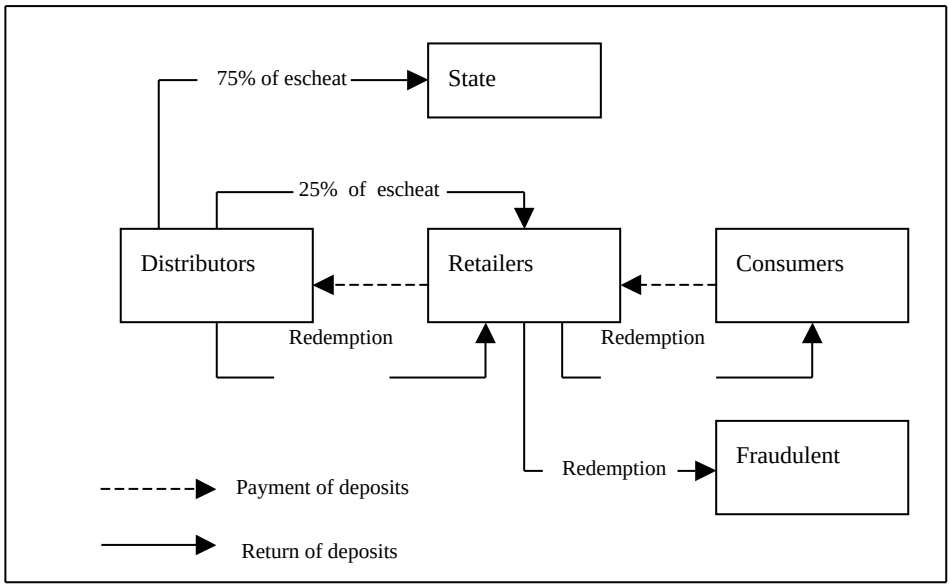

Figure 2.1-3: Flow of payments established under the Michigan CDL system

Source: Stutz & Gilbert, (2000), ***Michigan Bottle Bill, A Final Report to: Michigan Great Lakes Protection Fund***, p5 [Online] Available: http://www.deq.state.mi.us/ogl/michigan_bottle_bill.htm [16/04/01].

2.1.3 Canada

In Canada, deposit-refund systems have been in place in some provinces for many years. Each Canadian province utilises its own method of return for used beverage containers. The Canadian provinces use a combination of deposit-refund system, kerbside and/or environmental levy methods. The Canadian systems have recycling and reuse objectives.

Recent changes have seen the expansion of many of the CDL programs to include a greater number of containers. During the 1990s seven of the ten provinces strengthened regulations to increase producer responsibility. This reflects the provincial trend in waste management policies, away from traditional government-centred waste management and towards polluter pays and industry responsibility.

In British Columbia, Newfoundland, Alberta, and New Brunswick, the brand owners are responsible for establishing a common collection system for container recovery. Of these, British Columbia is the only province that has refillables regulation and mandatory return to retailer (point of sale). The other three provinces have collection centre based systems, with return to retail for refillables only (predominantly beer bottles). Further details on each of the systems are provided in *Appendix A.*

Beer containers are primarily recovered through a deposit-refund system, operated voluntarily by the beer manufacturing industry, of nationally standardised refillable glass bottles. Beer container recovery rates are typically high (greater than 90%). In most provinces the refillable beer container recovery system is separate from other collection systems (Container Recycling Institute, 2000a).

The British Columbia (BC) system is an example of product stewardship and forms part of an extensive waste management policy approach initiated by the BC Government (Ministry of Environment Land and Parks, 2001).

British Columbia and Alberta were chosen as the most appropriate potential models for the NSW CDL options based upon the following criteria:

- population;
- kerbside system and the percentage of the population with access to kerbside;
- method of return: depots, point of sale;
- deposit value: 10¢, 20¢, and;
- managing body: brand owners.

The British Columbia and Alberta systems are briefly described below.

2.1.3.1 Alberta

The deposit and refund system in Alberta is called the Beverage Container Recycling Regulation. Standard features of Alberta's system are summarised in *Table 2.1-3*. Other important features of the system are:

- non refillable containers returned at collection centres;
- the retailers only collect refillable containers (e.g. beer);
- the Alberta Beverage Container Recycling Corporation (ABCRC) is a non-profit organisation that collects monies from manufacturers and pays out handling commissions to collection centres, and markets the recovered beverage containers;
- the 1998 Beverage Container Recycling Regulation passed the regulatory and enforcement function from the provincial government to a nine member multi-stakeholder group, the Beverage Container Management Board (BCMB);
- the BCMB consists of three manufacturers, three depot operators, one environmental representative, one representative from municipal government and one representative from provincial government;
- a Canadian 0.05¢ charge per container funds the Beverage Container Management Board
- the overall cost per container is estimated as about 0.8¢ (Morawski, 1998 p16).

2.1.3.2 British Columbia

The deposit and refund system in British Columbia is called the Beverage Container Stewardship Program Regulation. Standard features of this system are summarised in *Table 2.1-3*. Other important features include:

- all beverage containers except milk are included;
- there are three Stewardship agencies: Encorp (non-alcoholic beverages) and Brewers Distributors Limited and Liquor Distribution Branch (alcoholic beverages);
- in 1997 the Beverage Container Stewardship Program Regulation (BCSPR) expanded the existing system to cover all beverage containers except milk and milk substitutes;
- brand owners are responsible for setting up collection centres that are convenient for consumers, provide province wide coverage, and that are sufficient to meet a recovery rate of 85% by October 2000, with containers exempt from the 85% target;
- retailers are required to accept for return and refund any container type of the brands they sell;

- the British Columbian provincial government conducted a study to determine the cost of kerbside recycling for all beverage containers versus an expanded deposit system and concluded that savings of $7 million would result from expanding the deposit system.

The British Columbia grocery chain "Overwaitea Food Group" have launched fully automated "Changes Recycling Centres"- so that Save-On-Foods stores could offer consumers the convenience of returning recyclable containers to a retail outlet while handling containers efficiently, minimising loss of retail space used for bottle collection and storage. In return for containers, customers can receive a cash refund at a Save-On store, or collectible points, or can donate the points to a charity, in which case Overwaitea and Changes more than match the donation. In co-operation with some manufacturers, containers that are not part of the deposit-return system are also accepted. Critics suggest that the acceptance of milk containers is an attempt to obtain high recovery rates from a voluntary system so that mandatory deposits may be avoided (Solid Waste and Recycling, 1999). See http://www.changesrecyclingcenter.com/.

	British Columbia	Alberta
Proportion of population with access to kerbside recycling	About 80% have access to multi material kerbside and/or depot programs.	65% have access to multi material kerbside and/or depot programs.
Unredeemed deposits	Retained by distributor/bottler for non-alcohol and domestic beer. Retained by vendor for alcohol.	Retained by distributor/bottler.
Deposit level	CA 5¢ (~6¢Aus) CA 10¢ (~13¢Aus) CA 20¢ (~25¢Aus) CA 30¢ (~38¢Aus)	CA 5¢ (less than 1 litre) CA 20¢ (greater than 1 litre)
Overall recovery rate	Non alcohol: 75% Alcohol: 89% Refillable Beer: 93%	Non alcohol: 78.6% Refillable Beer: 97%
Handling fee	Non alcohol 1.65¢ (~2¢Aus)	Overall 0.8¢ (~6¢Aus) per container.

Table 2.1-3: Summary of British Columbia and Alberta (Canada) CDL systems

2.1.4 Europe

2.1.4.1 Overview

Container deposit laws or voluntary deposit-refund systems exist in the following European countries: Austria, Belgium, Denmark, Finland, Germany, Norway, Sweden, and Switzerland. The focus of container deposit legislation in Europe is largely on increasing the reuse (through maintenance of market share for refillables) and recycling of packaging as opposed to litter management (EUROPEN, 2000). Some countries have specifically introduced legislation in response to the environmental impact of certain materials. For example, in Sweden and Denmark, because aluminium requires more energy in its manufacturing process than other packaging materials, legislation has been introduced to either ban its use or encourage its recycling.

Europe's container deposit systems are usually used in combination with other tools like taxes and recycling targets (Perchard, 2000). Some countries use deposits to achieve recycling or refillable targets, others use deposits in combination with taxes on non-refillable (single-use) containers. Some countries have regulated that refillable containers must represent a specific percentage of market.

Most European systems are administered and managed by the private sector rather than the government.

Table IA-3 in Appendix A summarises some deposit systems and their respective recovery rates and requirements.

2.1.4.2 Germany

Germany has a unique packaging waste recycling system that extends well beyond container materials. The Packaging Ordinance that established this system in 1991 set targets for the use of refillable containers. The Ordinance stated that mandatory deposits would be imposed if the targets (share of refillables on the market not less than 72%) were not met in two separate years (Perchard, 2000). Ten years after the Ordinance was first enacted, the German Minister for the Environment recently announced that mandatory deposits would be imposed on beverage containers due to industry's failure to meet refillables targets (Reuters, 04.02.2001).

In Germany, from 2002, under a categorisation of beverage containers according to their lifecycle impacts on the environment, all one-way beverage containers (aluminium cans, PET, glass) will be subject to a deposit as they are considered 'ecologically harmful drink packaging' (Trittin, 2001 p.1). The new deposits will see industry paying an extra cost of less than 2 pfennigs (AU$0.017) per packaging unit. The deposit, which excludes wine bottles, would be 0.25 euros (AU$0.42) per unit and 0.50 euros (AU$0.84) per 1.5-litre bottle. (Reuters, 04.02.2001). Reverse vending machines (RVMs) will be used in the new system for collection of used beverage containers.

Container packaging subject to mandatory deposits will no longer be part of the Duales System Deutschland, the packaging collection system established by industry in response to the Ordinance, however, many other products will continue to be managed by it. The objectives of the Ordinance (Southam, 1997) are to:

- transfer at least part of the costs of packaging waste to the producers of the packaging, in line with the principles of extended producer responsibility;
- inform the packaging industry of the environmental costs of their packaging; and
- provide an economic incentive to the packaging industry to alter their practices to be more environmentally friendly.

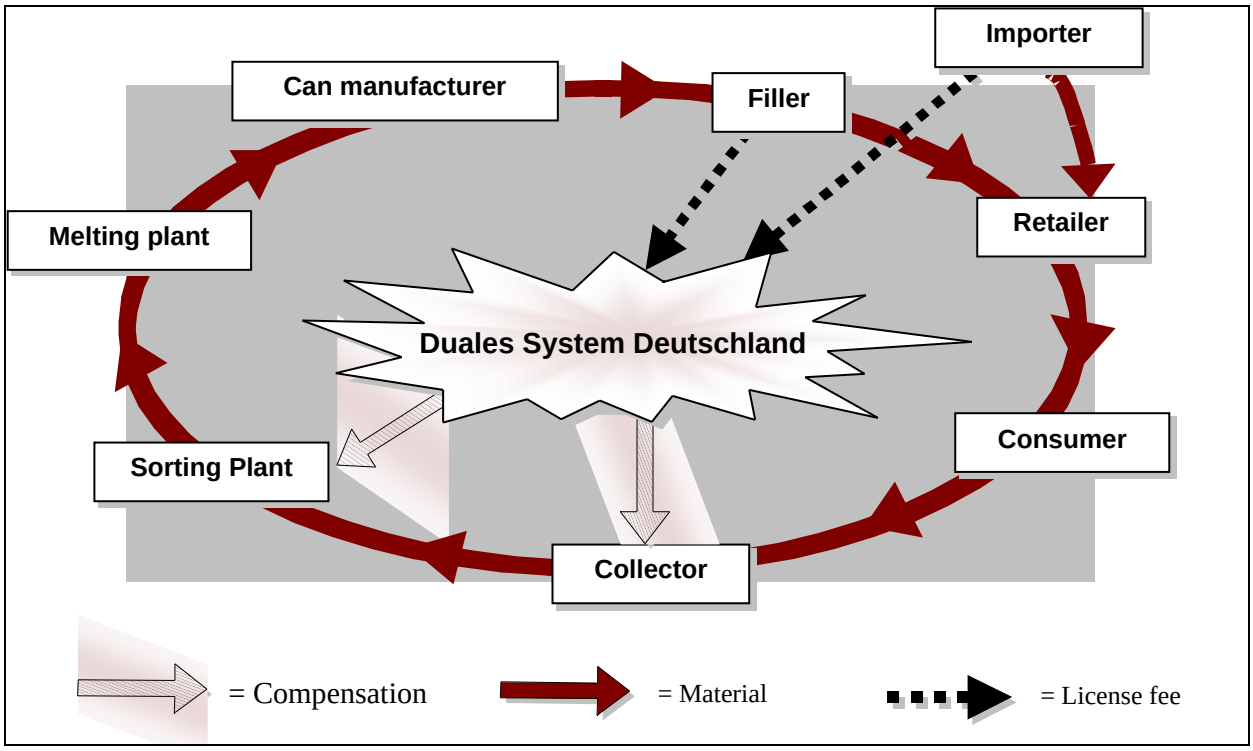

Figure 2.1-5: German Recycling System (adapted from Vanthournout, H. (1998), *Beverage Container Recycling Systems in Germany, Sweden and Switzerland*, Thesis (MSc), International Institute for Industrial Environmental Economics (IIIEE), Lund University: Lund.)

2.1.4.3 Sweden

Sweden was the first country to implement policy measures for EPR in 1979. By 1982 the Act on Recycling of Aluminium Beverage Containers had been passed. This was designed both to ensure littering was avoided and to prevent excessive energy consumption associated with aluminium production (Vanthournout, 1998). The aluminium container Act is not an example of container deposit legislation as it does not mandate for a deposit. Instead, the Act contains a provision to ban the use of aluminium beverage cans for beer and soft drinks unless a recycling rate of 75 percent is achieved by 1985 (Franklin, c1997).

The aluminium can industry then established its own deposit-refund system, having determined that it was the only means to achieve the 75 percent recycling rate. The industry moved to a deposit-refund system after having tried several collection schemes, including kerbside recycling programs. The recovery rate for aluminium cans in Sweden in 1995 was in excess of 90% compared to 64% in the US, and Australia.

The administration and management of the voluntary deposit system is the responsibility of AB Svenska Returpack. Any beverage cans, that are part of the deposit system are exempt from paying import can duty.

In the early 90s new legislation was enacted to require the return of PET containers for reuse or recycling (Vanthournout, 1998). Reverse vending machines are used to collect the used beverage containers from retail outlets.

2.1.4.4 Switzerland

The Swiss government favours reuse over recycling (Vanthournout, 1998). Switzerland's Beverage Container Ordinance (VGV) mandates for deposits on refillable containers and ensures that only refillable and recyclable beverage containers are permitted for use (Perchard, 2000). Mandatory deposits will be applied to one-way beverage containers if they fail to meet their defined waste reduction targets.

The goal of the Ordinance was firstly to avoid one-way beverage containers ending up in the municipal waste stream and secondly to provide industry and retailers with incentives to switch to refillable beverage containers.

While no deposit is currently applied to beverage cans, collection points are widespread, located at shops, snack-bars and railway stations, rather than centralised. Since the majority of beverage cans are consumed away from home in Switzerland, collection points are located more frequently at special events, tourist areas and roadsides. It is the job of collectors (i.e. whoever is responsible for the collection of containers) to return the used beverage containers to a scrap dealer who in turn takes the containers to sorting plants.

No deposit is paid by the consumer for PET bottles. Used PET beverage containers are able to be returned to PET-recycling collection containers at various convenient locations.

2.1.4.5 Recent and Future Trends

While the European deposit systems emerged initially with a focus on beverage containers, current systems are being modified and extended to take a more holistic approach (Perchard, 2000). This reflects an increased awareness of the importance of EPR. There is also a push by the European Union to co-operate or harmonise systems between countries. There are certain barriers to such harmonisation as various countries already have existing and unique systems (Vanthournout, 1998).

System changes within individual European countries are still occurring. In Germany, from 2002, all one-way beverage containers (cans, PET, glass) will be subject to a deposit as they are considered 'ecologically harmful drink packaging' (Trittin, 2001 p.1). It was a provision under the Packaging Ordinance that if the share of refillables on the market fell below 72% in two consecutive years, a deposit system would be introduced. The deposit system is designed to provide incentives for the industry to return to reusable packaging thus avoiding waste. The new system will involve the use of reverse vending machines (RVMs) for collection of used beverage containers. According to Trittin, the Packaging Ordinance will in future categorise beverage containers according to their cradle-to-grave impact on the environment.

The Swiss container deposit system is currently being extended. Amendments include payment by importers or producers of a disposal fee for all glass containers requiring collection. The fee will be administered by a private company. It is anticipated that following this amendment, the fee will apply to all other containers (except milk).

An advanced disposal fee on all glass bottles greater than 90ml will be introduced in Switzerland to be paid for by the glass packaging industry and importers (Perchard, 2000).

2.1.5 Israel

2.1.5.1 Overview

On August 2, 2000 Israel enacted the Deposit Law on Beverage Containers. Manufacturers, importers and retailers are required to collect the equivalent of an 8¢ AUD deposit.

A recycling corporation consisting of manufacturers, importers, retail chains, and their representative organisations is responsible for implementing the provision of the law. Targets for the recycling corporation are:

- 50% (minimum) by 2001.
- 60% (minimum) by 2002.
- 70% (minimum) by 2003.
- 80% (minimum) by 2004.
- 85% (minimum) every year beginning with 2005.

(Israel Ministry of the Environment, 2000 p17)

2.1.5.2 Unique Features

- Manufacturers or importers that are not members of the recycling corporation will transfer the uncollected deposits to the Maintenance of Cleanliness Fund.
- Legislation does not include containers above 1.5 litres. The creation of a private company for the voluntary collection of these containers has resulted.
- The recycling corporation will report on the number of containers not collected (Israel Ministry of the Environment, 2000 p17).

Where targets are not met, payment of double the deposit on every container not collected is required (Israel Ministry of the Environment, 2000 p17).

2.2 CDL – South Australia

2.2.1 Background

In the 1950's refillable bottles were the predominant packaging for soft drinks. Each of the refillable bottles had a deposit that was refunded when returned for reuse (usually through retailers). Retailers and householders paid for the costs of collection and return. At this time, it was commercially viable to wash and reuse bottles. Environmental costs, however, were not taken into consideration (Hatch & Mules, 1993 p.26).

Changes in technologies and manufacturing processes, however, led to a shift away from refillable containers to one-trip containers (Recyclers of South Australia Inc, 1999 p1).

2.2.2 Introduction

CDL was introduced in South Australia in 1976 under the *Beverage Container Act*. The system applied to all beverage containers, except wine and milk. The Act aimed to decrease litter and provide an incentive for recycling. Since the implementation of the Act, it is claimed that litter from deposit bearing items has decreased to less than 1 percent of the total amount of litter in South Australia (Recyclers of South Australia Inc, 1999 p1). The CDL system has wide (in excess of 95%) public and community support (SA EPA, 2000b p1).

2.2.3 Overview

In South Australia the deposit system is different for refillable and non-refillable containers. For refillable containers a deposit of 10 cents applies, and the container is to be returned for refund at the point of sale. All other materials have a 5 cent deposit and are taken to collection centres to obtain a refund (SA EPA, 2000b).

Table 2.2-1 provides an overview of the transfer of containers and deposit refunds between retailers, beverage fillers, consumers, community groups, and the recycling depots for non-refillable beverage containers.

Before a collection depot can be established approvals must be received from the South Australian Environment Protection Agency (EPA). To provide for easy access for consumers, collection depots in Adelaide are generally located within a 5km radius. In rural areas larger towns have collection centres or an agent acting for the depots (SA EPA, 2000c p2).

STEP 1 Beverage filler	Manufacturer/filler/wholesaler supplies to the retailer. The five cent deposit and an agreed handling fee is included in the wholesale price of the beverage.	The deposit and handling fee is retained by the beverage filler or their agent who operates as the collection coordinator. This is held until the deposit containers are returned to them to be recycled.
STEP 2 Retailer (hotels, delicatessens, supermarkets etc)	Supply consumers. The five-cent deposit and 3 cent handling fee is included in the retail price paid by the consumer for the beverage.	
STEP 3 Consumer (or community group)	Return deposit containers to recycling depot for full payment, five-cent deposit.	
STEP 4 Recycling depot	Sort the containers by material and responsible agent, i.e. glass, aluminium, PET, into containers for return to the collection co-ordinators.	
	E.g. SA Brewing (refillable bottles and aluminium cans).	Back to brewery for refilling. Back to Marine Stores P/L (Gold Top can collection co-ordinators)
	CUB (one trip bottle).	Broken up and cullet sent to beneficiation plant.
	CUB (aluminium cans).	Back to Toll Recycling (Can co-ordinator)..
	Coca Cola Amatil, Schweppes and companies marketing a wide range of boutique beers, spring waters etc. cans, PET and non-refillable glass containers.	Cans and PET back to Statewide Recycling, the collection co-ordinator. Glass returned to the beneficiation plant.
STEP 5 Collection co-ordinator	Once containers are sorted, they are sent back to the collection co-ordinator, agent for the recycling of material and auditing.	Collection co-ordinators pay the recycling depot back the five cent deposits which they paid out to the consumer in Step 3, plus an agreed handling fee for their containers.
	Collection co-ordinators are:	
	Statewide Recycling.	
	Flagcan Distributors.	
	Toll Recycling.	
	Adelaide Bottle Company.	
	Marine Stores Pty Ltd.	

Table 2.2-1: South Australian Recovery System for Deposit Containers

Source: Recyclers of South Australia (1999). ***The South Australian Advantage: Why South Australians Favour Container Deposit Legislation***: Adelaide.

2.2.4 Recovery of Beverage Containers

The South Australian kerbside recycling and CDL systems result in high recovery rates. Recyclers of South Australia Inc. reported in 1999 that the recovery rates are higher than those rates achieved in any other State or Territory of Australia (SA Department for Environment and Heritage, 2000 p13; Recyclers of South Australia Inc., 1999).

Table 2.2-2 shows the current recycling rates for aluminium, glass and PET in South Australia compared to ANZECC targets.

Material	South Australian recovery rate
Aluminium	86%
Glass	84%
PET	74%

Table 2.2-2: Recovery rates of beverage containers in South Australia
Source: Recyclers of South Australia Inc., 1999.

In addition to high recovery rates, Recyclers of South Australia and representatives of South Australia materials coordinators, also reported that the materials collected through the CDL system are a higher quality than anywhere else in Australia (Recyclers of South Australia Inc., 1999).

2.2.5 Changes to Existing CDL Legislation

On 1 January 2001 a new CDL regulation was enacted that will increase the variety of containers captured under the CDL system. The aim of this expansion is to be able to capture a number of products that contribute to the litter stream. The expansion applies to containers that are less than one litre. These including:

- flavoured, non-carbonated waters;
- pure fruit juices, and;
- flavoured milks.

In South Australia, CDL is considered compatible with the National Packaging Covenant (NPC) and the National Environment Protection Measure (NEPM), (SA EPA, 2001 p3).

2.3 Policy Framework

This section provides background information on the regulatory framework for the management of waste in New South Wales. It includes a review of the waste history, recycling, packaging, administration, and waste reduction targets.

2.3.1 History of Waste as an Issue in NSW

Increasing volumes of waste put pressure on waste management, disposal facilities, and the environment. Disposal by burial to landfill is the traditional method of waste management. Limited landfill sites are a problem for waste disposal and management.

In 1992, over 14 million tonnes of solid, domestic, commercial and industrial waste was disposed to landfill in Australia. Landfill sites were limited and community debate over waste management issues emerged (Commonwealth Environment Protection Agency, 1992 p.2).

Opposition from local communities towards the creation of new landfill sites grew on the basis of local amenity concerns. As a result, Australian metropolitan areas, in particular Sydney, experienced a constraint on available landfill sites (Commonwealth Environment Protection Agency, 1992 p.1).

The landfill problem is most evident in Sydney where two thirds of NSW's waste is managed. Local campaigns have prevented the development of new major landfills to cater for household waste (Industry Commission, 1995 p.xxxi). Waste management is becoming increasingly complex and expensive due to

environmental concerns such as the effects of leachate and landfill gas, and the local amenity effects of litter, vermin, dust, and noise (NSW EPA, 1997a).

Waste can be diverted from landfill through mechanisms such as reuse, recycling and composting (NSW EPA, 2000 p.375). Recycling of materials reduces waste through greater reuse and recovery, and also conserves resources that would otherwise be used during production, and reduces the environmental impact arising from virgin material production.

2.3.2 Recycling

In Australia kerbside recycling was introduced during the 1980's and 1990's. Kerbside recycling initially provided for the collection and recycling of paper, glass, and aluminium and was later expanded to include PET, HDPE, LPB, and steel cans (Planet Ark, 1996). Recycling is a waste management practice that has received broad community support and has provided the community with the opportunity to be active on environmental issues. The success of recycling has raised environmental awareness within the community (Wright, 2000b p29).

2.3.3 Regulatory Framework for Waste

The following provides the current legislative and policy frameworks for waste in NSW. If CDL were introduced it would occur in this policy context.

2.3.3.1 History

Until 1970 waste management was largely a local government matter in NSW; and local councils organised the collection of waste and disposed of it in their local landfill. In 1971 the Metropolitan Waste Disposal Authority (MWDA) was established with powers under the Waste Disposal Act 1970. The MWDA became the operator of metropolitan Sydney's putrescible landfills (Inner Sydney Waste Board, 1998 p.21).

In 1988 the MWDA was renamed the Waste Management Authority, to reflect a change in emphasis from disposal to management of wastes. Waste minimisation became a major policy focus as part of emerging world trends, and the difficulties in establishing new landfills within the greater Sydney region (Inner Sydney Waste Board, 1998 p.21).

2.3.3.2 Commonwealth Government

In 1992 the *National Waste Minimisation and Recycling Strategy* was introduced by the Commonwealth Government. The strategy adopted a national target of 50% waste reduction to landfill by the year 2000 based on 1990 levels, and included the extension of kerbside recycling schemes to at least 90% of households in urban areas. A number of recycling targets for certain materials were endorsed, in line with specific commitments made by industry as part of the ANZECC National Kerbside Recycling Strategy. Materials covered include plastic containers, glass, aluminium cans, steel cans, liquidpaperboard containers, newsprint, and paper packaging (Commonwealth Environment Protection Agency, 1992 p.23).

A key aspect of Ecologically Sustainable Development (ESD) is to reduce the flow of wastes to the natural environment. Waste minimisation and efficient use of resources are important mechanisms for ESD (Commonwealth Environment Protection Agency, 1992 p.2).

2.3.3.3 NSW Government

In 1995 the *Waste Minimisation and Management Act* was enacted to address NSW's growing volume of waste. Key objectives of the Act included:

- a 60% reduction of the per capita amount of waste by 2000 (compared to 1990);
- adoption of a waste hierarchy (reduce, reuse, recycle, dispose);
- new roles for state and local government, the waste industry, and other industry sectors.

The Waste Minimisation and Management Act established a framework for the strategic planning and funding of waste reduction in NSW. It developed responsibilities for stakeholders, including industry (NSW EPA, 2000b p67). These included:

- a focus on the waste hierarchy;
- decentralisation of waste management through the establishment of regional groupings of local government, known as the Waste Boards;
- establishment of a State Waste Advisory Council (SWAC), selected representatives to advise the Minister and the NSW Environment Protection Authority on waste planning and policy issues;
- new roles for industry, created with the development of an Industry Waste Reduction Scheme (see below).

2.3.3.4 Local Government

Municipal authorities are responsible for the collection of domestic waste including recyclables (Wright, 2000b p28). Consistent with practice overseas this is the only substantial part of the waste stream that is not managed by industries, but by government at the taxpayers' expense (Organisation for Economic Co-operation and Development, 1998 p6). Currently, ratepayers ensure the continuation of this service through their waste disposal charges.

Under pressure from the State government to increase its recycling rate, the Metropolitan Waste Disposal Authority began providing financial support to local government kerbside collection (Reeve, p.12).

2.3.3.5 Waste Management Hierarchy

The principle of the waste hierarchy was established in Germany in 1986, with the passage of the Waste Avoidance, Recycling and Disposal Act (OECD, 1998c p13). A hierarchy reflects the notion that waste avoidance is preferable to recycling, which is preferable to disposal, which becomes an option of last resort in waste management.

In order of preference, the waste management hierarchy is expressed as:

- waste avoidance - practices which prevent the generation of waste altogether;
- waste reduction - practices which reduce waste;
- waste reuse - direct reuse of waste materials for the same grade of use;
- waste recycling or reclamation - using valuable components of waste in other processes;
- waste treatment - to reduce hazard or nuisance, preferably at the site of generation;
- waste disposal (see *Figure 2.3-1*).

(Commonwealth Environment Protection Agency, 1992).

The principle of the waste hierarchy was incorporated into the Waste Minimisation and Management Act (1995).

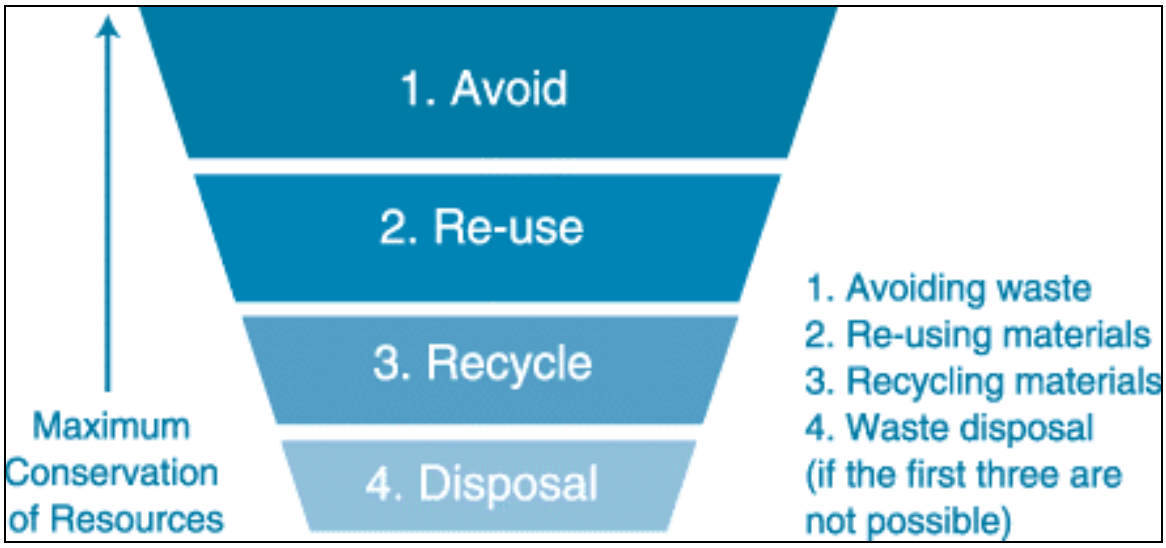

Figure 2.3-1 Waste Management Hierarchy

Source EPA (2001) NSW State of the Environment Report 2000, p 67 (Human Settlement)

2.3.4 History of Packaging Regulation in Australia

2.3.4.1 National Packaging Covenant

The National Packaging Covenant (Covenant) was signed by ANZECC Ministers, Local Government and a range of packaging supply industries on 27 August 1999 (ANZECC, 1999).

The Covenant is the main policy instrument for managing packaging waste in Australia. It is a voluntary agreement that includes all spheres of government and the packaging supply chain.

The Covenant is based on the principle of product stewardship, which it defines as "an ethic of shared responsibility for the lifecycle of the product through to and including its ultimate disposal" (ANZECC, 1999 p.3). The Covenant covers consumer packaging and household paper and has a five-year life span. The stated objectives of the Covenant are to minimise environmental impacts of packaging waste:

- through the entire lifecycle of the product;
- by closing the recycling loop;
- by developing economically viable and sustainable recycling collection systems; and
- through ensuring that the process continues (ANZECC, 1999).

The Covenant states that Signatories are committed to product stewardship through:

- the continuous improvement in recovery and reprocessing of used packaging materials; and
- support for kerbside recycling collection or other recovery systems.

The Covenant contains a commitment by industry to provide up to $5.1m per year for three years towards improving the sustainability of kerbside recycling, to be matched by government signatories. Failure to meet commitments agreed under the Covenant can result in a signatory becoming subject to the NEPM. The report of the Alternative Waste Management Technologies and Practices Inquiry recommends that if after one year of signing, the Covenant has not made significant progress, alternative means towards achieving waste reduction from "consumer packaging" should be considered (Wright, 2000b).

2.3.4.2 Industry Waste Reduction Plans

Industry Waste Reduction Plans (IWRP's) were waste minimisation plans that could be required of industries under the NSW Waste Minimisation and Management Act, 1995. They were prepared by an industry association member, on behalf of the members, and through a process of negotiation with the NSW EPA. IWRPs set out the commitments and obligations of industry members relating to that industry's waste (NSW EPA, 1998 p1). The two key industries in relation to CDL, the dairy industry and the beer and soft drink industry, both developed IWRPs.

Beer and Soft Drink Industry Waste Reduction Plan

Packaging for the beer and soft drink industry includes glass, aluminium, and PET containers. The IWRP for the beer and soft drink industry aimed to reduce disposed packaging waste through packaging lightweighting and greater recovery of packaging materials from both the residential and non-residential streams. *Table 2.3-1* provides the targets defined in the Beer and Soft Drink IWRP.

Parameter	1990	1996	2003
PET packaging weight per unit volume (g/L)	41.1	35.6	33.6
PET away from home recovery rate		11.5%	23%
PET at home recovery rate	11%	48.2%	55%
Glass packaging weight per unit volume (g/L)	636	569	546
Glass away from home recovery rate	25.5%	45.8%	45.8
Glass at home recovery rate	30%	55%	55%
Aluminium packaging weight per unit volume (g/L)	45	38.4	37.4
Aluminium recovery rate	62.9%	63.8%	66.5%

Table 2.3-1: Waste minimisation recovery targets required under the beer and soft drink IWRP

Source: NSW Environment Protection Authority (1999) ***NSW Beer and Soft Drink Industry Waste Reduction Plan*** NSW EPA: Sydney.

Dairy Industry Waste Reduction Plan

The Dairy IWRP applied to:

- Amalgamated Milk Vendors Association Inc.
- Association of Liquidpaperboard Carton Manufacturers Inc
- Australian Supermarket Institute
- New South Wales Milk and Dairy Products Association
- Plastics and Chemicals Industries Association
- Retail Traders' Association of New South Wales
- Manufacturers of milk packaging
- Milk processors
- Milk vendors

Table 2.3-3: Signatories to the Dairy Industry Waste Reduction Plan

It required:

- a reduction in packaging mass per unit volume of product from 33.3g/L in 1990 to 13.3g/L in 2000;
- an average milk packaging recycling rate of 47% by 31 December 2000;

- in the Sydney Metropolitan area an increase in recovery from 17% in 1997 to 35% in July 1999 (NSW EPA, 1998).

2.3.4.3 NEPM on Used Packaging Materials

The National Environment Protection Measure (NEPM) on Used Packaging Materials came into force on 2 July, 1999 and is intended to ensure that the signatories to the National Packaging Covenant (a voluntary measure) are not competitively disadvantaged by fulfilling the requirements of the NPC. The goal of the NEPM is to reduce environmental impacts resulting from the disposal of used packaging materials and conserve virgin resources by encouraging re-use and recycling by supporting and complementing the strategies in the National Packaging Covenant (National Environment Protection Council, 1999a).

The requirements under the Used Packaging materials NEPM (for those who are not Covenant signatories and non-complying Covenant signatories) are shown in *Table 2.3-4.* The NEPM has been implemented in NSW through the Used Packaging Material Industry Waste Reduction Plan, gazetted in September 2000.

Material	Required recovery/ utilisation rate
Aluminium cans	65%
Glass	60%
PET	50%
HDPE	50%
LPB	45%
Paper/cardboard packaging	75%
Other materials	50%
Combinations of materials	50%*

(*Note: or the highest rate applicable to any material in the combination, whichever is the higher rate)

Table 2.3-4: Requirements under the NEPM for Used Packaging materials.

2.4 Refillable Containers

This section begins with a discussion of the history of refillable beverage containers both in Australia and internationally. It then addresses the issues of why refillables were phased out in some regions of the world (such as North America) and are seen as important in other regions (such as parts of Europe). It discusses some of the costs and benefits of refillables compared to recyclable one-way beverage containers, including environmental and economic issues.

It should be noted that the introduction of CDL does *not* automatically imply refillable beverage containers would be reintroduced. This section has been included because the use of refillables appear to have economic advantages, particularly if the environmental externalities are included, and the use of refillables and regulation through quotas would be a logical extension to the introduction of container deposit legislation.

refillables and regulation through quotas would be a logical extension to the introduction of container deposit legislation.

2.4.1 Background

Refillable beverage containers generally refer to the reuse of either glass or PET containers, or more recently, PEN (polyethylene napthalate). Prior to the 1960s and 70s, glass refillable beverage containers held a prominent share of the beverage packaging mix for milk, beer and carbonated beverage containers in both Australia and other parts of the world. While PET/PEN refillables are largely a new packaging material which emerged in several European countries in the 1980s, refillable PET containers are also used in Central and South America (Recycling Council of Ontario, 1997). Appendix B discusses refillable plastic bottles in more detail.

According to the waste management hierarchy set out in both Australian legislation (such as the *NSW Waste Minimisation and Management Act 1995* and now the *Waste Avoidance and Resource Recovery Act 2001*) and international legislation (such as the *European Packaging and Packaging Waste Directive 1994*), waste avoidance and reuse are preferred over recycling, with disposal being the least favoured option (Industry Commission, 1995).

Although refillables are categorised as 'reuse' there has not been a move towards refillable beverage containers in Australia, North America or Britain.

2.4.1.1 History of Refillables in Australia

The past 20 years in Australia have seen the emergence and significant increase in market share of one-way beverage containers at the expense of glass containers. Refillable PET containers have never been used in Australia (Hopper, 1992). The following graphs (*Figures 2.3-1, 2.3-2, 2.3-3*) illustrate the trends away from refillables to one-way bottles and cans for each of carbonated soft drinks, plain milk, and beer.

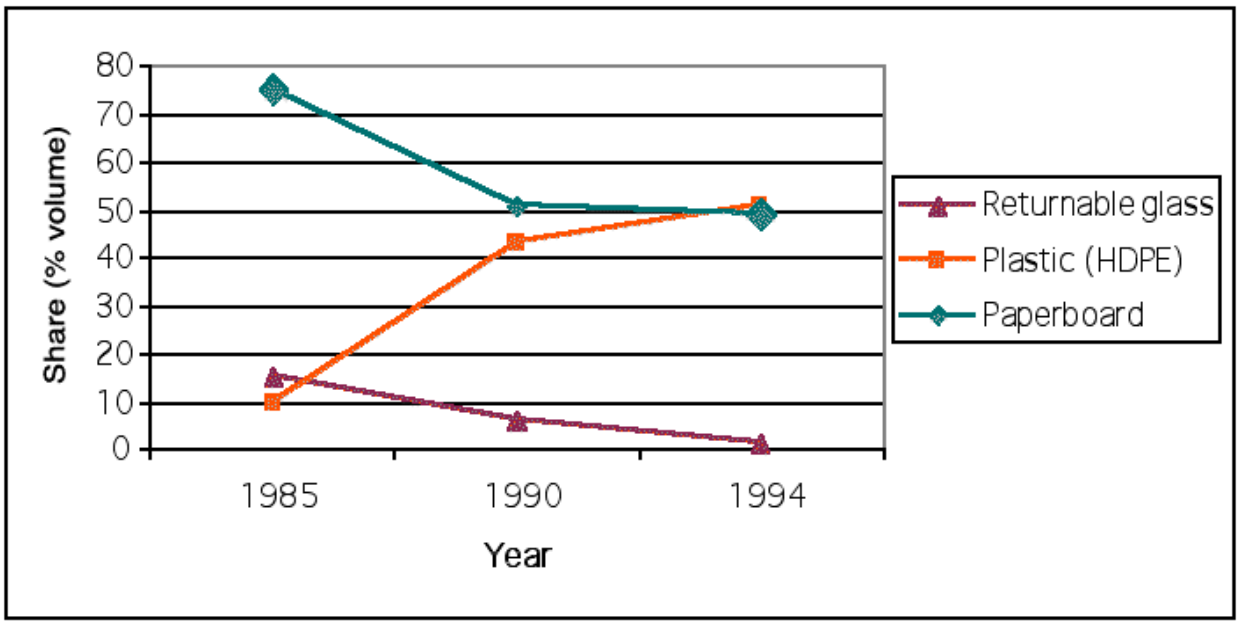

Figure 2.4-1: Trends in plain milk packaging mix (by percent volume).

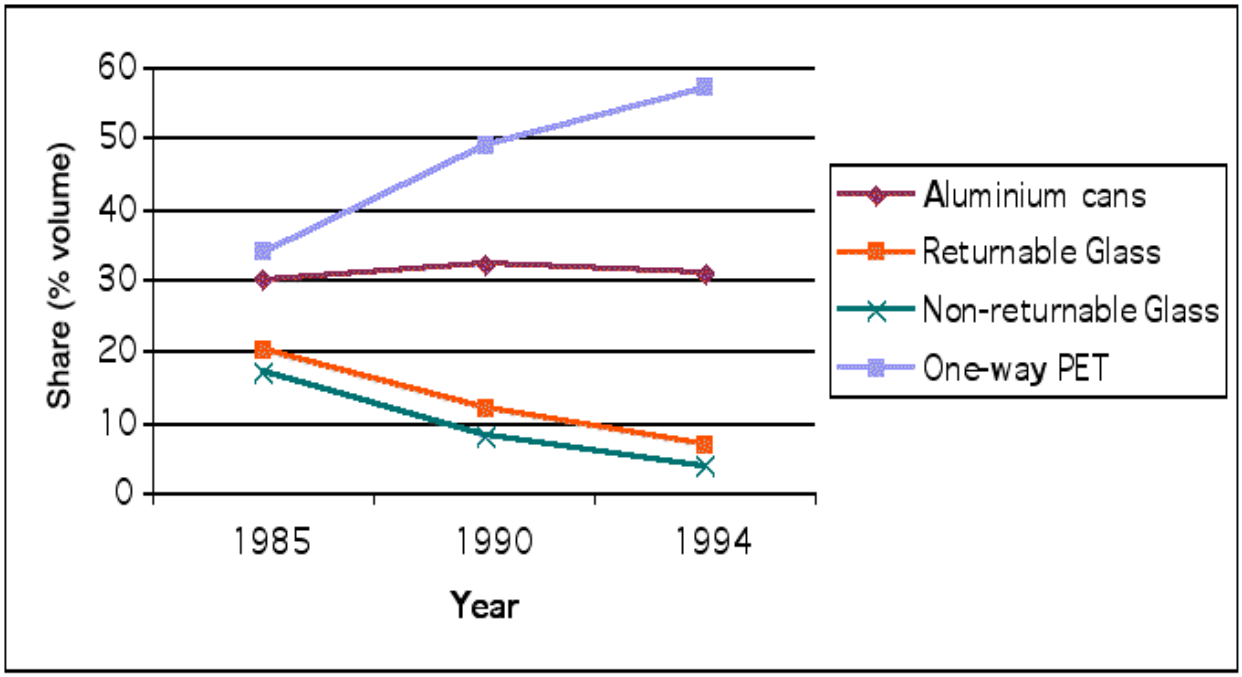

Figure 2.4-2: Trends in carbonated beverage packaging mix (by percent volume).

Source: Industry Commission (1995), Packaging and Labelling, Draft Report, Industry Commission Oct 1995: Canberra.

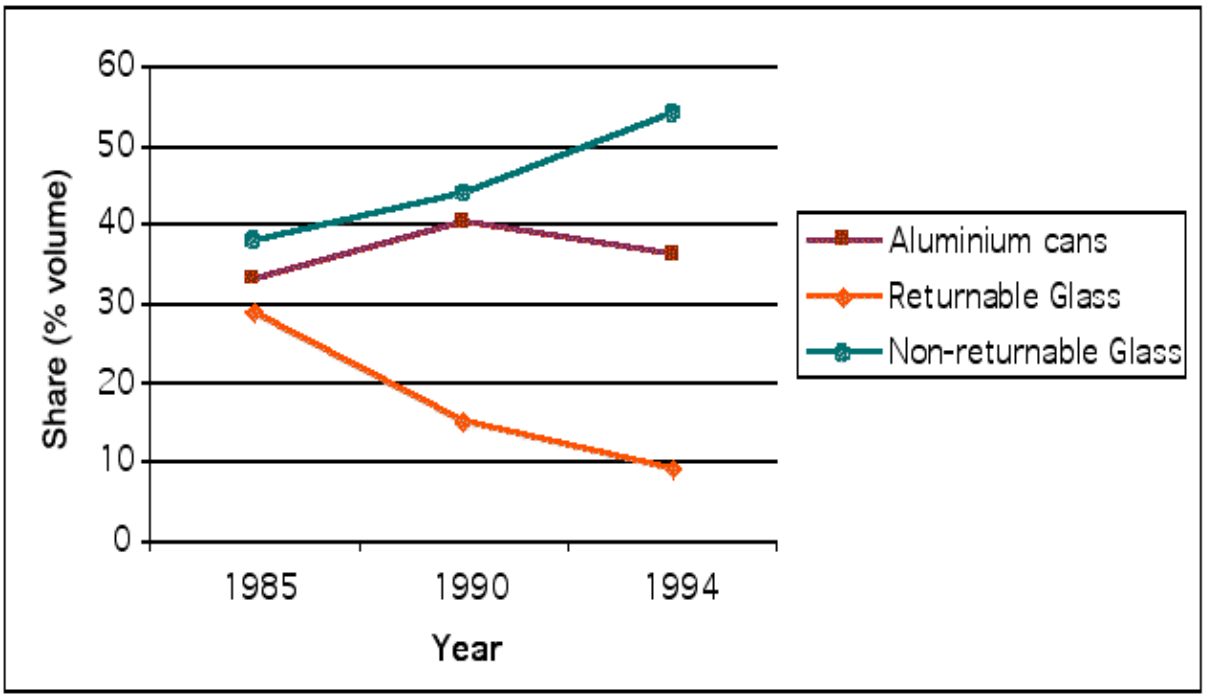

Figure 2.4-3. Trends in beer packaging mix (by percent volume)

Source: Industry Commission (1995), ***Packaging and Labelling***, Draft Report, Industry Commission Oct 1995: Canberra.

The above graphs also illustrate the trend away from glass (reusable and one-way) in favour of PET, aluminium, and steel.

Other than in South Australia, there is no national or state legislation that directly encourages the use of refillable beverage containers (Industry Commission, 1995).

2.4.1.2 History of Refillables in Europe

The market share of refillables in continental Europe decreased after the 1970s with the advent of one-way containers and returned in the 1990s when recovery targets were set in new and more strategic waste management plans which included the use of economic incentives.

The general trend away from reuse towards one-way beverage containers in Europe in the late 1960s coincided with several other trends in the market:

- The growth of non-carbonated beverages requiring less rigid packaging material, allowing more flexible, lightweight material;
- The emergence of ultra-heat treated milk and juices meant glass was no longer required (Golding, 1998).

2.4.1.3 History of Refillables in North America

Prior to WWII almost all beer and soft drink containers in the US were refilled. Almost all infrastructure for collecting and refilling bottles has since been dismantled, except in Canada where refillable beer is still significant.

2.4.2 Current Trends with Refillables

This section compares the current situation and trends in Europe – specifically Denmark – to the situation in North America on the use of refillable beverage containers.

2.4.2.1 Refillables in Europe

Currently, most continental European countries with a CDL system in place have quotas for recovery rates of refillable bottles. For example, in Denmark the recovery rate for refillable beer and soft drink containers is 99.5 percent, while in Switzerland it is 95-98 percent for refillable glass and greater than 70 percent for refillable PET. In Germany, a provision under the Packaging Ordinance is that if the share of refillables on the market fell below 72 percent in two consecutive years, a deposit system would be introduced. This has occurred and thus the German government will begin implementation of a CDL system (See *Section: 2.1 International Experience* for more details of CDL in Europe).

Case Study: Denmark

Since 1981 the *Danish Order on Waste* has required that beer and carbonated soft drinks only be sold in refillable non-metal packaging, which must be approved by the Environment Protection Agency (Danish EPA, 1999b). Each glass bottle is reused on average 35-40 times before being recycled.

In 1998[2] the Danish Environment Agency commissioned a life cycle assessment on packaging systems for non-alcoholic drinks and wine, in accordance with ISO Standards 14040 to 14043 (Danish EPA, 2000). The findings of the environmental significance of different beverage packaging materials are provided in *Table 2.4-4* in *Section 2.4.4* below.

2.4.2.2 Refillables in North America

In contrast to the recent trends in continental Europe which saw the implementation of policies to ensure high recovery rates of refillable beverage containers, the United States moved away from refilling beverage containers decades ago and has not implemented measures to reintroduce them.

In contrast to the high recovery rates of refillable bottles in Europe and Latin America, only 5-7 percent of beer and soft drinks and less than 5 percent of milk sales are currently produced in refillable bottles in the US (Saphire, 1994). Most of these refillables are used at away from home locations such as hotels, bars, and other commercial establishments where the bottles can be easily collected and returned to the bottler (Forman, 1998). In the nine US states with mandatory deposit systems[3], the average market share for refillable beer bottles was 13.2 percent in 1992 compared to an average of 3 percent in non-deposit US states (INFORM, 1994).

2.4.3 Economics of Refillables

The economics of refillables has been debated since the emergence of one-way containers. According to Golding (c1998) a cost comparison of refillable versus one-way beverage containers will involve three major players: fillers, wholesalers/distributors and retailers. The distributional impacts will differ for each group. Reuse of packaging is most profitable for the beverage fillers and least so for the retailers as it increases their handling costs. Distributors' costs do not vary significantly. This will of course depend on whether a deposit and refund system is in place.

The relative economic merits of refillables will depend on a number of factors. However, international experience reported on below, suggests that refillables, particularly the use of plastic refillables, have significant economic advantages relative to one way containers.

2.4.4 Environmental Significance

According to the life cycle assessment conducted on significant beverage packaging materials (relevant to market share) in Denmark, refillable bottles have a lower environmental impact than one-way bottles. This is true for both glass and PET as shown in *Table 2.3-1*.

Environmental Impact	Glass bottle		PET bottle	
	Refillable	One-way	Refillable	One-way
Global Warming	1-2	2-4	1	2-4
Photochemical Ozone formation	1-2	2-4	1-3	4

[2] Earlier LCA's were conducted in 1995-96 however due to criticisms that the LCA was based on outdated information, the Danish Minister for Environment and Energy commissioned another more reliable LCA.

[3] Connecticut, Delaware, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont.

Acidification	1-2	3-4	1-2	4
Nutrient enrichment	1-2	3-4	1-2	2-4

Table 2.4-4. Comparison of environmental impacts of refillable versus non-refillable bottles, using a 1-4 rating.

Source: Danish Environmental Protection Agency (1999b), Packaging for Soft Drinks, Beer, Wine and Spirits, Faketuelt No. 18, Danish Ministry of Environment and Energy, January 18, 1999.

Environmental benefits of refillable over one-way bottles include reducing waste to landfill, reducing raw materials consumption, reducing energy required to extract raw materials, reduce water consumption, and reducing pollution associated with such activities (INFORM, 1994).

2.4.5 Consumer Attitudes

One argument against the use of refillables is the consumer preference for one-way bottles. The CDL Televote Survey indicated that 56 percent of respondents disagreed with the statement that "*people would be unwilling to buy containers which had been returned, sterilised and refilled*". However, only 30 percent agreed while the remainder were undecided. (See *Volume II1, Section 7.2* for further details of the survey).

2.4.6 Implementation Issues

Currently, very few beverage fillers in NSW utilise refillable bottles. Theoretically, the introduction of CDL could provide an economic incentive for the beverage industry to manufacture and reuse refillable bottles. This is because CDL encourages the return of used and unbroken beverage containers to central points (Ackerman, 1995; Hopper, 1993). However, this has not necessarily been the case in US bottle bill states. While the market share of refillables typically increased slightly after the introduction of a deposit system, it usually declined. The percentage market share of refillables in non-deposit states has been steadily declining since the 1980s (Ackerman, 1995). This indicates that while a deposit system has the potential to encourage the proliferation of refillables, it is not guaranteed to do so. Other policy measures such as quotas and targets that encourage refillables are summarised in *Appendix B*.

2.5 Litter

In order to assess the potential impact of CDL on the NSW litter stream, it is important to first understand the current impact of beverage container litter. This section of the CDL Review discusses the sources of litter in NSW, the proportion of beverage containers in the litter stream and trends in littering. This is compared to the situation in other Australian states and the international experience where a CDL system has been implemented. It is imperative that caution be exercised when comparing figures from different litter studies. Percentages can vary substantially depending on whether litter was analysed by number, volume, weight, or visual impact, and what items were included in the survey. Public attitudes and behaviours regarding litter were analysed, as were litter reduction incentives other than CDL.

Key Findings:

- The most recent litter analysis by Keep Australia Beautiful (1996) indicates beverage containers make up 13 percent of the NSW litter stream (by count) compared to 9 percent of the South Australian litter stream.

- The percentage of beverage containers in the litter stream will vary when measured by counts, volume, or weight, so precaution must be exercised when comparing different litter surveys.
- The literature on litter attitudes and behaviour is often inconclusive and contradictory. Some argue that the act of littering can be attributed to laziness or rejection of societal norms, while others argue littering occurs because litter has no economic value. Studies suggest a range of behavioural interventions to reduce litter: increasing bin availability; education campaigns with positive messages; or economic incentives.
- Of those respondents to the CDL Televote who supported the introduction of CDL in NSW, approximately 25 percent thought litter reduction was one reason to introduce CDL.
- Litter reduction has three potential financial benefits: reduced expenditure on litter collection and management; increased visual amenity; and reduced personal injury and damage to infrastructure. For the purpose of the cost benefit analysis, only the potential reduction in local government litter control and management costs for NSW were considered. This was found to be approximately $4.5 million per year.

2.5.1 Current Litter Management in NSW

It is important to consider the proposed and existing alternative litter reduction instruments to CDL. Many studies indicate no one measure alone would suffice and that a combination of approaches is required (NSW EPA, 2000d). Alternatives to CDL may include fines and penalties, community education and awareness, volunteer clean up programs, increasing consumer convenience and accessibility of bins, increasing waste collection services, or reducing packaging waste (EcoRecycle, 1998).

2.5.1.1 Government Litter Reduction Initiatives

The NSW government recently implemented new litter laws for NSW[4] (from July 2000), which extend both the range of litter offences and the range of penalties that can be issued. Enforcement agencies and officers from local governments are authorised to enforce penalties.

In addition to enforcing litter penalties, local government also plays a significant role in the collection and management of litter. Local governments are responsible for cleaning and collecting litter from public places, such as streets, parks, and beaches. As shown in the survey of NSW councils on litter costs conducted by the CDL Review (see *Section 3.3.4*) some local governments also employ a waste education officer, implement litter education programs, enforce litter penalties, maintain anti-litter signage among other litter reduction initiatives.

2.5.1.2 Non-Government Litter Reduction Initiatives

Whilst it is evident that NSW local councils expend a significant amount of time, labour and money on litter control and management, it must be acknowledged that other non-government organisations contribute significantly to litter management and prevention costs, and facilitate litter reduction initiatives. According to McGregor (1994a) Keep Australia Beautiful (KAB) programs in environmental awareness and improvement provide more that $50 million throughout Australia. KAB litter reduction and awareness initiatives include *Tidy Towns*, *The Litter Challenge* and litter reduction grants.

[4] See http://www.epa.nsw.gov.au/litter/ for further details.

Clean Up Australia (CUA) organises and promotes litter awareness and reduction via its annual Clean Up Australia Day during which volunteers from the Australian public collect litter from various locations throughout Australia.

Industry initiatives include those encouraged by the National Packaging Covenant (NPC) (see *Section 2.3 Policy Framework in NSW* for details of the National Packaging Covenant).

In the first annual Beverage Industry Environment Council (BIEC) Joint Action Plan under the NPC, the Beer & Soft Drink Industry discusses the main target areas in relation to the objectives of litter prevention and reduction, namely: to educate stakeholders on techniques to improve the management of litter; and to assist stakeholders to understand and deter littering behaviour.

In relation to littering, the objective of the Beer and Soft Drink Plan was to maintain litter from beer and soft drink packaging waste at an annual target of below 10 percent of the litter stream as measured by the current Keep Australia Beautiful Council (NSW) Litter Count Methodology and documented to the EPA.

2.5.1.3 Litter Definition

Under the revised NSW litter laws discussed (NSW EPA, 2000a), the expanded definition of litter is now as follows (s. 144A):

> "Common types of litter are specified, such as glass, metal, cigarette butts, paper, fabric, wood, food, abandoned vehicles, abandoned vehicle parts, construction or demolition material, garden remnants and clippings, soil, sand or rocks.
>
> Other materials or substances can constitute litter if their size, shape, nature or volume makes the place where they are deposited disorderly or the litter detrimentally affects the proper use of that place.
>
> Under the new definition it is irrelevant whether the litter has any value when or after it is deposited in or on the place."

For the purposes of the CDL Review, rocks, garden clippings etc. are not considered litter (see Glossary).

2.5.2 Litter Reduction and CDL: The Issues

It is anticipated that the introduction of a container deposit system in NSW would reduce beverage containers in the litter stream, with the following benefits:

- reduced local government expenditure on litter control and management;
- environmental benefits such as increased amenity; and
- potential reduction in injury (mainly from glass) and damage to tyres.

The actual extent of impact on litter reduction is difficult to determine and predict. The two main opposing arguments are as follows. Those in favour of CDL argue it would dramatically reduce litter because beverage containers comprise a large proportion of the litter stream by volume, weight and visual impact thus reducing the associated litter costs. Those opposing the implementation of CDL argue it is an inefficient tool that focuses on a minor portion of the litter stream by count and does not address the other more numerous litter items. Ackerman (1997) highlights that if analysed by number, beverage containers account for only a minor fraction of the litter stream, so CDL would result in a "statistically insignificant" reduction in litter (p.131). Conversely, if analysed by volume, beverage containers

comprise a substantial fraction of the litter stream and the removal of such items from the litter stream via CDL will result in a significant reduction in litter.

According to various surveys conducted in Australia (McGregor, 1994a; McGregor, 1994b; McGregor, 1994c; McGregor, 1994d; McGregor, 1994e; Keep Australia Beautiful [Homepage]) litter is perceived to be a significant environmental problem by the community, retailers and local government. However, according to NSW EPA (2000a) peoples' perception of the litter problem and solution will vary. Australia-wide research undertaken for KAB (McGregor, 1994a) found 60 percent of retailers surveyed throughout Australia said they would support CDL on cans and bottles, however only 17 percent said they believed this would be effective in reducing litter[5]. The McGregor (1994 series) study also revealed NSW local governments were least inclined to agree CDL was a method most likely to reduce litter, compared to local council representatives in other states. NSW LGAs also have the highest annual expenditure on litter management of all Australian states (KAB, 1994). *Section 3.3.4 Costs of Litter* discusses local government expenditure on litter in more detail.

Arguments against the use of a container deposit system as a tool for litter reduction include that it is not a "holistic approach" as it '*diverts disproportionate resources to a minority segment of the total litter stream'*. (LRRA, 1996 p4) and is against the preferred management strategy of litter *prevention* rather than litter *collection.*

According to Ackerman *et al* (1995) litter prevention is one of the least documented and analysed environmental issues. Ackerman *et al* (ibid) state that there is a lack of accurate data on litter generation and collection in the US. This has implications in determining the diversion of beverage containers from the litter stream. While there is no data in Australia on total quantity of litter generated, there have been studies on what litter items comprise the national and state litter streams and their respective trends. Most work in this field has been conducted by KAB. Caution must nevertheless be used when comparing different litter analyses that have used different survey methods. *Section 2.5.3* below addresses some different methods of assessing the litter stream in terms of content and impact.

2.5.3 Litter Analysis Methods

Various methods for analysing litter exist, however it is important that the method chosen be appropriate for the intended use of the data, such as analysing litter trends, litter management costs, behavioural studies, or educational/awareness purposes. According to Ackerman 1995, US studies that look at litter generation tend to use different measures of litter, such as volume, weight or number. This may account for the inconsistencies in estimates of the percentage of beverage containers in the litter stream. Beverage containers tend to account for significantly larger fractions by volume than count, or sometimes even weight. A U.S. General Accounting Office report (GAO, 1990) found that roadside litter comprised 10-20 percent by weight and 40-60 percent beverage containers by volume. The most common method in use in Australia is the visible litter count. It is important to note that litter analysis by count may also provide inconsistent results depending on whether cigarette butts and other relatively small litter items are included or not. Cigarette butts often account for approximately 50 percent of the litter stream by count but (KAB, 1996) are often not included in litter count surveys (McGregor, 2000).

Litter analysis is based on:

- volume;

[5] It is not known what definition of *Container Deposit Legislation* was given to the respondents

- counts;
- perception;
- weight.

Table 2.5-1 below summarised the main methods by which litter can be analysed and how they represent beverage container litter.

Litter analysis surveys in Australia	Measurement	Institution	Advantages	Disadvantages
Visible litter count	Number	KAB, KESAB	Provides indicative information on composition of litter stream; detects spatial and temporal trends.	Only provides ***percentage*** composition information, not ***total*** quantity.
Full-litter	Number	-	Total quantity of the litter stream.	Expensive and resource intensive (time and labour).
Rubbish report	Number	Clean Up Australia	Awareness raising; community participation; low cost.	Conducted by inexperienced surveyors; potentially oversampling of certain items.
Litter behaviour surveys	Observations, interviews	BIEC, EPA	Indicates why consumers litter and what motivates them to change.	Don't indicate levels of litter.
Volume surveys	Volume		Useful for assessing material and cost impact on litter collection.	Time consuming if measurement of individual item volumes are required.

Table 2.5-1: Summary of Litter Analysis Techniques and their relative advantages and disadvantages

2.5.3.1 Visible Litter Count Technique

This litter analysis technique is based on number of visible litter items in a given region. It enables detection of spatial and temporal variations in litter by conducting the same survey in selected representative locations at regular intervals, usually quarterly.

According to KAB (2000) in its *Review of Litter Statistics Collection and Analysis Methods* the Visible Litter Count Technique "[is] the best, cost effective method providing longitudinal data on litter levels". It enables trends to be detected between litter survey periods, as well as spatial trends such as differences in litter type from site to site. This method is easily reproducible. One disadvantage of this method is that it does not provide an absolute quantity of litter.

A further advantage of measuring litter by counting litter product types as highlighted by KAB Victoria (1995) and Meathrel (2000), is that it enables identification of litter sources (where the litter item originates) and thus informs litter reduction initiatives.

In South Australia, KESAB has expanded its litter monitoring strategy to include the Visible Litter Survey technique in order to better assess the impacts of CDL on litter. A total of 151 locations across the state are selected; 8 different site types are surveyed (including residential, industrial, shopping centre,

highway, beach, carpark, retail, recreational park); five major material categories are counted (including glass, metal cans, plastic, paper/paperboard, miscellaneous).

2.5.3.2 Full-Scale Litter Surveys

Full-scale litter surveys can also be conducted to analyse litter. They differ from Visible Litter Surveys as they provide data on the *absolute* quantity of litter, not just the relative proportion of litter types. Full-scale surveys are much more resource intensive (time and labour). Studies have shown that the visible litter surveys have a 'close positive correlation' with full-scale litter surveys (Meathrel, 2000), (Keep Australia Beautiful Council Victoria, 1995), and may not be sufficient for the collection of longitudinal litter data.

The CDL Review is not aware of any full-scale litter survey that has formally been conducted in NSW to determine the total quantity of the litter stream.

2.5.3.3 Rubbish Report

The *Rubbish Report* is produced each year by Clean Up Australia (CUA) after the annual Clean Up Australia Events during which members of the Australian public volunteer to clean up littered locations throughout Australia. The KAB Review (2000) comments that the Rubbish Report is not a valid research method, though it does provide a useful cross section (snapshot) of the amount and type of rubbish found in the environment (KAB, June 2000).

It is also important to note that the surveyors in CUA litter statistics collections are volunteers not subject to supervision. This potentially increases the margin of error in the sampling. For example, The Surfrider Foundation notes that as plastics are lightweight, often colourful materials, they float easily into public view and, accordingly, are probably over sampled in analyses of coastal litter (along with aluminium cans and glass containers) due to their high visibility and relative recyclable value. Conversely, paper products, cigarette butts, building materials, and liquid pollutants are less obvious and more difficult to collect or "count" (Powlik, 1998).

In the opinion of KAB (2000), the CUA Rubbish Report is more useful for educational purposes, than for providing a sound research technique.

2.5.3.4 Littering Behaviour Surveys

Extensive littering behaviour surveys have been undertaken in Australia by the Beverage Industry Environment Council (BIEC) and other organisations such as the EPA. The BIEC behavioural surveys are beneficial in analysing littering behaviuor. Such information would complement explanations of trends identified in KAB litter count surveys. KAB (2000) recommends littering behaviour surveys be used in conjunction with visible litter counts. However, they are not sufficient for establishing levels of litter.

2.5.3.5 Volume Surveys

Beverage litter assessment by volume or weight rather than litter counts can be undertaken in litter analysis surveys, although litter counts are by far the most frequently undertaken in Australia. Analysis by volume may be desirable for analysis of potential reduction of solid waste to landfill or potentially reduced cost to Council in cleaning/managing litter (Porter, 1978). However it should be recalled that measuring litter by volume will usually result in greater percentages for beverage containers.

If a litter survey based on volume has not been performed (which is usually the case), litter counts can be converted to volume using data from visible litter surveys, converting to percentage counts then percentage volume. This analysis by volume was desired for the purpose of fully assessing the impacts of reduction in beverage litter on, say, Council clean up costs. If cleaning frequency was based on litter volumes, then it is more appropriate to determine the marginal cost of litter management based on reduction in volume.

2.5.4 The NSW Litter Stream

In order to analyse the potential impact of CDL on the NSW litter stream, it is important to address specific characteristics of beverage litter in NSW, namely:

- where beverage litter is found in NSW (sinks);
- where it has originated (sources);
- composition of the litter stream showing proportion of beverage containers, and;
- any trends which are occurring (in terms of changes in composition and quantity).

2.5.4.1 Sources

Table 2.5-2 below shows the location of beverage litter in Australia according to different sources.

Source	Frequency of occurrence (%)[6]			
	KAB (1996)	EPA SA (1996)	AFGC (2000)	EPA Vic (1991)[7]
Highways/roads	31%	35%	17%	9%
Parks	16%	11%	16%	13%
Rivers/waterways/beach	7%	9%	-	34%
Industrial areas	17%	13%	31%	11%
Shopping/ retail outlets	11%	6%	-	22%
Restaurant	-	-	-	8%
Station	-	-	-	-
Residential	7%	13%	-	-
Car park	11%	13%	-	-

Table 2.5-2: Main sources of litter and their respective frequency of occurrences

According to a recent study of six Sydney beaches, litter levels on beaches has increased by 15 percent since a similar study in 1997. It was also found that over 60 percent of beach litter originated from stormwater while approximately 20 percent was left by beachgoers (Woodford, 2000). The study also indicated that most beach litter is removed within 7 days.

[6] Data varies in year of collection and source. Although, according to other literature sourced from KAB, the places where litter is found over the years remains relatively constant.

[7] Data from EPA Vic is *perceived* worst littered places – not *actual*.

2.5.4.2 Sinks

KAB (1996) suggests that litter will be carried from its place of origin until it becomes trapped in one of the following locations:

- gross pollutant traps (GPT);
- water catchments, beaches, ocean;
- road verges;
- vacant blocks;
- fence & wall bases; and
- grassy and planted areas.

2.5.4.3 Beverage containers in the litter stream

Significantly different results for the proportion of beverage containers in the litter stream are often quoted, both in Australian literature and internationally. This is particularly important when the extent of the impact of CDL on the litter stream is being analysed. As discussed in *Section 2.5.3,* the variation in results can be attributed to whether the litter survey was based on counts, volumes, weight or perception. *Figures 2.5-1* and *2.5-2* show the percentage of beverage containers in the NSW litter stream based on counts and volume. Additionally, the items actually considered in the litter survey will potentially effect the results. If litter is analysed by percentage counts, the presence of cigarette butts may indicate a disproportionate amount of beverage containers in the litter stream for the purpose for which the litter survey was conducted. Inclusion or exclusion of cigarette butts in a litter count can skew resulting percentages of other items by 50 percent (Jamal, 2000). According to KAB data (1996), beverage containers make up less than 10 percent of the litter stream in NSW and approximately 4 percent in South Australia. These figures are based on percentage count and have either included cigarette butts in the counts or only refer to CDL beverage container items (as listed in the South Australian CDL).

An analysis based on the perception of retail traders in NSW (McGregor, 1994) found 35 percent of the litter stream is perceived to be attributed to beverage containers. This is a higher percentage than those based on counts or volumes.

The following table, based on litter counts by KAB, shows the percentage of individual beverage items in the litter stream for various Australian States. At first glance, Victoria appears to have a lower percentage of beverage containers in the litter stream compared to South Australia. However, if only those items incurring a deposit in South Australia (in bold in *Table 2.5-3*) are compared, it is clear that South Australia has less CDL beverage items in the litter stream by percentage counts.

Material	Container type	% of total litter stream			
		NSW	SA	VIC	AUST
Metal	Beer (aluminium)[7]	1.64%	0.40%	0.77%	1.22%
	Soft drink (aluminium) [7]	2.77%	1.26%	0.89%	1.76%
	Soft/juice steel (375ml) [7]	0.06%	0%	0%	0.04%
Plastic	PET bottles[9]	2.77%	0.47%	1.79%	1.82%
	Plastic beverage bottles	0.19%	0.18%	0.55%	0.50%
Glass	Beer (glass – small) [7]	1.13%	1.12%	1.71%	1.57%
	Beer (glass – small) [7]	0.44%	0.36%	0.06%	0.15%
	Soft drink (glass) [7]	0.63%	0.40%	0.48V	0.8%6
	Wine/spirit (glass)	0.19%	0.07%	0.08%	0.10%
Paper	Fruit drink cartons	1.64%	0.79%	0.48%	0.64%
	Milk flavoured cartons	1.32%	3.14%	0.91%	1.52%
	Milk cartons	0.57%	0.58%	0.08	0.21%
	TOTAL	**13.35%**	**8.77%**	**7.80%**	**10.39%**
	TOTAL CDL items[7]	**9.38%**	**4.01%**	**5.70%**	**7.38%**

Table 2.5-3: Percentage of beverage containers in the litter stream by counts in NSW, SA, Victoria and National average.

Source: (KAB, 1996)

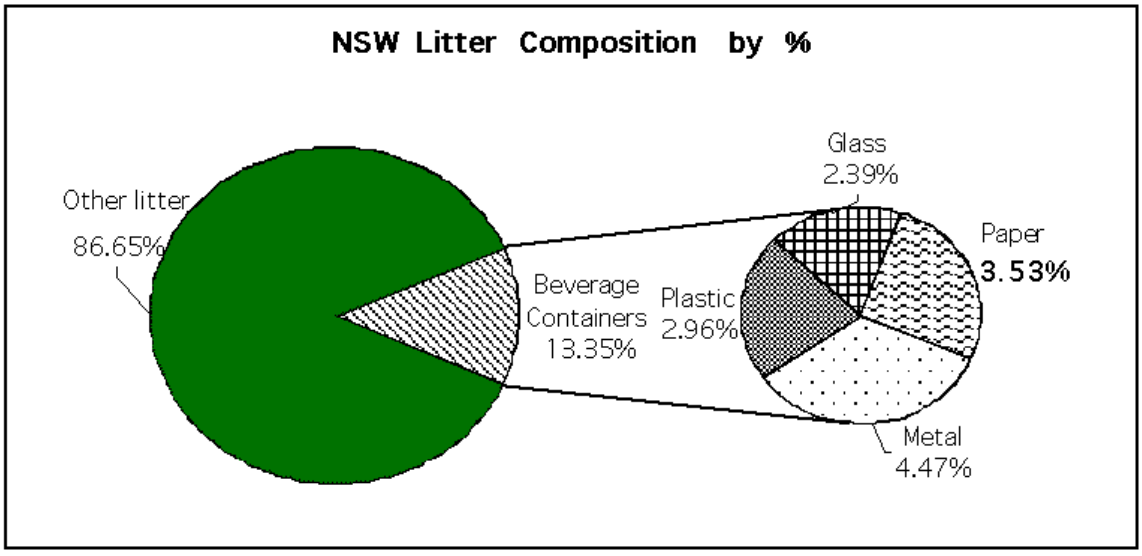

Figure 2.5-1: Composition of NSW litter stream by percentage count.

[7] CDL items as defined by the SA Beverage Container Act 1975

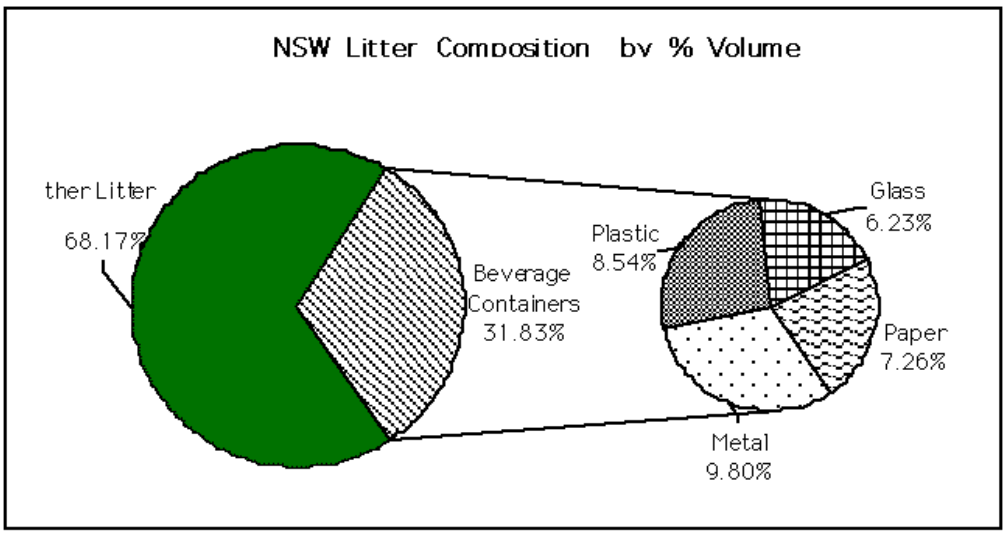

Figure 2.5-2: Composition of NSW litter stream by percentage volume.

2.5.4.4 Litter Trends

Changes in Composition

According to KAB, the 'sinks' of litter are remaining almost static (KAB *homepage*, 1995 national statistics), while its composition is varying slightly as shown in *Table 2.5-4* below. *Table 2.5-4* summarises data from three different visual litter surveys over different periods to compare any changes in composition.

It should be noted that although all the data originates from KAB litter surveys, 1991/2 and 1993/4 data were yielded from surveys identical in method, while 1995 data was obtained using improved litter count techniques, therefore caution should be exercised when comparing 1995 data to earlier years (KAB, 1994) and (KAB 1992).

Material	Container type	NSW trends (KAB) Percent of total litter stream		
		1991/2	1993/4	1995/6[8]
Metal	beer (aluminium)	1.10%	0.80%	1.64%
	soft drink (aluminium)	4.20%	2.30%	2.77%
	soft/juice steel (375ml)	NA	NA	0.06%
Plastic	PET bottles	0.50%	0.50%	2.77%
	plastic beverage bottles	0.20%	0.40%	0.19%
Glass	beer (glass -small)	1.60%	1.90%	1.13%
	beer (glass - 750ml)	2.20%	0.30%	0.44%
	soft drink (glass)	3.50%	2.10%	0.63%
	wine/spirit (glass)	0.10%	0.20%	0.19%
Paper	fruit drink cartons	1.40%	1.80%	1.64%
	milk flavoured cartons	NA	NA	1.32%
	milk cartons	1.70%	1.10%	0.57%
	TOTAL	**16.50%**	**11.40%**	**13.35%**

Table 2.5-4: Trends of beverage containers in the NSW litter stream.

Changes in quantity

As noted earlier in *Section 2.5.3* the CDL Review is not aware of any formal Australian studies that have been undertaken on the absolute quantity of the litter stream. The following points summarise KAB key findings of litter trends in Australia based on the indicative results of its surveys.

- KAB estimates litter has decreased by 10 percent between 1992 and 1996;
- KAB also states litter increased by 2.1 percent between February 1995 and February 1996;
- KAB estimates there has been an 80 percent increase in the potential to litter as a result of population increase;
- annual growth rates in the retail of fast food of up to 25 percent; and
- increase in availability and marketing of convenience foods.

Curnow *et al.* (1997), observed that beverage containers were more than seven times as likely to be binned as they were to be littered. If the quantity of beverage containers in public place litter bins was known, it would, in principle, be possible to determine the number of beverage containers in the litter stream.

[8] It should be noted that 1992 & 1994 data for NSW and Australia varies for the above percentages, however 1995 data was compiled using improved litter count techniques, therefore caution should be exercised when comparing 1995 data to earlier years - see (KAB, 1994) & (KAB 1992).

2.5.5 Comparing Litter Reduction in other Australian States

In order to assess the impact of CDL on the NSW litter stream, litter reduction in other Australian states was reviewed. The impact of CDL on the South Australian litter stream has been assessed, as has litter reduction in Victoria which does not have CDL. Much of the existing literature on the impact of CDL on the South Australian litter stream is conflicting and inconclusive. While some studies argue litter may have been reduced by up to 90 percent due to CDL, others argue no reduction in litter can be attributed to the implementation of CDL. In Victoria it has been argued that the proportion of beverage containers in the litter stream is lower than that in South Australia thereby, implying that CDL does not have a noticeable impact on the litter stream.

2.5.5.1 Litter Reduction in South Australia

The submission by the Milk and Dairy Industry to the CDL Review suggests that CDL in South Australia has not resulted in a reduction in litter. When the percentage of deposit-bearing litter in South Australia is compared to the same items in other states, it is apparent that these items occur less frequently in the South Australian litter stream. SA EPA (2000a) data indicates between February 98 and February 2000, deposit bearing items comprised 26 percent of total beverage litter.

KESAB (2000b) data indicates that in 1999/2000 only 3 percent of the total litter stream in South Australia was beverage items. However, this figure was based on litter counts that include cigarette butts in the analysis, reducing the relative proportion of other items in the litter stream. Analysis of KAB's 1995/6 data reveals beverage containers comprise 8.77 percent of the litter stream when cigarette butts are not included.

The variation between the metropolitan and regional litter stream in South Australia is also noteworthy. KESAB (2000) found that 3 percent of the metropolitan litter stream was attributed to beverage items while in regional South Australia, the figure was 9 percent.

2.5.5.2 Litter Reduction in Victoria

While South Australia is the only Australian state with CDL, Victoria has a lower percentage of beverage items in the litter stream than South Australia. According to KAB national litter statistics (1996), South Australia had 8.77 percent of the litter stream attributed to beverage items, while Victoria had 7.8 percent. However, if only those beverage containers incurring a deposit in South Australia are compared with other Australian states, then South Australia is lower than Victoria. See *Table 2.5-5* for details.

	Percent of total litter stream (1995/6)			
	NSW	SA	VIC	AUST
TOTAL beverage containers	13.35%	8.77%	7.80%	10.39%
TOTAL CDL[9] beverage containers	9.38%	4.01%	5.70%	7.38%

Table 2.5-5: Comparison of beverage containers in litter stream in Australian States.

Source: KAB, 1996

[9] CDL items as defined by SA Beverage Container Act 1975.

Direct comparisons of litter statistics between states should be made with caution (KAB 1996, p3), due to differences in demographics, consumption patterns, anti-litter laws, packaging regulation and climate.

It is possible that Victoria's relatively low percentage of beverage containers in the litter stream is due to:

- higher population densities than South Australia or NSW. South Australia studies have shown beverage items in the litter stream are more numerous in regional areas compared with metropolitan.
- litter education/awareness (Waste Wise Programs, media campaigns);
- litter grants and awards;
- employment of regional education officer (Litter & Waste); and
- Waste Wise Events.

2.5.6 Comparing Litter Reduction with US States

This section of the CDL Review highlights some examples from the US where the implementation of the bottle bill (the US term for CDL) has impacted upon the litter stream, in states including New York, California, Oregon, and Michigan. This section also compares the proportion of beverage containers in the litter stream of the US State of Kentucky which does not yet have a Bottle Bill. The available data indicates some non-Bottle Bill US states have a higher proportion of the litter stream attributed to beverage containers. The introduction of a CDL system would potentially have a more significant impact on those litter streams where beverage containers were more prominent to begin with.

A recent statewide study conducted by the Kentucky Solid Waste Coordinators found that beverage bottles and cans made up 48 percent of total litter[10]. Other non-deposit US states have approximately 36-69 percent[11] of their litter stream attributed to beverage containers (CRI, 1999). According to these surveys in US states, beverage containers are the dominant source of litter by both *volume* and *number* counts. However, other US data from visible litter surveys indicate that beverage containers—the only items affected by mandatory deposits—make up less than 9 percent of roadside litter (NSDA, 1999).

It should be noted that this percentage is substantially higher than that in Australia (see KAB 1992, 1994, 1996; CUA 1998) where between 8-20 percent of the litter stream is attributed to beverage containers. However, analysing litter by volume or weight or count may result in large differences. State government surveys in bottle bill states found beverage container litter was reduced after enactment of their Bottle Bills. The various litter reductions are shown in *Table 2.5-6* below.

[10] Percentages determined in other studies on Kentucky's beverage container litter differ significantly from this figure and are summarised in Table 2.5-7.

[11] The data source did not state whether these figures were % by count, weight or volume.

State	Litter reduction[12]	
	Beverage container	TOTAL
New York	70%-80%	30%
Oregon	83%	47%
Vermont	76%	35%
Maine	69-77%	34-64%
Michigan	84%	41%
Iowa	76%	39%
Massachusetts	-	30-35%

Table 2.5-6: Reduction in litter in some US states after implementation of bottle bill.

Source: Container Recycling Institute (1999) in ***Environmental Impacts: Litter*** , Bottle Bill Resource Guide, [online] Available: www.bottlebill.org/Environmental/Litter/litter.htm [20/12/00])

2.5.6.1 New York

After the implementation of New York's Bottle Bill, litter on the state's highways and streets was projected to decline by as much as 30 percent, saving taxpayers approximately US$50 million annually.

According to the Institute of Applied Research, one year after deposit implementation, accumulated[13] beverage litter rates were reduced by 70 percent. There was no significant reduction in non-beverage litter after the implementation of the deposit legislation.

2.5.6.2 Kentucky

Kentucky has not implemented a Bottle Bill, however, analysis of the proportion of beverage containers in the Kentucky litter stream is useful for comparison with that in the Australian litter stream. Kentucky litter surveys conducted by various organisations yield a range of results for beverage containers in the litter stream, probably reflecting the range of survey techniques used. *Table 2.5-7* compares the results from different surveys. The variation in results is significant, ranging from 8.6 percent to 48 percent of litter being beverage containers. In the summary of each survey, there was no discussion of whether cigarette butts were included in the litter counts. In Australian litter surveys it has been recognised that this can significantly skew the results (by up to 50 percent).

[12] Percentages are by litter numbers.

[13] ***Accumulated*** litter refers to long term litter, whereas ***fresh*** litter refers to that recently littered

Source	Percent beverage containers in litter stream (by count)	Litter survey technique
Kentucky Beverage Industry Recycling Program (BIRP)	8.6%	· Counts in 22 litter categories · Compared 1980 to 1998 · Sampled urban streets, rural highways & roads
Kentucky Transport Cabinet	31.7% [14]	· Examined state roads · Conducted by road crews in 12 highway districts, split evenly between rural and urban · 1/2 mile road section surveyed in each district
Solid Waste Coordinators of Kentucky (SwaCK)	48%	· modelled after the BIRP survey (above) · only looked at 1999 statistics · sampled urban streets, rural highways and roads · litter grouped into 7 categories.
Butler County Innmates	30%[15]	· estimate, no formal litter survey technique

Table 2.5-7: Comparison of percent of beverage containers in the Kentucky litter stream estimated by different sources.

2.5.6.3 California

Accumulated litter reduction was found to be approximately 45 percent as measured in the period (1985-1988) after the Bottle Bill was implemented (see table II, p.8, in Syrek, 1989). The fresh[16] litter reduction was similarly found to be 42 percent (approximately) over the same period. Both were measured as containers per mile-week.

2.5.6.4 Oregon

Within two years of implementing the Bottle Bill in Oregon, litter from beverage containers had dropped by 83 percent. Within 15 years, beverage containers accounted for only four percent of roadside litter, down from 40 percent prior to the Bottle Bill. According to the state government, the bill creates a broader anti-litter ethic, as within two years, Oregon's roadside litter was cut almost in half. (http://www.deq.state.or.us/wmc/solwaste/bbfactsheet.html)

2.5.7 Litter Attitudes and Behaviour

This section addresses the attitudes (opinions) and behaviour (actions) of the Australian public towards littering and how they perceive CDL as a tool to reduce litter. While the literature cited in this section refers to Australian examples, reported behaviour and attitudes may not be unique to Australia. Some literature (Curnow *et al*, 1997) on litter behaviour highlights a contrast between the attitude of Australians to litter and their actual behaviour. An extensive survey by Curnow et al. (1997) found that

[14] this % was found to be 39.6% by weight and 30.8% by volume

[15] it is recognised that this is just an informal estimate by the inmates that serve on roadside crews.

[16] ***fresh*** litter refers to that recently littered.

78 percent of people observed littering (indicating their litter behaviour) felt that litter was a very important or extremely important environmental issue: an attitude not reflected in their littering behaviour. The survey also found that less than half the people who were observed littering within the previous five minutes admitted to the interviewer that they had littered within the last 24 hours.

2.5.7.1 Factors Affecting Littering Attitudes

Several studies have addressed the psychology of why Australians litter. Common motivations for littering include both laziness and the attitude that '*someone else will pick it up*' (EPA NSW, 2000e; McGregor, 1994e; Williams, 1997). The latter attitude is particularly prevalent at special events such as sporting events where litterers believe workers are paid to attend to litter after an event. While a social psychologist may say littering attitudes can be attributed to lack of awareness of one's actions or a rejection of societal norms, an economist may argue that littering occurs because litter material has no economic value. (NSW EPA, 2000)

2.5.7.2 Factors Affecting Littering Behaviour

Curnow *et al.* (1997) identify a range of social and environmental factors that potentially affect the way consumers litter:

- **Socio-demographic factors**. Studies on the impact of socio-demographic factors such as gender on littering behaviour are contradictory and inconclusive. Curnow *et al.* (1997) cite several studies indicating a difference in littering behaviour between genders and different age groups. Many studies (both observational and interviews) indicate males are more likely to litter than females, however, according to Curnow *et al*. *(ibid)* other studies have indicated inconclusive outcomes in gender differences. The Beverage Industry Environment Council in Australia (1998c) conclude that in general males are not more likely to litter than females, however they may be more likely to admit to littering. Similarly, studies of age as a factor in litter behaviour are generally not consistent.
- **Existing litter**. According to Curnow *et al*. (1997) practically all studies indicate that a person was more likely to litter if the environment was already littered, and if others were littering.
- **Bin availability**. The presence and proximity of bins has been found to impact on the way Australians litter.
- **Signage**. Anti-littering signs can influence litter behaviour. Some studies make a distinction between positive signage such as "do the right thing", or negative signage such as "penalty for littering is $200" (Huffman *et al,* 1995). The results in Huffman indicate consumers are more receptive to positive signage.

2.5.7.3 Attitudes to CDL and Litter Reduction

Approximately 25 percent of respondents to the ISF Surveys (see *Volume II1, Section 7:CDL Televote Survey)* who supported the implementation of CDL in NSW thought litter reduction was one reason CDL should be introduced. Of those respondents who did not support the introduction of CDL in NSW, 2-6 percent thought no change in litter reduction was one reason it should not be implemented.

Approximately 53 percent of respondents disagreed with the statement that if CDL was introduced in NSW, people would be more likely to litter those items not bearing a deposit (see *Volume III, Section 7: CDL Televote Survey).*

2.6 Recycling Behaviour and Motivations

Understanding the way in which consumers of containerised beverages are likely to behave under a CDL system is important to the task of reviewing the likely impacts of the introduction of such legislation. This section examines both the determinants of consumer recycling behaviour in general and consumer attitudes to deposit-refund systems. The information provided under this heading is the result of an extensive international literature review. It does not pertain to the social research conducted by the CDL Review, presented in *Volume III: Consultation and Social Research*.

2.6.1 Factors influencing Recycling Behaviour

2.6.1.1 Demographics

Past research has indicated that certain demographic variables such as age, education and income can be linked to participation in recycling programs. More recent studies have only found weak links between demographic variables and recycling behaviour. (Gamba & Oskamp, 1994, Vinning & Ebreo, 1990).

2.6.1.2 Access and Location Issues

The degree to which a system is convenient to a consumer will depend, to a large extent, on where they live, what form of transport they have access to and where a collection centre is located. This is an especially pressing issue for people who live in rural and remote areas and for those who do not own a car or are otherwise less mobile. These issues are discussed in more length in *Section 4.9 Access and Convenience*.

2.6.1.3 Ability to store, clean and sort containers

This issue affects those people living in smaller spaces and those who are less able (and willing) to clean, sort and store used containers. For instance, the Moreland Commission cites this as one of the main reasons New York City residents have lower return rates than up-state New Yorkers (Moreland Act Commission, 1990 p17)

2.6.1.4 Knowledge

Understanding the logistics of local recycling programs, including an understanding of which materials can and cannot be recycled, is an important factor in influencing recycling participation. Knowledge also encompasses peoples' understanding of other waste minimisation practices such as composting, reuse and source reduction. Knowledge and support of waste reduction policies and institutions can also be a factor.

2.6.1.5 Attitudes

A range of studies have attempted to correlate pro-environment attitudes to participation in recycling. Three key studies (Vinning & Ebreo, 1990; Gamba & Oskamp, 1994) found that pro-environment attitudes failed to discriminate recyclers from non-recyclers. Other studies (Derksen & Gartrell, 1993) have shown that when provided with convenient kerbside recycling even those with relatively low environmental concern will participate.

2.6.2 Motivations for Participation in CDL Systems

Peoples' motivations for recycling in general, and participation in CDL systems in particular, include:

- concern for the environment;
- tangible financial rewards and receipt of payments such as lottery tickets, deposits, and reduced fees for waste disposal;
- conservation of resources and decreased landfill;
- personal values of frugality; and
- influence of social norms and peer pressure, friends, and neighbours.

Inconvenience factors ("hassle / inconvenience") were main reasons for not supporting CDL in the CDL Televote.

2.6.2.1 Porter's Willingness-to-Pay to Avoid Inconvenience

R. Porter has studied the propensity of consumers not to participate in CDL systems in America. He has constructed a model of consumer behaviour based on the concept of 'willingness of consumers to pay to avoid inconvenience' in relation to a Bottle Bill (i.e. CDL system) (Porter, 1983 p367). *Figure 2.6-1* reproduces the curve that Porter uses to illustrate this concept.

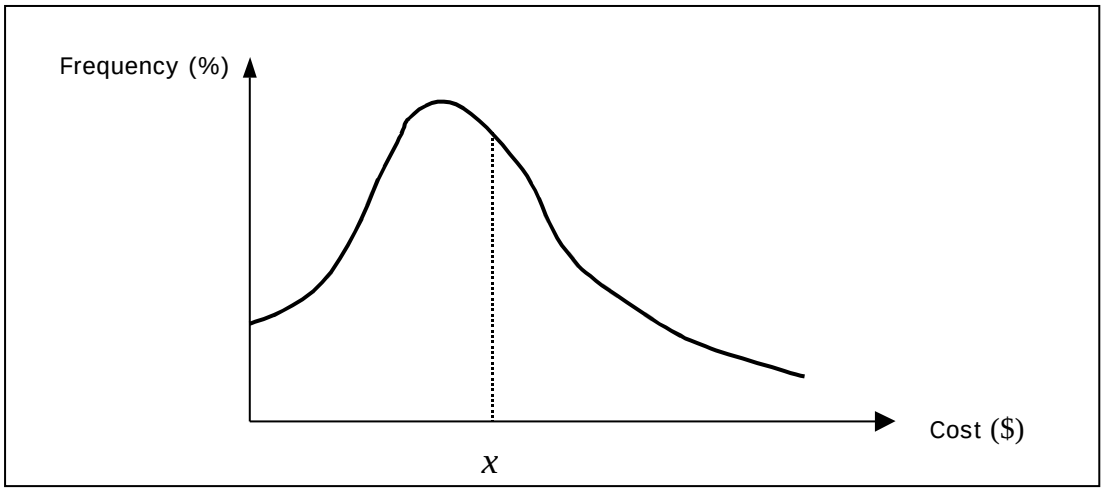

Figure 2.6-1: Willingness to pay for litter reduction.

Source: Porter, 1978

Porter groups people into three categories according to their willingness termed 'y' to pay a fee, to return a container:[17]

- Those for whom 'y' is negative – i.e. for whom the environmental benefits of CDL are sufficient motivation (i.e. do not currently need a financial reward to recycle);

[17] Other studies of recycling motivations group consumers into more categories, for instance, a study of British Columbia (Canada) residents attitudes and behaviour in respect to recycling and the return of beverage containers. This study identifies 6 segments: High maintenance recyclers (21%), affluent and apathetic (19%), refund seekers (27%), moderate empty nesters (12%), and socially responsible (21%) who express strong opinions on environmental issues. Groundworks, 1999, p i).

- Those for whom 'y' is positive but small – ie a few cents. Sizable group – those who do the returning;
- Those for whom the deposit level should be greater than 10c (US in 1983, same as 8.8c AUD in 1983[18]) per container to motivate them to return containers.

The curve is truncated at 10c (US - in 1983) per returned container because Porter argues that no one who values the convenience more highly would ever actually return a bottle (and would rather pass it on to charity).

Porter's analysis shows that people who already contribute to kerbside recycling and who otherwise actively support and undertake voluntary recycling even at a cost to themselves, will still be able to do so under CDL. Those who are in the mid range (where the deposit level is positive but small) will return containers under CDL. Those whose willingness to pay to avoid the inconvenience is higher, end up paying more, and it is used containers stemming from these consumers that will mainly be the source of revenue for collectors other than consumers (i.e. kerbside, charities and other collectors). CDL thus extends recycling to consumers with a wider range of motivations than those already dedicated to recycling or interested in environmental issues.

2.6.2.2 Recycling as a form of Social Dilemma

Peoples' willingness to cooperate with activities like recycling has also been explained in terms of a "social dilemma", which can involve a person making an individual or collective sacrifice in the interests of the common good. A social dilemma is a situation where there is a community goal, such as preserving the earth's resources, that can only be achieved if almost all community members make a sacrifice. Community members would prefer that everyone including themselves make a sacrifice in order for the common goal to be achieved, rather than everyone not sacrificing at the risk of not achieving the goal.

The social dilemma literature provides one interpretation for what motivates some members of the community to participate in activities for the common good like recycling. Some sectors of the community are motivated by self-interest and therefore require incentives to motivate them to participate in activities for the common good. Other community members are perhaps more likely to cooperate when they have reason to believe that others are co-operating or will co-operate. There are a range of other interventions which can be employed to encourage recycling behaviour and these are discussed briefly below.

2.6.2.3 Strategies aimed at Changing Recycling Behaviour

Strategies (or behavioural interventions) that aim to increase recycling rates often follow two different models:

- Strategies that focus on altering behaviour *before* an action. These include written and oral prompts, commitment strategies and goal setting, environmental alterations such as changing the recycling system or container type etc.
- Strategies that focus on altering behaviour *after* an action. These include rewards (prizes, lottery tickets, coupons or money), feedback, penalties (bottle bills or differentiated garbage fees). Financial incentives or disincentives (such as lottery tickets, raffles, coupons and deposits) are generally considered to be an effective means of encouraging recycling participation.

[18] Federal Reserve Statistical Release, http://www.federalreserve.gov/releases/H10/hist/)

Porter and Leeming argue that financial incentives work because:

> *"Individual differences and market strategies notwithstanding, society clearly understands that the appropriate use of penalties can serve as effective behavioural interventions to increase recycling. Passing laws to mandate recycling (i.e. a penalty based approach like a bottle law) is certain to increase recycling behaviour of an overall community, regardless of education or individual differences within that community."*
>
> *Porter & Leeming (1995)*

CDL uses both strategies because it tries to influence recycling behaviour with monetary incentives after the act of consumption, but also may start to influence before consumption in purchasing behaviour, (in choice of packaging materials and convenience to redeem deposits). This tendency has been seen in Germany with changes in packaging type due to the German Packaging Ordinance of 1991 (Vanthournout, 1998).

CDL is likely to produce high rates of container return because it motivates those who would do it anyway (i.e. for intrinsic environmental reasons), *and* those that would be motivated by a monetary incentive. For those people who would not be motivated (unless the deposit level was much higher), we can expect that the containers would still be collected by those people whose loss of inconvenience threshold is lower and those for whom CDL represents a way of raising revenue (individuals or groups).

2.7 Recycling in NSW: Systems and Infrastructure

This section provides a brief overview of relevant recycling systems and infrastructure in NSW. The aim of this section is to provide the context in which a CDL system would operate in NSW, as well as to identify potential synergies between CDL and existing systems and infrastructure. The impact that the introduction of CDL may have on the current kerbside recycling system is discussed elsewhere in this report (see *Section 3.6.1: Kerbside Recycling and Local Government*).

2.7.1 Current Recycling Systems

Presently, containers are to be recovered by three means in NSW:

- **Kerbside** through municipal recycling;
- **Away from home** via public place and special event recycling; and
- **Depots** or waste management facilities where recycling is sent to a centralised collection point.

2.7.1.1 Kerbside Recycling

Kerbside recycling is by far the most significant mechanism currently in NSW for recovery of containers that have been consumed at home. In this report, kerbside recycling is used synonymously with at home recycling under the current system.

There have been several major studies of kerbside recycling both in NSW and Australia as a whole (BIEC 1997b; Nolan-ITU 1998b; Nolan-ITU/SKM, 2001). *Table 2.7-1* has been adapted from Nolan-ITU/SKM (2001) and shows the relative market share of different types of kerbside collection throughout Australia.

The CDL Televote Survey undertaken as part of the CDL Review (see *Volume II1, Section 7.2*) found that approximately 80 percent of respondents had access to kerbside recycling. Reported access was as high as 95 percent for metropolitan respondents, and approximately 73 percent for rural respondents.

System Classification Group (M = Metropolitan, R = Country/Regional)	Collection method for Containers	Collection method for Paper	System frequencies
System M1 and R1 48% of reporting households	Crate	Loose/bundled	Weekly & Fortnightly
System M2 and R2 4% of reporting households	MGB	Loose/Bundled	Containers weekly & Paper Fortnightly
System M3 and R3 10% of reporting households	Split MGB for garbage and recyclables	Weekly	
System M4 and R4 19% of reporting households	Split MGB for recyclables	Fortnightly	
System M5 and R5 6% of reporting households	MGB	MGB	Fortnightly
System M6 and R6 13% of reporting households	Commingled MGB for recyclables	Fortnightly	

Table 2.7-1: Systems classification for kerbside recycling systems in Australia.

Source: Nolan-ITU/SKM, 2001: p. 25

2.7.1.2 Away from Home Recycling

Away from home recycling can be broken into three main categories:

- public place;
- special events; and
- commercial.

Recyclables in each category can be collected by either (BIEC, 1997):

- council day labour;
- council contractors; or
- private collectors (e.g. Visy Recycling).

Public Place

Public Places include beaches, parks and streets. Public place recycling relies on a voluntary system of recycling by the consumer. Therefore successful recovery rates depend in part on 'user friendliness' of the recycling stations. This includes clear, consistent, and appropriate signage.

Southern Sydney Waste Board was the designated NSW Waste Board to promote the standardisation signage system for public place recycling and to review and monitor the progress. It produced resources such as public place waste management guidelines (South Sydney Waste Board, 1999) and waste audits on shopping centres, food festivals and open-air cinemas.

There is currently no single body overseeing provision of public place recycling systems. It is the responsibility of the individual local government organisation, contractor, or manager of commercial premises. It is currently not mandatory to implement such a system. Many individual councils have

implemented programs e.g. South Sydney City Council supports public place recycling which is implemented in the council's parks, council venues, and council sponsored events.

Special Events

Special events includes sports events or festivals. Like public place recycling, special events recycling also relies on a voluntary system of recycling and collection. Contamination rates can be high, affecting the quality of the recyclables collected or requiring time for extra separation.

The NSW Waste Boards commissioned guidelines to improve recycling at special events called *"7 Steps to a Waste Wise Event"* (EcoRecycle Victoria, 1999). Community Aid Abroad has also published a guide to recycling at events. Often contamination at special events or public places can be a problem, especially when signage is not clear or bins are not staffed with someone to guide the consumer/disposer.

Commercial Recycling

Commercial includes hospitality (hotels, motels, restaurants, food courts), institutions and workplaces.

Unlike recycling in public places, recycling at hospitality facilities requires a recycling service to be set up where recyclers such as Visy are contracted to collect and manage the recyclables.

According to the Beverage Industry Environment Council (BIEC, 2000), approximately half of beer and soft drink containers are consumed away from home. Glass is the most common material component of the away from home waste stream, although lack of colour separation and contamination impact adversely on the market value of recycled glass.

According to the *"Away From Home Recycling Report"* (BIEC, 1997), large restaurants close to Sydney were more likely to have recycling systems. The report also found that coffee shops are less likely than restaurants to have recycling systems. Glass (followed by cardboard) was found to be the focus of recycling for hospitality premises. Little if any PET is currently recycled.

BIEC (1997) also highlighted barriers to implementation of a recycling system at restaurants and coffee shops including:

- inability to locate a willing collector;
- owner/manager seeing recycling as a waste of staff time;
- lack of storage space.

BIEC (1997) identified 13 major glass and other material recyclers from Sydney commercial premises with only 36 trucks operating in total. In almost all cases, collectors/recyclers do not charge the commercial premises for their collection service, simply relying on the material value of the collected material.

2.7.1.3 Kerbside Recycling Collection Trial for Businesses

In 2000, the Southern Sydney Waste Board (SSWB) conducted a twelve-week kerbside recycling collection trial for businesses on King Street, Newtown. This study area covered both South Sydney and Marrickville council areas. The trial involved 73 to 96 businesses over the 12-week period. *Table 2.7-3* summarises the materials that were accepted for recycling.

❑ Brown glass	❑ Numbers 3,5,6,7 plastics
❑ Blue glass	❑ Aluminium cans
❑ Clear Glass	❑ Steel cans
❑ Green glass	❑ Liquid Paperboard
❑ Broken glass	❑ Tetrapak
❑ Clear PET	❑ White office paper
❑ Green PET	❑ Mixed paper
❑ Clear HDPE	❑ Newsprint
❑ Coloured HDPE	❑ Cardboard

Table 2.7-3: Materials included in the King St Newtown recycling trial.

Over twenty tonnes of materials were recycled during the trial. Approximately 89 percent by weight and 86 percent by volume of which would have been recycled (Southern Sydney Waste Board, 2000 p.13).

2.7.2 Recycling Infrastructure

There are approximately 100 recycling depots in NSW. The type and standard of these depots varies, however, they are typically incorporated into the operations of existing facilities and are used as a collection point for recyclable materials, for self haul materials, and items that are not suitable for kerbside waste collections (such as oils, paints, hazardous material).

Facilities	Sydney Metropolitan Area	Greater Sydney Region	Rural NSW
No existing Depots	24[a]	32[b,c]	69[c]
No of potential Depots	15[19,c]	43[c]	29[c]
Total	44	70	98

Table 2.7-2: Potential container recycling depots in NSW.

2.7.2.1 Existing Infrastructure

At March 2001, there were 133 EPA licensed waste facilities in the Sydney metropolitan area. Of these 133 waste facilities, 24 were designated depots of which 18 were Council owned and 6 privately owned. In addition to the 24 depots, there were 20 other waste management facilities, including: scheduled waste management centres (WMCs) waste management facilities (WMFs); waste recycling and processing facilities (WRPF) waste transfer stations (WTS), and; waste depots (WDs).

Of the 20 waste facilities that are not depots, 7 were Council owned and 13 privately owned. It is likely that most of these waste management facilities already have built infrastructures (i.e. sealed roads, sealed floors, public access, shelter, and some degree of power and water supply) which may be modified to some degree to enable them to become container depots.

2.7.2.2 Potential Use of Existing Infrastructure

In addition to the 24 existing depots and 20 potential containers depots, there remain another 87 EPA licensed waste facilities, of which some may potentially be modified or upgraded for use as container recycling depots. Furthermore, there is an additional number of existing depots or WMFs (both Council and private owned) that are not EPA licensed. These include some council depots, landfill sites (old and current) and other WMFs. These facilities may also provide potential use as container depots.

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[19] EPA licensed waste management facilities

Canterbury City Council, Salt Pan Creek Tip, Riverwood

Fairfield City Council, Recycling Centre, Wetherill Park

Hawkesbury City Council WMF, Windsor

Hawkesbury City Council Waste Depot, East Kurrajong

Marrickville City Council, Tempe Waste Depot, Tempe

Auburn WMC, waste recycling and processing, Homebush

Lidcombe Liquid Waste Plant, waste recycling and processing, Lidcombe

Seven Hills WMC, waste recycling and processing, Seven Hills

Collex Pty Ltd, Riverstone WMF, Schofields

Eastern Creek WMC, waste recycling and processing, Eastern Creek

Grange Avenue WMC, waste recycling and processing, Marsden

b. Nolan-ITU Pty Ltd (1998) "Overview of Integrated Infrastructure Requirements - Greater Sydney Region" NSW Waste Planning and Management Boards

c. EPA licensed waste facilities, NSW EPA (March 2001)

2.7.2.3 Potential Container Depots in Greater Sydney Region

In this report, the Greater Sydney Region (GSR) is based on the NSW Waste Planning and Management Boards regions and extends to the Hunter region in the north, the Illawarra region in the South and the Macarthur region in the west. There are 32 existing EPA licensed and Council owned waste management facilities in the Greater Sydney Region. In addition, there are another 29 EPA licensed council and 9 privately owned waste management facilities in the greater Sydney region. These include: scheduled waste management centres (WMCs); waste management facilities (WMFs); waste recycling and processing facilities (WRPF); waste storage; transfer and separating facilities (WSTSFs), and; solid waste landfilling facilities (SWLFs). It is likely that most of these waste management facilities already have built infrastructures (i.e. sealed roads, sealed floors, public access, shelter and some degree of power and water supply) that may be modified to some degree to enable them to become container depots. There are another 53 EPA licensed waste facilities, some of which may provide potential use as container recycling depots.

2.7.2.4 Potential Container Depots in Rural NSW

There are 69 EPA licensed and Council owned waste management facilities in rural NSW. In addition, there are three privately owned waste storage, transfer and separating facilities (WSTSFs) that may be used as potential depots. There are also another 24 privately and two government owned waste facilities in rural NSW, which include composting and related processing facilities (CRPFs), and solid waste landfilling facilities (SWLFs).

There are 13 existing unlicensed landfill sites in rural NSW, some of which may be modified or upgraded to container depots.

2.7.3 The Proposed Infrastructure

The Western Sydney Waste Board (WSWB) proposed the development of a "Drive Thru Recycling Centre" (DTRC) as part of a national network of centres designed to minimise waste by managing it as a resource. According to the WSWB:

> *Its intention of the centre is to service the domestic and light commercial sector and to provide infrastructure to re-aggregate products and resources into commercially viable lots that can be processed, repaired or re-engineered by industry.* (WSWB, 2000)

The WSWB identified a large resource base of items that could be re-used if kept separate from current mixed waste streams. The intended items for collection include:

- household hazardous waste;
- electronic appliances;
- white and brown goods;
- household bric-a-brac;
- light building materials;
- scrap metals;
- garden refuse;
- traditional dry recylables;
- other light building materials;
- council clean up items.

The DTRC is designed to capture these resources and complement the two major options currently available to the community: (i.e. existing mixed waste garbage service for putrescible wastes and the kerbside recycling service for systematic recovery of traditional dry recyclables).

The DTRC is targeted to small businesses within the catchment area of the centre, not large trucks or large commercial waste operators, which will be directed to more commercial existing facilities.

As part of the analysis of DTRCs, the WSWB considered a variety of alternatives, including existing transfer stations, exiting reuse centres (Reverse Garbage, Revolve, etc.), but none were identified as meeting the requirements of the DTRC.

The WSWB proposed that the DTRC be publicly owned and privately operated, and expected a pre tax ungeared internal rate of return of 29 percent. At a discount rate of 7 percent per annum the net present value of the additional benefits and costs to society are evaluated as $36.230 Million (2.12 to 1.00 benefit to cost ratio). A key factor contributing to this is the scope to reduce the provision of council neighbourhood large waste clean-up services.

The estimated diversion from landfill is 58,000 tonnes per annum. The WSWB also projected that there would be transport savings with a net reduction of vehicle trips and associated pollution/environmental impact. The intent is to reduce the requirement for storage and purpose-made trips to the centre, and to be convenient and accessible in the same manner as the 'charity bin approach' where drop-offs occur on the way to another destination.

If DTRCs were established in Sydney, they would form an ideal infrastructure for container collection centres. The incentive for patronage of the centres that would be provided by the existence of a deposit on containers, would also contribute to the success of the DTRCs and the collection of other recyclables.

2.8 Container Consumption Data

Key Findings:

- Carbonated Soft Drink (CSD) packaging contributes most significantly to PET and Aluminium packaging. Plain Milk is the most significant contribution to the HDPE and LPB packaging waste. Beer packaging is a major contributor to glass waste and together with CSD, contributes significantly to aluminium can packaging waste.
- Historically, only Beer and CSD were included in container deposit legislation.
- Milk, CSD, and juice are shifting towards PET packaging.
- Food, non-food (such as shampoos, cleaners etc), and secondary packaging products also play a role in the contribution to overall waste stream.
- Estimates are used to predict production and consumption trends from 1990-2003 for all beverage types. Data sources are often incomplete or not readily available.

2.8.1 Introduction and Method

This section identifies and briefly describes the container consumption trends by product type. Analysis of container consumption trends was an important component of the CDL Review. It allowed the flows of container material (to landfill, and recycling) to be extrapolated for application in the cost-benefit analysis conducted by the Review. The material flow analysis is described further in *Section 2.9: Material Flows* and *Section 3.2: Scenario Description and Container/Material Flows*.

While a range of products including both food or non-food products (such as shampoos, cleaners etc), are packaged in containers, the quantitative analysis conducted by the CDL Review focused on beverage products. The CDL Review focused on beverage containers for three reasons. Firstly, beverage containers are estimated to make up almost eighty percent of the primary container market. Secondly, container deposit-refund systems internationally are almost universally restricted to beverage containers. Thirdly, there is very little reliable data available in NSW for both consumption and disposal of non-beverage primary packaging.

The market analysis described in this section categorises beverages into ten categories: carbonated soft drink (CSD), new age beverages, bottled water, milk, soy-milk, beer, wine, spirits, juice, and cordial. These ten categories are based on the 'extended container deposit legislation' systems of Canada and the United States.

A variety of sources[20] were used to identify general trends in the markets of each produce including statistical data supplied by industry, Australian Bureau of Statistics (ABS), marketing reports (AC Nielson, 1996, 1998, 1999, 2000; IBIS, *Online*), and other data where available.

2.8.2 Results

2.8.2.1 Overview

Consumption in NSW from 1990 – 2003 for the ten beverage categories analysed by the CDL Review is shown in *Figure* 2.8-1.

The graph demonstrates the dominance of soft drink, milk and beer in the beverage market. Juice, bottled water, wine and cordial contribute less significantly. The least contributing beverages are spirits and new age beverages.

[20] IBIS business information PTY LTD (http://www.ibis.com.au); Australian Bureau of Statistics (http://ww.abs.gov.au) ; ASDA year Book 2000, industry supplied data, and Industry statistical summary 1992-1993; AC Nielsen, grocery Reports, 1996,1998,1999,2000.

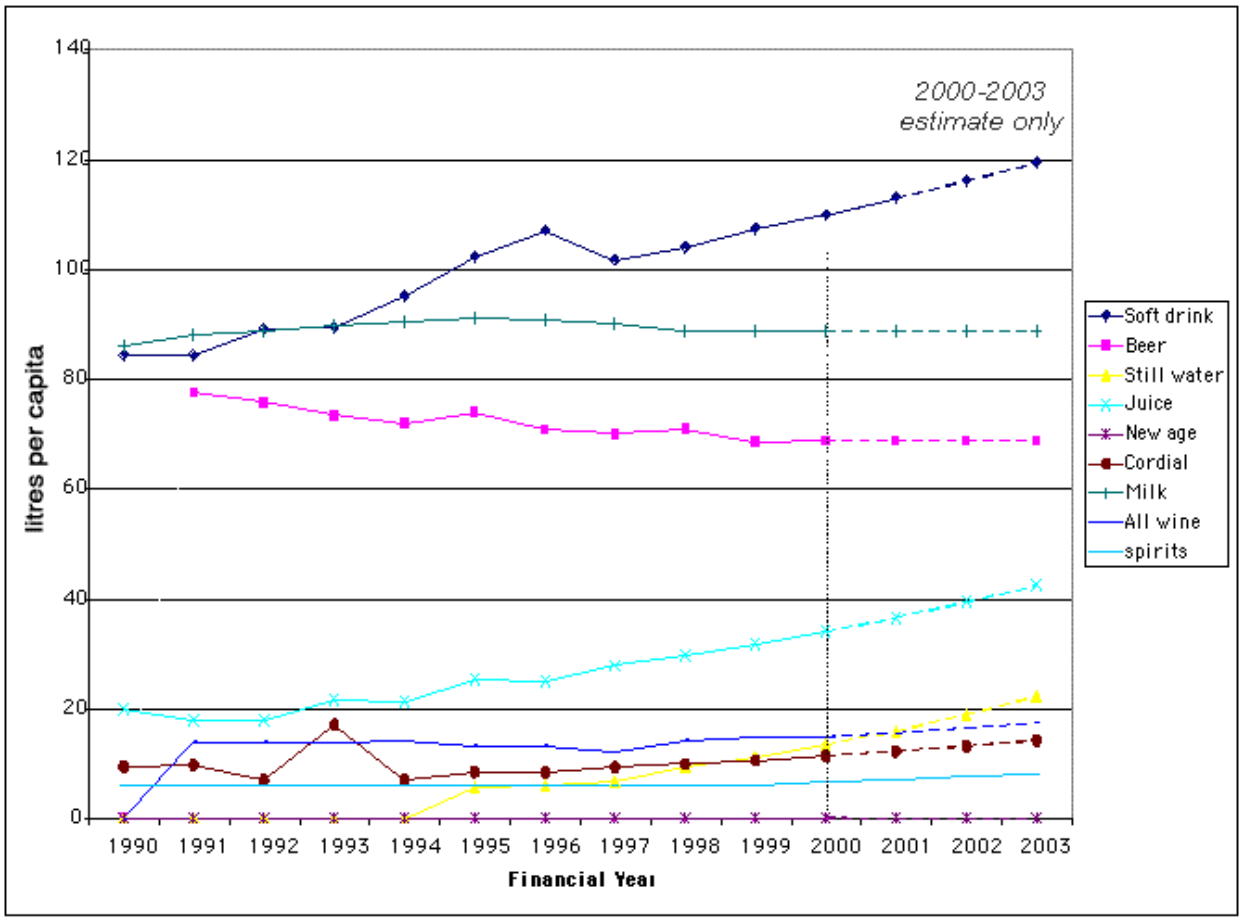


Figure 2.8-1: Per capita consumption for beverage products in NSW between 1990-2003.

Table 2.8-1 summarises current consumption and growth rates in NSW that were used to extrapolate historical consumption to the year 2003. 2003 is the year in which the CDL Review's cost-benefit analysis is based. The results of the extrapolation are shown as dotted lines in *Figure 2.8-1*.

Product	Consumption (NSW)		Packaging Types in order of significance
	Litres per capita in 2000	Total growth percent pa	
Carbonated Soft Drink (CSD)	110	3%,	PET, Aluminium, Glass
Milk	89	<1%	LPB, HDPE, PET
Beer	69	<1%	Glass, Al
New Age	0.1	20%	Glass PET, Aluminium
Bottled Water	13	20%	PET, Glass
Flavoured Milk	5	<1%	LPB, HDPE
Soy-milk	2	11%	LPB
Flavoured Soy-milk	<1	11%	LPB
Juice	34	9%	LPB, HDPE, Glass, PET, steel, Other Plastic (PVC)
Imported Wine		8%	Glass
Domestic Wine	15[21]	11%	Glass
Cordial	11	9%	Other plastic (PVC), HDPE Glass
Sprits	7	<1%	Glass and Aluminium

Table 2.8-1: Consumption trends and material types for various beverage products.

2.8.2.2 Product Specific Results

Carbonated Soft Drink (CSD)

The packaging of CSD is predominantly PET, aluminium and glass with a general shift towards PET and away from glass. The per capita consumption of CSD is 110 litres per person per annum, which is the highest of all ten beverage categories. Of the ten categories, CSD packaging contributes most significantly to the PET and aluminium packaging in the beverage container waste stream.

New Age Beverages

The packaging of new age beverages is predominantly glass, plastic and aluminium. Although the growth rate is very high (20 percent), the per capita consumption of new age beverages is very low, (0.1 litre per person per annum) and the packaging from this product has little effect in contributing to overall the beverage container packaging.

Bottled Water

The packaging of bottled water is predominantly PET and glass. The per capita consumption of bottled water is approximately 13 litres per person per annum, combined with a high growth rate (20 percent) it

[21] Includes both imported and domestic wine.

may be assumed that the PET and glass container waste from this product is likely to increase in the future.

Milk

The packaging of plain milk is predominantly HDPE and LPB. Plain milk is the most significant contribution to the HDPE and LPB packaging waste, with a per capita consumption of 89 litres per person, the second highest consumption rate of the ten categories.

The per capita consumption of flavoured milk is only 2 litres per annum but with a predicted growth of 2 percent (faster than non-flavoured milk at -<1 percent) its relative contribution to the milk packaging waste stream is likely to increase.

The recent introduction of PET into the packaging trends for milk has not been modelled but it is worth noting that PET container waste is also likely to increase as a result of this.

Soy-milk

The packaging of soy-milk is LPB (or aseptic). The per capita consumption of soy-milk is one of the lowest of the categories at 2 litres per person per annum, (comparable to flavoured milk and lower than cordials, bottled water juice and wine). Although its growth rate is reasonably high at 11 percent. Soy-milk is not considered a significant contributor to packaging waste.

Beer

The packaging of beer is predominantly glass and aluminium. The per capita consumption of beer is the third highest at 69 litres per person per annum. Beer packaging is a major contributor to the glass waste and also contributes significantly to aluminium can packaging waste.

Wine

The packaging of wine is predominantly glass. The per capita consumption of all wine (import and domestic) is 15 litres per person per annum, (comparable to juice). A growth rate of around ten percent implies that the relative contribution of wine packaging to the glass waste stream is likely to increase.

Spirits

Spirits are packaged in aluminium and glass. In 1999/2000 the per capita consumption of spirits in NSW was 7 litres per person, per annum, which is one of the lowest of all categories (higher than new age beverages and flavoured milk only). Per capita consumption is assumed to remain constant, but packaging changes, such as lightweighting, will affect the tonnes of aluminium and glass which result. Packaging of spirits in considered a small contribution to the glass and aluminium beverage containers waste.

Juice

The packaging of juice is predominantly HDPE, LPB and glass. The per capita consumption of juice is 34 litres per person per annum and the growth rate is 9 percent per annum. Second to milk, juice is the major contributor to HDPE, LPB and will also contribute to glass beverage container packaging waste.

Cordial

The packaging of cordials is predominantly ‘other plastics’, such as UPVC. The per capita consumption of cordials in the year 2000 was 11 litres per person per annum and the growth rate is 9 percent per

annum. Packaging of cordials is considered to have a relatively small contribution to the PET and glass beverage containers waste streams.

2.8.3 'Other Non-Beverage' Containers

CDL systems currently in place around the world, including South Australia, apply to beverage containers only. However, 'other non-beverage' containers such as tinned or glassed food, paints, oils, shampoos, cleaners, and chemicals also contribute to the waste stream and to the environmental impact of virgin material production.

In the CDL Review, 'other non-beverage' containers are defined as food and non-food containers, excluding beverage containers, for the purpose of consumption or use by consumers and pets. Consumption of this category of containers was analysed but it was not included in CDL impact modelling and cost-benefit analyses conducted by the CDL Review.

A brief survey was conducted to estimate the proportion of containers entering the waste stream, which were food, non-food and beverage. It is estimated that for non-steel rigid containers, beverages account for over 80 percent of the container flow.

Results

Beverage containers make up 61 percent of the top 100 categories of sales of items packaged in containers. Non-beverage items make up the other 39 percent, comprising food container items (23 percent), non-food (8 percent) and pet food at 8 percent.

Food and non-food are estimated to comprise less than 20 percent of the rigid container market for non-steel containers. In steel (tin plate) beverage containers are estimated to be less than 4 percent of the market.

2.9 Material Flows

2.9.1 Introduction

This section provides results of the analysis conducted by the CDL Review of the current consumption and recovery of beverage containers for NSW. The analysis has been conducted on a material specific basis for aluminium, glass, polyethylene terephthalate (PET), high-density polyethylene (HDPE), liquidpaperboard (LPB) and steel. Consumption estimates in this section are based on the product-specific market analysis described in *Section 2.8: Packaging – Products*.

2.9.2 Overview

This section provides an overview of the estimated total amount of container materials produced, recycled,[22] and sent to landfill in tonnes/annum and containers/annum for the whole of New South Wales.

[22] The term recycled means either the amount of material accepted at a MRF or the amount of material sold to recyclers. This depends on the material type given contamination and other issues. For glass beverage containers recycled means the total amount collected for recycling minus a 15% contamination rate, and for all other materials recycled is the same as that collected, given that a negligible contamination rate was assumed. Although this assumption was made, it must be noted that there is likely

Key findings:

- Glass is over 80% of all beverage container materials by weight
- Glass and aluminium are the major beverage container materials by container number
- Beer and soft drink beverage containers are 61% of all beverage containers by weight and 63% by container numbers.
- It is estimated that over 50% of beer, soft drink, still water, juice and flavoured milk are consumed away from home.

Table 2.9-1 and *Figure 2.9-1* provide an overview of the production and recovery of beverage container materials by weight of material. Section 2.9.3 provides a detailed methodology as to how each of these figures were obtained.

Material	Production (tonnes/a)	Recycled (tonnes/a)	Landfilled (tonnes/a)	Recovery (%)
Aluminium	13,593	8,156	5,437	60%
Glass	255,235	109,521	145,714	43%
PET	20,995	11,710	9,285	56%
HDPE	13,745	4,977	8,768	36%
Other plastic	3,271	-	3,271	0%
LPB	9,801	1,999	7,802	20%
Steel	784	308	476	39%
Total	**319,424**	**2,307**	**178,893**	

Table 2.9-1: Percentage breakdown of beverage container materials by weight for 2000.

to be some contamination, both at kerbside and at MRF, although this has been reported as zero to one percent (Nolan-ITU/SKM, 2001: 31).

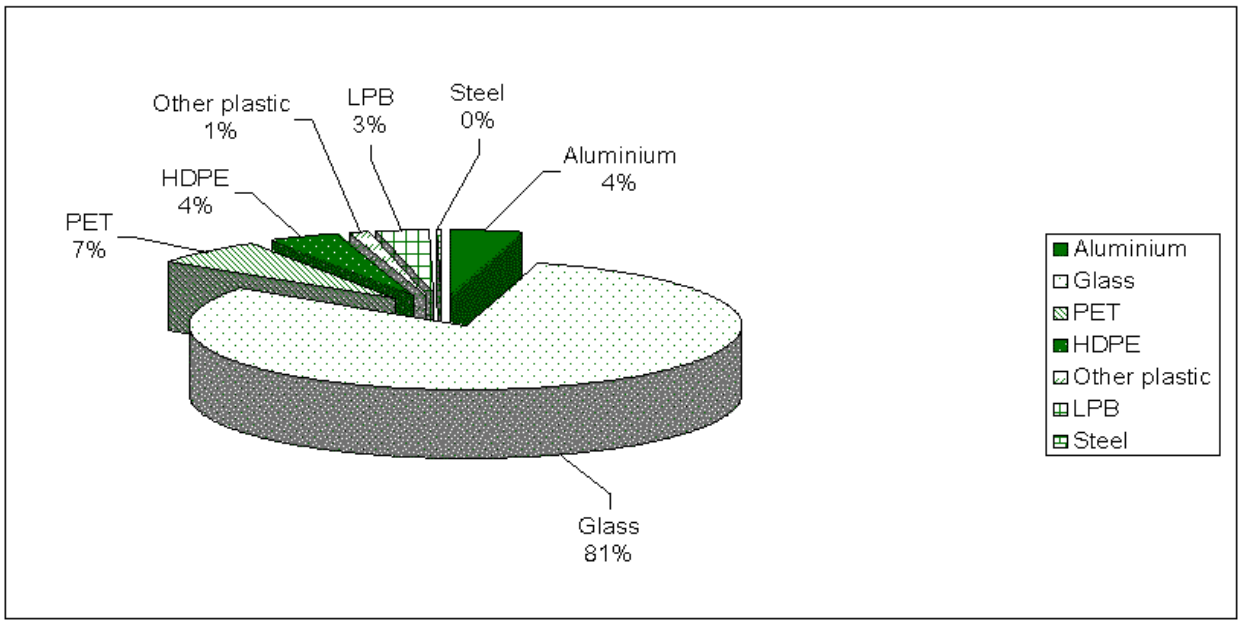


Figure 2.9-1: Percentage breakdown of beverage container materials by weight for 2000.

Table 2.9-1 and *Figure 2.9-1* show that glass represents the majority of all beverage container materials produced by weight. PET has the second largest proportion of the materials stream with seven percent of the total production. HDPE, LPB and aluminium represent a fairly equal proportion of the remaining total production at four percent, three percent and four percent respectively, while steel and other plastic represents a very small proportion of the total beverage container material production.

Table 2.9-2 and *Figure 2.9-2* provide an overview of the production and recovery of beverage container materials by number of containers for each material type.

Material	Produced (millions)	Recycled (millions)	Landfilled (millions)	Recovery (%)
Aluminium	908	545	363	60%
Glass	1,221	524	697	43%
PET	614	342	271	56%
HDPE	275	100	175	36%
Other plastic	65		65	0%
LPB	251	51	200	20%
Steel	10	4	6	39%
Total	**3,345**	**1,603**	**1,740**	

Table 2.9-2: Percentage breakdown of beverage container materials production, recovery and landfilled by container number for 2000.

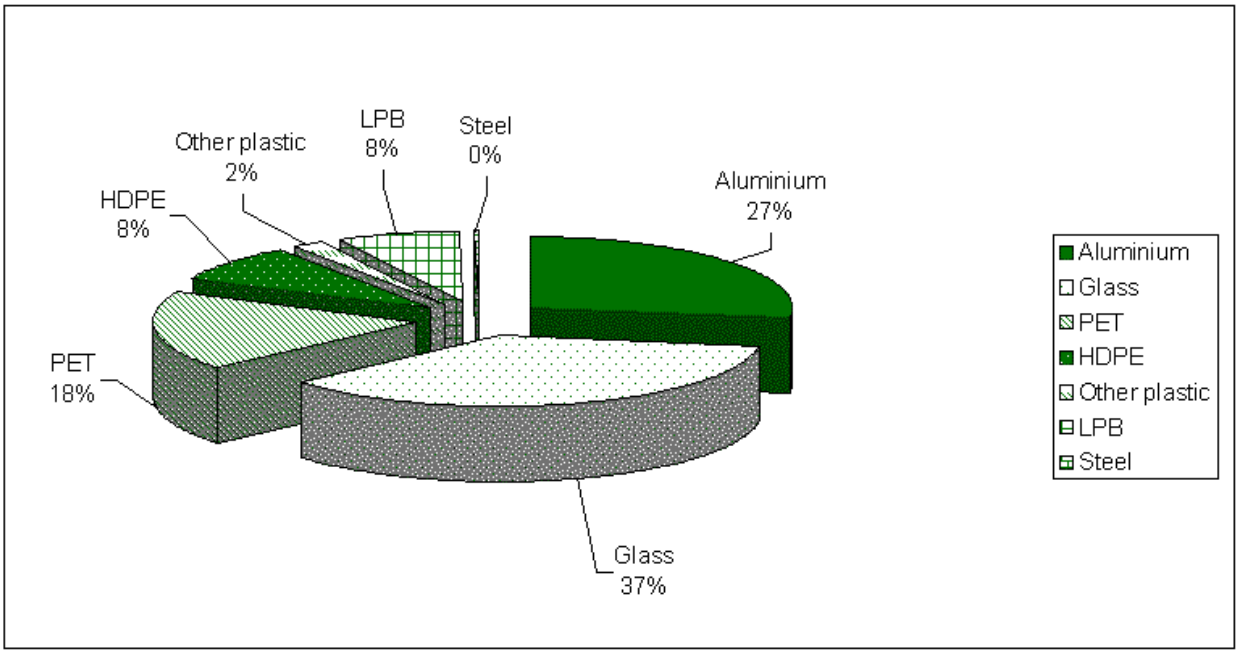


Figure 2.9-2: Percentage breakdown of beverage container materials by container number for 2000.

As shown in *Table 2.9-2* and *Figure 2.9-2*, when assessing the number of containers that are produced for each material, the proportions are substantially different than when measured by the weight of the material. Glass, aluminium and PET represent the highest percentages of containers produced with 37 percent, 27 percent and 18 percent respectively. HDPE and LPB each represent eight percent of the total production. Other plastic and steel represent a very small proportion of containers produced.

2.9.3 Methodology

This section describes the methodology for determining the total amount of materials produced and recycled, and the split in production and recycling between the at-home and away-from home sectors. *Table 2.9-3* provides a summary of the sources for the data used in this analysis.

Data source	Description of data	Information	
BIEC 1995 Greater Metropolitan Sydney audit	❑ Audit of 18 randomly selected Local Government Areas in which 30.17 tonnes of garbage was collected and sorted from 1620 households	❑ Per household quantities of garbage and recyclables for each material type. ❑ At-home quantities (t/annum) for each used container material. ❑ At home recycling quantities (t/annum) of used container materials	
BIEC 1997 National recycling audit and garbage bin analysis	❑ Audit of 29 councils. 23.17 tonnes of waste was collected and sorted. 15.4 tonnes made up the garbage stream, 6.56 tonnes made up the recycling stream, and 12.13 tonnes were green waste.	❑ Per household quantities of garbage and recyclables for each material type. ❑ At-home quantities (t/annum) for each used container material. ❑ At home recycling quantities (t/annum) of used container materials	
BIEC statistics	❑ Total produced (t/annum), collected, reused and landfilled for aluminium, glass and PET for the years 1990-1996	❑ Used as a comparison for the total production of beverage containers in aluminium, glass and PET. ❑ Used as a comparison for the total recycling of beverage containers in aluminium, glass and PET.	
EPA kerbside recycling data	❑ Data was provided for the years 1990 to 1998 for total amount of aluminium, glass, plastic, steel and paper that was collected from kerbside. Data provided for 1999 included a breakdown of plastic into PET, HDPE and other plastic and LPB	❑ At home recycling (tonnes/a) for each material type. ❑ Per household quantities of recyclables for each material type. ❑ Per capita quantities of recyclables for each material type.	
Visy Recycling	❑ NSW glass cullet recovery data for 1995-2000	❑ Total glass recycling in NSW after contamination was taken out.	
ABS statistics	❑ Apparent consumption of foodstuffs, Australia. ❑ Population data ❑ Manufacturing production ❑ CPˆ£äyT‰es produced	❑ Consumption of food and beverages ❑ Milk, beer, soft drink, juices, cordials produced ❑ Total beer produced	❑ Used the sum of all beverage container products of the same material type to determine the total production of beverage containers in NSW for each material type. ❑ Used to project (model) the likely production to the year 2003 based on known or assumed trends
Australian Soft Drink Association	❑ Data on the amount of soft drinks, fruit drinks, cordials and syrups produced from 1995 –2000. ❑ Data on changes in packaging trends	❑ Total consumption of soft drinks	
Australian Liquor Merchants Association	❑ Container Sales in NSW for liquor for 1999 and 2000	❑ Total consumption	
Media Sources	❑ Bottled water growth trends	❑ Projections	
Milk Packaging Stewardship Council	❑ Production and recovery rates of milk packaging in NSW	❑ Total production and recycling	
PACIA, 1998	❑ Production and recovery of plastic	❑ Used to determine the split between beverage and non-beverage HDPE produced in NSW.	
Nolan-ITSU/SKM (2001)	❑ Kerbside recycling systems in Australia: production and recovery of materials in all sectors	❑ To determine the glass contamination rate in kerbside recycling	
Can Makers Institute of Australia, BHP, National steel can recycling program	❑ Steel can recycling rates ❑ Number of cans per tonne	❑ Information on the current recovery rates of steel cans in NSW and the number of steel can beverage containers produced/recycled.	

Table 2.9-3: Sources for and data used in the assessment of beverage container materials.

2.9.3.1 Material production and recycling

For each material, the estimated total amount used in beverage container manufacture was based on the combined demand determined for each beverage type (see *Section 2.8: Container Consumption Data*). *Table 2.9-4* shows which products contribute to the total consumption for each container material.

Material Type	Products
Aluminium	Beer; soft drink; juice; premixed alcoholic beverage; and new age drinks.
Glass	Beer; spirits and premixed alcoholic beverages; wine; soft drink; juice; cordial; and new age drinks.
PET	Soft drink; juice; new age drinks; and still water.
HDPE	Milk; juice; and cordial.
Other Plastic	Cordial and juice.
LPB	Milk and juice.
Steel	Juice only.

Table 2.9-4: Products included to determine the total production of each beverage container material type in 2000.

Further detail regarding the estimation of total consumption is given on a material specific basis under heading *2.9.4: Container Flows* and in *Appendix*.

2.9.3.2 Home versus Away-From-Home Split.

The at home and away from home production and recycling split was based upon information obtained from two audits conducted by BIEC in 1995 and 1997, and the EPA kerbside recycling data for 1998 and 1999. In the 1997 BIEC audit (RAGBA) garbage, recycling, and green waste was collected and analysed from residential premises in 98 local government areas (BIEC 1997). This included a study of 29 NSW councils. In the 1995 audit, eighteen local government areas were audited.

The audits contained per household information for both the at home garbage and recycling streams. The raw data provided in the studies were used and extrapolated to determine the amount of containers (tonnes/capita) that were collected for recycling and also contained within the general waste stream. This *pro rata* extrapolation was based upon the percentage of the population that had access to the containers that were recycled. The percentage breakdowns for recycling at home and away from home were kept constant from 1999 to 2000.

This information was then extrapolated on a per household basis to incorporate the whole of NSW based upon the metropolitan and rural access to recycling split (95 percent metropolitan and 73 percent rural: 80 percent overall). This split was obtained from the CDL Televote survey that was conducted as part of this Review (see *Volume III: Section 7: CDL Televote*).

The away from home production and recycling was determined by subtracting the at home production and recycling from the total amount produced and recycled.

2.9.4 Container Flows

2.9.4.1 Aluminium

Key findings:

- Discrepancies between data sources
- Reduction in the total amount of aluminium being produced resulting from a decline in aluminium beer and soft drink production
- If current trends continue the IWRP target for aluminium may not be reached.

Methodology

The total amount of aluminium recycled in NSW was determined by extrapolating from national data[23] based upon the population in NSW at the time the data was collected. This information was current until 1998 and it was assumed that the recovery rate was held constant until the year 2000. This assumption is consistent with data provided by the independent statistician for BIEC. Given that aluminium has a very low contamination rate (Nolan-ITU/SKM, 2001), it was assumed that the recovery rate figures represent the aluminium that is actually recycled.

Results

Table 2.9-5 provides a summary of the amount of aluminium that the CDL Review estimates was consumed and recycled in NSW both at home and away from home in the year 2000.

	At-home (tonnes/a)	Away-from-home (tonnes/a)	Total (tonnes/a)
Consumed	3,398	10,195	13,593
Recycled	1,733	6,423	8,155
Landfilled	1,665	3,772	5,438

Table 2.9-5: Beverage container aluminium consumed and recycled at-home and away-from-home in NSW (2000).

Currently in NSW, 75 percent of aluminium cans are consumed away-from-home and 25 percent are consumed at home. Overall, approximately 60 percent of all aluminium consumed in beverage containers is recycled: 12.7 percent recovered from at-home consumption and 47.3 percent from away-from-home. Forty percent of all aluminium containers consumed are disposed of at landfill.

[23] www.aluminium-cans.com.au/fact_figures/figures.htm

2.1.1.1 Glass

Key findings:

- Consistent data
- Steady decline in the overall amount of glass recycled
- Contamination rate of approximately 15 percent
- If current trends continue it is unlikely that the 2003 IWRP away from home target will be met.
- The IWRP at home recycling target is currently already being met
- Decline in the total amount of container glass produced due to a decrease in the amount of beer, soft drink and still water being produced in glass

Methodology

The total amount of glass recycled in NSW was assumed to be equal to the amount of recovered glass that is received at Visy Recycling Sydney Beneficiation Plant.

At home glass recovery was determined from EPA data. A fifteen percent contamination rate was then applied to determine the amount of glass containers consumed at home that are actually recycled. The fifteen percent contamination was calculated by taking a weighted average of contamination of each of the kerbside recycling systems described in Nolan-ITU/SKM (2001). Contamination of glass is high due to breakage that occurs at several points before the material is sold to a recycler. The main points at which these breakages occur are when:

- the glass is put out into the kerbside recycling containers;
- the glass is picked up by the kerbside recycler;
- travelling to the MRF, and;
- being sorted at the MRF.

Glass recycled after consumption away from home was then determined from the difference between total recycling (at Visy Recycling) and at home recycling.

Results

Table 2.9-6 provides a summary of the amount of glass consumed and recycled in NSW both at home and away from home in the year 2000 that was determined following the processes described above.

	At-home (tonnes/a)	Away-from-home (tonnes/a)	Total (tonnes/a)
Consumed	114,856	140,379	255,235
Recycled	105,498	4,023	109,521
Landfilled	9,358	136,356	145,714

Table 2.9-6: Snapshot of glass consumed and recycled at home and away from home in NSW (2000).

Currently in NSW, 55 percent of glass beverage containers are consumed away from home and 45 percent are consumed at home. Overall, approximately 43 percent of all glass used in beverage containers is recycled. 41 percent of this is recovered from the at home sector and approximately two percent is recovered from away-from-home. 57 percent of all glass beverage containers consumed are disposed of at landfill.

2.9.4.3 PET

Key findings:

- There has been an increase in the total amount of PET used in beverage packaging due to an increase in the use of PET for soft drinks and juice.
- The data available for total recycling and recycling in the at home sector is highly inconsistent.
- Although no data is currently available, the increase in PET in the future is likely to be even higher due to the recent trend of milk packaging from LPB to PET.
- The 2003 IWRP target for at home recovery is already being met.
- On current trends it appears unlikely that the IWRP away from home 2003 target will be met.

Methodology

The amount of PET consumed away from home was determined by subtracting the amount consumed at home from the total amount consumed.

The amount of PET recycled at home in 2000 was based upon an assumption that the recovery rate steadily grew from 74 percent in 1999 (EPA data) to an at home recovery rate of 80 percent in 2003. The growth in recycling from 1996 to 2000 is consistent with the increased growth in products produced from PET[24]. The amount recycled away from home was determined by maintaining the same recycling rate that was achieved in 1996. This was held constant at 11.5 percent. This figure was reported by the Beer and Soft Drink IWRP to have been the rates achieved in 1996.

Results

Table 2.9-7 provides a summary of the amount of PET consumed and recycled in NSW both at home and away from home in the year 2000, which was determined following the processes described above.

	At-home (tonnes/a)	Away-from-home (tonnes/a)	Total (tonnes/a)
Consumed	14,864	6,131	20,995
Recycled	11,005	705	11,710
Landfilled	3,859	5,426	9,285

Table 2.9-7: Snapshot of PET consumed and recycled at home and away from home in NSW (2000).

Currently in NSW, approximately 30 percent of PET beverage containers are consumed away from home and approximately 70 percent are consumed at home. Overall, approximately 55 percent of all PET beverage containers produced are recycled. 52 percent of this is recovered from the at-home sector and approximately three percent are recovered away from home. 48 percent of all PET beverage containers produced are disposed of at landfill.

[24] Production data released by BIEC after the preparation of this report indicates that the growth in PET production has not been as high as the modelled result.

Note that BIEC statistics for glass production for the period to 1996 for NSW indicate approximately 200,000 tonnes/a. The difference between this amount and the amount modelled here is the wine, other alcoholic drinks, juice and other containers not included in the BIEC statistics.

2.9.4.4 HDPE

Key findings:

- Recycling occurs predominantly in the at home sector.
- There is a lack of data on the production of non-beverage HDPE containers.
- The increase in production occurs mainly from an increased production of juice containers in HDPE.

Methodology

The amount of beverage containers produced at home was determined first by assuming that 70 percent comprised of HDPE produced for the at home sector beverage container. The total amount of HDPE production shown in the BIEC audits was then used to calculate the amount of HDPE (beverage) produced at home. This percentage of the total amount produced was held consistent until the year 2000.

The amount produced for the away from home sector was determined by subtracting the at home and production figures from the total production figure.

The amount recycled at home was determined by calculating what 70 percent of the amount recycled determined by the BIEC audits to ascertain how much of the overall HDPE recycled (in tonnes) was beverage container HDPE. The amount recycled away from home was determined assuming that five percent of the total away from home production was recycled.

Results

Table 2.9-8 provides a summary of the amount of HDPE consumed and recycled in NSW both at home and away from home in the year 2000 calculated as described above.

	At-home (tonnes/a)	Away-from-home (tonnes/a)	Total (tonnes/a)
Produced	8,934	4,811	13,745
Recycled	4,737	240	4,977
Landfilled	4,197	4,571	8,768

Table 2.9-8: Snapshot of HDPE produced and recycled at home and away from home in NSW (2000).

Currently in NSW, approximately 45 percent of HDPE beverage containers are produced away from home and approximately 55 percent are produced in the at home sector. Overall, approximately 36 percent of all beverage container HDPE produced is recycled. 34 percent of this is recovered from the at home sector and approximately two percent is recovered away from home. Approximately 64 percent of all HDPE beverage containers produced are disposed of to landfill.

2.9.4.5 LPB

Key findings:

- Drop due to a reduction in the total amount of plain milk being sold in LPB.

Methodology

It was assumed that there is no significant level of recycling of LPB in the away from home sector, therefore the total amount recycled was assumed to be the same as the amount recycled at home.

Results

Table 2.9-9 provides a summary of the amount of LPB consumed and recycled in NSW both at home and away from home in the year 2000.

	At-home (tonnes/a)	Away-from-home (tonnes/a)	Total (tonnes/a)
Produced	7,841	1,960	9,801
Recycled	1,999	-	1,999
Landfilled	5,842	1,960	7,802

Table 2.9-9: Snapshot of LPB produced and recycled at home and away from home in NSW (2000).

Source: BIEC, 1997a; BIEC audit data, BIEC, 1997b; ABS statistics; BIEC away from home report, Milk Packaging Stewardship Task Force annual report.

Currently in NSW, approximately 20 percent of LPB beverage containers are produced away from home and approximately 80 percent are produced at home sector. This does appear to represent production at home as being very high, however, these figures are considered to be justified. Overall, approximately 20 percent of all beverage container LPB produced is recycled. 100 percent of this is recovered from the at home sector. Approximately 80 percent of all LPB beverage containers produced are disposed of to landfill.

It seems unlikely that the IWRP (NEPM) targets of 45 percent will be reached given that currently no LPB is recycled from the away-from-home sector and that the current recovery rate at home is currently only 20 percent.

2.9.4.6 Steel

Key findings:

- Lack of data available on both production and recycling of steel cans.
- Lack of data on the split between beverage and non-beverage containers.
- Inconsistencies between data sources for the recovery of materials.
- There appears to have been a large increase in the recovery of steel cans in the past five years.

Methodology

The total amount of beverage containers recycled was determined by assuming that the overall NSW recovery rates for all commodities provided by the Can Makers Institute of Australia, BHP, and the National Steel Can Recycling Program for NSW, remain the same for beverage containers.

The total amount of all steel containers recycled at home was determined based upon information provided by the EPA and BIEC audits.

Results

Table 2.9-10 provides a summary of the amount of steel consumed and recycled in NSW both at home and away from home in the year 1997.

	Total (tonnes/a)
Produced	784
Recycled	308
Landfilled	476

Table 2.9-10: Steel material flows.

Source: BIEC, 1997a; BIEC audit data, BIEC, 1997b; ABS statistics; BIEC away from home report.

Section 3: COSTS & BENEFITS

The CDL Review included a comprehensive consideration of the costs and benefits of the introduction of container deposit legislation in NSW. Costs and benefits have been considered both quantitatively and qualitatively, and they have been considered from a 'whole of society' perspective and from the perspectives of various stakeholders. Finally financial, environmental, and social costs and benefits have been included.

The cornerstone of the quantitative assessment of costs and benefits has been a formal Cost-Benefit Analysis (CBA). The CBA is introduced in *3.1 Cost-benefit Analysis Methodology*. The results of the CBA from a whole of society perspective are presented in *3.3 Whole of Society Costs and Benefits* and *3.5 Summary of Whole of Society Costs and Benefits*.

3.6 Stakeholder Perspective – distributional impacts covers both the formal CBA and broader discussion (qualitative and quantitative) of costs and benefits that were not appropriate for inclusion in the formal CBA.

*3.2 Scenario Description and Container/Material Flow*s describes the implementation scenarios and container flow modelling on which all the costs and benefits have been based.

3.1 Cost-Benefit Analysis Methodology

The principal methodology that has been employed for evaluation of the financial, environmental, and social implications of a deposit and refund system is a formal cost-benefit analysis (CBA). This section introduces the concept of CBA, outlines the function of the CBA in the CDL Review, and provides an overview of the method used in the CBA. A detailed method for individual cost components is provided under the relevant heading in *Section 3.3 Whole of Society Costs and Benefits*.

The US Environment Protection Agency "Guidelines for Preparing Economic Analyses" (US EPA, 2000) have been applied in the CDL Review to ensure that the CBA is logically and structurally sound. Accordingly, the CBA consists of two distinct sections: an assessment of the economic efficiency of the introduction of container deposit legislation, and an assessment of the distributional impacts of the introduction of CDL. The clear separation of efficiency and distributional issues is important for ensuring stakeholder perspectives are not confused with implications for society as a whole. Many previous assessments of CDL have failed to adequately distinguish between costs and benefits that accrue to society as a whole, and those that are merely transfer payments between stakeholders.

3.1.1 Costed Scenarios

Costs and benefits have been determined for a range of scenarios describing the implementation of Container Deposit Legislation, as well as reference scenarios. The scenarios used in the CDL Review are:

- Limited or no recycling, in which no used container material is recycled.
- Non deposit, collection centres only.
- Current system, with current performance and also a scenario in which 2003 industry targets are met.
- Collection centre, deposit and refund systems in combination with kerbside recycling.
- Point of sale (POS) deposit and refund systems in combination with kerbside recycling.

These scenarios are further broken down into a range of implementation options for the purposes of modelling and comparison. The options within scenarios vary primarily on the basis of the level of CDL deposit and the density of collection centres for return of deposit bearing containers. The options

modelled are described in more detail under heading *3.2 Scenario Description and Container/Material Flows.*

3.1.2 Types of Costs and Benefits

3.1.2.1 Total Costs versus Relative Costs and Benefits

The results of the CBA are principally reported as *relative* costs and benefits in comparison to an alternative scenario. The base case for comparison is the scenario in which there is no recycling in NSW (referred to in the CDL Review as Option 1a). However, costs and benefits for container deposit options are also frequently compared to the current kerbside recycling situation in NSW (referred to in the CDL Review as Option 3a).

Most of the relative costs and benefits presented in the report have been obtained by first calculating the total cost of a particular part of the system and then subtracting the total cost for the base case. *Relative costs* therefore refer to those costs for which the total cost under a CDL is *greater* than the total cost in the base case. *Relative benefits* are those costs for which the total cost under CDL is *less* than the total cost in the base case.

For a few types of costs and benefits (e.g. litter collection, non-residential garbage collection) it has not been possible to obtain total costs and therefore the relative cost or benefit has been estimated directly.

3.1.2.2 Financial, Environmental and Social Costs and Benefits

As with most public policy issues with environmental and social consequences, the costs and benefits are not always appropriately or easily expressed in financial terms. However, in the case of this Review, the major categories of costs and benefits have been estimated with sufficient reliability for conclusions to be made. Important costs and benefits that could not be estimated with sufficient accuracy for inclusion in the formal CBA are discussed in both qualitative and quantitative terms in relation to the particular stakeholders affected. This discussion is presented under heading *3.6 Stakeholder Perspective.*

3.1.3 Whole of Society CBA – Economic Efficiency

In order to determine the economic efficiency (including environmental externalities) of the introduction of CDL, costs and benefits are calculated on a 'whole of society' basis. Whole of society costs and benefits consider impacts in total and do not include transfer payments between different stakeholder groups. Transfer payments not considered in the whole of society analysis include the financial flows associated with the deposit itself, including unredeemed deposits, and the price paid by recyclers to buy the materials that have been collected.

Costs and benefits included in the 'whole of society' analysis are listed in *Table 3.1-1*. Detailed method and results for each cost or benefit listed in *Table 3.1-1* are given under heading *3.3 Whole of Society Costs and Benefits.* Results for all 'whole of society' costs and benefits are summarised under heading *3.5 Summary of Whole of Society Costs and Benefits.*

Cost / Benefit	Method Used	Notes
Financial cost of household garbage collection	WRCM model	The costs include trucks, labour, maintenance, fuel and bins
Financial cost of household kerbside recycling collection	WRCM model, based on a weighted average of the two most prevalent kerbside systems, fortnightly crate collection and fortnightly MGB collection	The costs include trucks, labour, maintenance, fuel, and bins.
Financial cost of non-residential garbage collection	WRCM model	
Financial cost of non-residential recyclables collection	WRCM model	
Financial costs of landfill (marginal costs only)	Own modelling and estimates of marginal cost, based on Wright (2000)	Most assessments do not differentiate between average and marginal costs (i.e. those that vary with disposed quantity
Financial costs associated with the infrastructure and labour for a deposit and refund system	Own modelling	Includes additional collection centres, point of sale return. Annualised capital, land and labour costs.
Additional financial costs of a deposit and refund system	Own modelling	Administration and compliance monitoring, labelling and education.
Reduced costs of litter collection and disposal	Survey of NSW councils	Avoided (i.e. marginal) cost based on survey of councils
Environmental cost of transport in trucks and cars (prior to MRF or transfer station)	Nolan- ITU/SKM (2001) and own modelling based on WRCM model	This result based on a conversion of total km/a to fuel use, and environmental impact per litre of fuel
Environmental costs of production of virgin container materials (additional costs compared to recycling)	Nolan- ITU/SKM (2001)	Full life cycle assessment and environmental costing

Table 3.1-1: Whole of society costs and benefits

3.1.4 Stakeholder Perspectives – Distributional Impacts

Analysis of the distributional impacts of each of the scenarios modelled answers the question of who would bear the cost and who would gain the benefits if CDL were introduced, based on an assumed model of implementation. Costs and benefits are therefore considered from the perspective of key stakeholders. There are several key differences between analysis of distributional impacts and whole of society impacts, these are:

- Distributional impacts include transfer payments between stakeholders that are not included in the whole of society analysis, for example, the value of unclaimed deposits, landfill charges (as distinct from landfill costs).
- No environmental costs have been included in the distributional impact analysis, since the stakeholder is, by definition, difficult to identify.

- Distributional impacts include a significant proportion of qualitative discussion of impacts that cannot be reliably quantified, for example, the benefits to society of reduced unemployment.

The stakeholder groups included in the distributional impact analysis are:

- suppliers or distributors of products that may attract a deposit (Suppliers);
- retailers of products that may attract a deposit (Retailers);
- local government (Councils);
- consumers of potentially deposit bearing products (Consumers);
- non-profit organisation and charities (who would benefit from redeeming deposits on containers that other consumers had purchased); and
- low-income groups.

Table 3.1-2 lists those costs and benefits that have been included in the quantitative assessment of distributional impacts.

Cost/Benefit	Method Used	Stakeholders Affected
Financial cost of household garbage collection	WRCM model	Local Government
Financial cost of household kerbside	WRCM model	Local Government
Reduced costs of litter collection and disposal	Survey of NSW councils	Local Government
Revenue from sale of recycled material	Calculation based on current market values	Local Government
Revenue from unclaimed deposits in kerbside recycling	Calculation based on modelled results and experience from locations with deposit and refund systems	Local Government
Landfill fees / charges	Weighted average of Greater Sydney Region values and rural NSW	Local Government
Collection centre (depot) Costs (capital, and labour)	Own modelling	Suppliers, retailers, local government (depending on implementation)
Collection centre costs (convenience zone)	Own modelling	Suppliers, retailers (depending on implementation)
Point of sale return costs	Own modelling	Suppliers, retailers (depending on implementation)
Ancillary financial costs of a deposit and refund system	Own modelling	Retailers, government, suppliers
Time cost of returning containers	Own modelling	Consumers
Increase in price of products / reduced profit for suppliers	Own modelling	Consumers, suppliers
Employment decrease and increase	Own modelling	Depot operators, retailers, council, waste contractors, suppliers

Table 3.1-2 Stakeholder costs and benefits included in distributional analysis

3.1.5 Significance of Container Flows

Variations in the costs and benefits associated with each of the options modelled in the CDL Review arise from two sets of factors. The first set is those costs and benefits that are integral to the description of the option. Capital costs associated with the establishment of collection centres for return of containers are an example of this type of cost. The second set of variable costs are those that depend not only on the description of the system but also on how many containers are recycled and how they are returned for recycling. Kerbside recycling costs, garbage collection costs, and all the environmental costs and benefits are examples. In order to estimate the values of this second set of costs, the CDL Review has modelled the container flows for each option considered. Modelling undertaken to predict container flows is the subject of the next section, *3.2 Scenario Description and Container/Material Flows.*

3.2 Scenario Description and Container/Material Flows

3.2.1 Introduction

This section provides a description of the scenarios and the options that were assessed in the CDL Review and the modelling that described material flows under each option. Modelled material recovery rates differed among the various CDL options investigated according to the level of deposit and the convenience of points of collection. Container recovery rates were based upon the international and South Australian experience with CDL systems.

Summary of Key Findings:

- There are two main types of CDL systems: point of sale (POS), also called return to retailer, or return to collection centres.
- In many POS systems, restrictions are placed on the number of containers that can be returned by a customer in one day.
- It is assumed that any CDL system introduced in NSW would achieve recovery rates at least as high as the system currently operating in South Australia.
- It is assumed that the recovery rates for HDPE, LPB and steel would be the same as for PET, given that these materials have historically been seen as disposable and unrecyclable. This was the case when PET was first introduced into CDL in South Australia.
- The higher the deposit, the higher the return rate.
- POS systems tend to achieve a higher recovery rates than collection centre systems for the same deposit amount, due to their increased convenience.
- Recovery rates for aluminium often exceed those of other materials, and glass recovery is often higher than plastic.

3.2.2 Scenarios and Options

A series of scenarios have been developed with which to model the likely impacts of implementing CDL in conjunction with the current kerbside recycling system in NSW. Each scenario contains a number of options that allow for variations in the deposit value and the convenience. *Table 3.2-1* summarises the scenarios and options that have been modelled. The results of modelling of these options are described in other chapters in *Section 3.*

Scenario	Option	Short Title	Description
Limited or no recycling	1a	Landfill Only	No recycling takes place either at home or away from home. Only garbage is collected and all waste produced goes to landfill. There is no deposit or refund system in place.
	1b	Paper Kerbside	Residential kerbside collection and recycling of paper only, with all container material and all non-residential paper being assumed to go to landfill. There is no deposit-refund system in place.
Non deposit, recycling depots only	2a	Depot Only	Recycling depots are used for the collection of recyclables from both the residential and non-residential sector. There is no deposit-refund system (i.e. no CDL) and no kerbside collection.
Current system, industry targets and optimisation of the current kerbside system	3a	Current Kerbside	This represents the current garbage collection and recycling situation in NSW. This system provides a kerbside recycling service with current performance and yields, and away from home (depot based) recycling consistent with current yields.
	3b	Kerbside 2003 IWRP	This option describes the likely impact if the 2003 industry Waste Reduction Plan targets for the Beer and Soft Drink Industry and Used Packaging Materials Industry are achieved through improved kerbside collection and away from home recycling.
Collection centre deposit and refund systems in combination with kerbside recycling	4a	CDL intermediate 5¢	CDL system based on the current South Australian system with a 5 cent deposit. The spacing of collection centres is based on the South Australian example and termed 'intermediate spacing'.
	4b	CDL intermediate 10¢	CDL system with intermediate spacing of collection centres and a 10 cent deposit
	4c	CDL intermediate 20¢	CDL system with intermediate spacing of collection centres and a 20 cent deposit
	4d	CDL convenient 10¢	CDL system with optimum spacing of collection centres and a 10 cent deposit
	4e	CDL convenient 20¢	CDL system with optimum spacing of collection centres and a 20 cent deposit
Point of sale deposit and refund systems in combination with kerbside recycling	5a	CDL POS 10¢	CDL system with mandatory point of sale requirements with a 10 cent deposit
	5b	CDL POS 20¢	CDL system with mandatory point of sale requirements with a 20 cent deposit

Table 3.2-1: Options and scenarios that have been modelled in the cost-benefit analysis

3.2.2.1 Scenario 1

Scenario 1 has two Options, 1a & 1b. Scenario 1 is characterised by having no recycling of container materials and was included in the CDL Review to provide reference cases. Option 1a involves no

recycling of any materials. Option 1b involves recycling of paper only through kerbside recycling of paper consumed 'at home'.

3.2.2.2 Scenario 2

This scenario is based on a depot-only recycling system, with no deposit and refund system and no kerbside recycling. It was developed for comparison purposes only. Option 2a was based on the current recycling system that is operating in the Lismore City Council region. This consists of a series of collection centres in which recyclable paper and containers are dropped off by residents and businesses at locations throughout the area.

3.2.2.3 Scenario 3

Scenario 3 describes the current recycling system in NSW, a combination of kerbside recycling and depot collection, with recovery of container materials dominated by kerbside recycling. There are two options for Scenario 3: Option 3a, which is the current performance of the system as determined by modelling and the literature, and Option 3b which is based on the assumption that industry targets for recycling are achieved by the target date of 2003. The relevant industry targets applied were the Beer and Soft Drink Industry Waste Reduction Plan (IWRP) (EPA, 1999); and the Used Packaging Materials IWRP (EPA, 2000c).

3.2.2.4 Scenario 4

Scenario 4 includes a number of options that describe CDL systems in which there is no requirement placed on retailers to accept returned containers at the point of sale (POS). The CDL system therefore operates through the establishment of collection centres to which consumers can take back their empty deposit bearing containers and receive a refund. Collection centres may be staffed, or may be entirely mechanised through the use of reverse vending machines (see *Appendix J* for an explanation of reverse vending machines). A number of different collection centre systems currently operate around the world. The two collection centre based systems that were used as case studies for the CDL Review are those in South Australia (Options 4a-c) and in California, USA (Options 4d & 4e).

In Adelaide (South Australia), licensed collection depots are located roughly 10km apart, and in country areas collection depots are set up by agents for the larger depots in the metropolitan area. The collection depots are owned and run by the container distributors.

In California, the system operates using a 'convenience zone' recycling infrastructure that is based in grocery store or supermarket parking lots. Each of these are state certified 'redemption centres' for the return of deposit bearing containers. A convenience zone is the area within half a mile (0.8km) of a supermarket, or a zone designated by the state Department of Conservation in areas with no supermarkets. A supermarket is considered a convenience zone area if it is a full line, self-service retail store with gross annual sales of US$2 million (~AUD$4m) or more, and sells dry grocery, canned goods, or non food items and some perishable goods.

Options 4a-c (based on the South Australian system) were differentiated only by the level of deposit that is applied to each container. Deposit levels of 5¢, 10¢ and 20¢ were used for Options 4a, 4b and 4c respectively. Similarly Options 4d & 4e (based on the Californian system) had deposit levels of 10¢ and 20¢ respectively.

Collection centres and other CDL related infrastructures are discussed in more detail in *Section 3.3.5 Infrastructure Costs*.

3.2.2.5 Scenario 5

Scenario 5 describes a CDL system in which there is return of containers to container retailers, referred to as point of sale (POS) return. POS return is the most common form of CDL system used around the world and usually has higher rates of return than collection centre based systems.

POS systems require legislation that places a requirement on some or all retailers who sell beverages with deposit bearing containers, to take back the same type of container at the point of sale. POS systems usually have some collection centres that supplement the retailer network and provide a return point for bulk loads of containers. In most states the container deposit legislation sets a limit to the number of containers that can be returned to any given retailer. Due to space restrictions retailers may accept a limited number and refer the consumer to the closest collection centre to obtain a full refund. British Columbia, for example, allows the return of 24 containers a day to retailers. Michigan allows for the return of up to $25-worth (or 250 containers) a day.

3.2.3 Methodology for Options Modelling

Modelling the use, return and disposal of containers under the different options discussed above was fundamental to the estimation of the costs and benefits of implementing CDL in NSW. This section describes the methods that were used to model the following used container material flows (both number and mass of containers):

- at home consumption;
- away from home consumption;
- household garbage disposal;
- household kerbside recycling;
- away from home garbage disposal (e.g. in parks or restaurants);
- away from home recycling;
- returns to collection centres under CDL systems; and
- returns to retailers (POS) under CDL systems.

Containers lost through littering were assumed to go to either at home or away from home garbage bins, except where litter costs were being calculated. As the number of containers lost to litter is a relatively small component of the total litter flows, this assumption has a negligible effect on the results obtained.

Consumption patterns were estimated from current market data and all other flows were estimated by attributing each end point with a certain fraction of the containers consumed.

Paper recycling is closely tied to container recycling in kerbside systems and it has been argued that CDL would affect paper recycling in NSW. Paper recycling and disposal has therefore been included in the analysis of material flows, costs and benefits. Data on the production and recycling of paper was obtained from the national figures from the Independent Assessment of Kerbside Recycling in Australia (Nolan-ITU/SKM, 2001), and converted to NSW figures on a population basis.

3.2.3.1 Consumption and Production

2003 was chosen as the base year for modelling the impacts of container deposit legislation. Current consumption patterns and trends were obtained through an extensive literature search, including Australian Bureau of Statistics data. Trends were then extrapolated as appropriate to obtain a description of the beverage container universe in 2003. Details of the method and results obtained through the analysis of the current market are presented in *Sections 2.8 Container Packaging: Products* and *2.9 Container Packaging: Materials*.

3.2.3.2 Scenario 1

Option 1a in Scenario 1 assumes that there is no recycling of any sort. All containers and paper was therefore assumed to go to landfill via garbage disposal.

Option 1b assumes that there is recycling of paper consumed at home only. The paper recycling rate overall was therefore set at 23 percent, compared to 59 percent for the current kerbside system in NSW. All containers were therefore assumed to go to landfill via garbage disposal.

3.2.3.3 Scenario 2

In Option 2a, the recycling rates for each commodity were maintained at those currently achieved in the Lismore collection centre system (Lismore City Council, 2000). An assumption was made that half of the material at the Lismore Collection Centres was from at home consumption (extrapolated across NSW this would represent about 92,000 tonnes per year). This was added to the amount currently collected in NSW at collection centres from the away from home sector. The proportions of different types of materials going to the collection centres were split on the same basis as those proportions currently collected from kerbside recycling in NSW.

3.2.3.4 Scenario 3

The methodology for determining the used container material (UCM) flows for Option 3a is described in more detail in *Section 2.7: Recycling in NSW*. The UCM flows for Option 3b were based on the Beer and Soft Drink Industry Waste Reduction Plan (IWRP) (EPA, 1996); and the Used Packaging Materials IWRP (EPA, 2000c) targets for 2003. Paper recycling rates were assumed to remain at the current level of 59 percent for both Options 3a & 3b.

3.2.3.5 Scenarios 4 & 5

Scenarios 4 & 5 include seven alternative options for the implementation of container deposit legislation in NSW. The options vary by level of convenience of points of return for containers and by level of deposit. The return rates and used container material flows achieved under each option have been predicted through a combination of empirical results and theoretical understanding of market and consumer behaviour under CDL.

Theoretical Basis for Predicting Used Container Material Flows Under CDL

Overall return rates achieved under a CDL system will depend on the behaviour of members of the public, industry and government. The behaviour of members of the public under CDL systems has been discussed by several authors (see *Section 2.6: Recycling Behaviour and Motivations*) but the effect of the financial incentive that CDL provides to commercial customers is less well understood. For members of the public, the key determinants of recycling behaviour under CDL systems are:

- level of deposit;

- level of convenience of points of collection;
- material type;
- level of environmental commitment and education;
- level of access to and adequacy of kerbside recycling systems;
- comprehensiveness of public place and special event recycling infrastructure;
- level of education regarding the CDL system.

The commercial and institutional sectors are responsible for the latter three points above, as well as for the organisation of non-residential recycling (such as pick-ups from pubs, clubs, cafes and restaurants). The key determinants of commercial and institutional customer behaviour under a CDL system are assumed to be:

- financial costs and benefits (including level of deposit);
- government policy and regulation;
- market structure and conditions (including oligopoly effects).

Application of Theory to Empirical Results

Of the above mentioned influences on return rates under CDL systems, only the effect of the level of deposit can be quantitatively examined. The effects of level of convenience and material type may be partially controlled by grouping data according to these features. *Figures 3.2-1 to 3.2-6* illustrate the observed influence of level of deposit on return rates for deposit-refund systems currently in place around the world.

Also shown on *Figures 3.2-1 to 3.2-6* are the overall return rates assumed by the CDL Review for Options 4a-e and Options 5a-b. The return rates assumed by the CDL Review are slightly higher than the trend for current experience in *Figures 3.2-1-3.2-6* would suggest. There are two key reasons that relatively slighter higher rates were used by the CDL Review. The first is that return rates in South Australia are relatively high considering it has only a conventional depot collection system and a relatively low level of deposit. This indicates that in South Australia other factors such as education and commitment to environmental improvement are favourable to high return rates. It was assumed that the population of NSW is closer to that of South Australia in this regard than it will be to populations in other countries.

The second reason for the relatively high assumed return rates is that over eighty five percent of NSW households are served by kerbside recycling programs (BIEC, 1997b, p11). High levels of access to kerbside recycling tend to facilitate high return rates (see *Tables 2.1-1* and *2.1-2* in *Section 2.1*). Good kerbside coverage facilitates high return rates by providing a more convenient recycling option for those people (usually high income earners) for which the opportunity cost of returning containers to a point of collection is higher than the value of the deposits they would redeem.

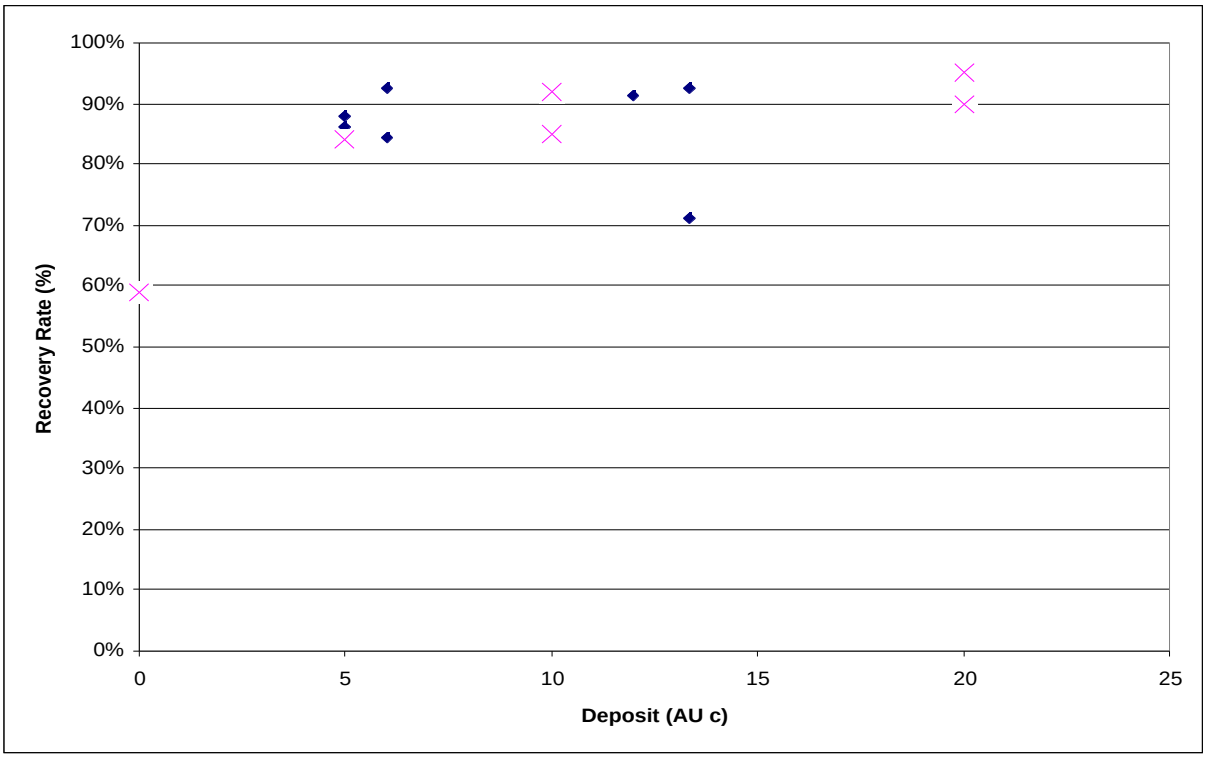


Figure 3.2-1: Aluminium recovery versus deposit for collection centre systems.

On graphs diamonds represent current international data. Squares represent the assumed recovery rates used by the CDL Review.

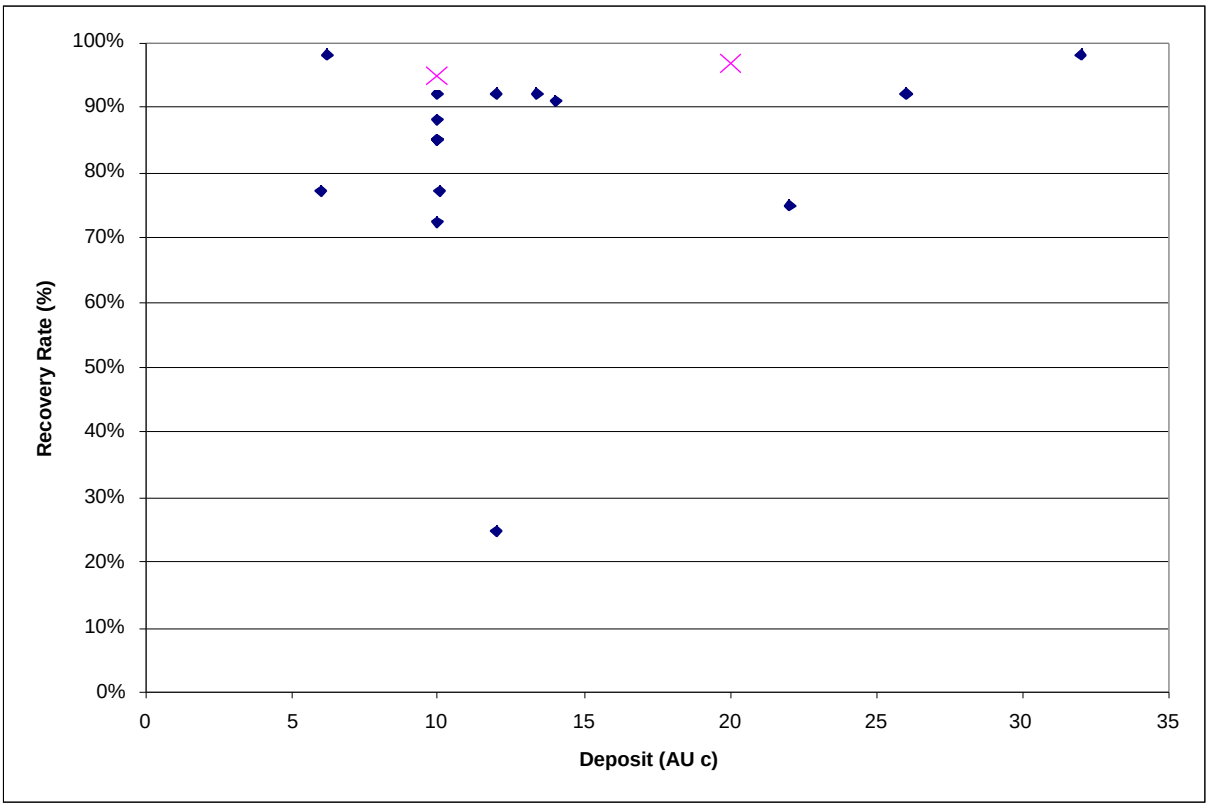


Figure 3.2-2: Aluminium recovery versus deposit for POS systems.

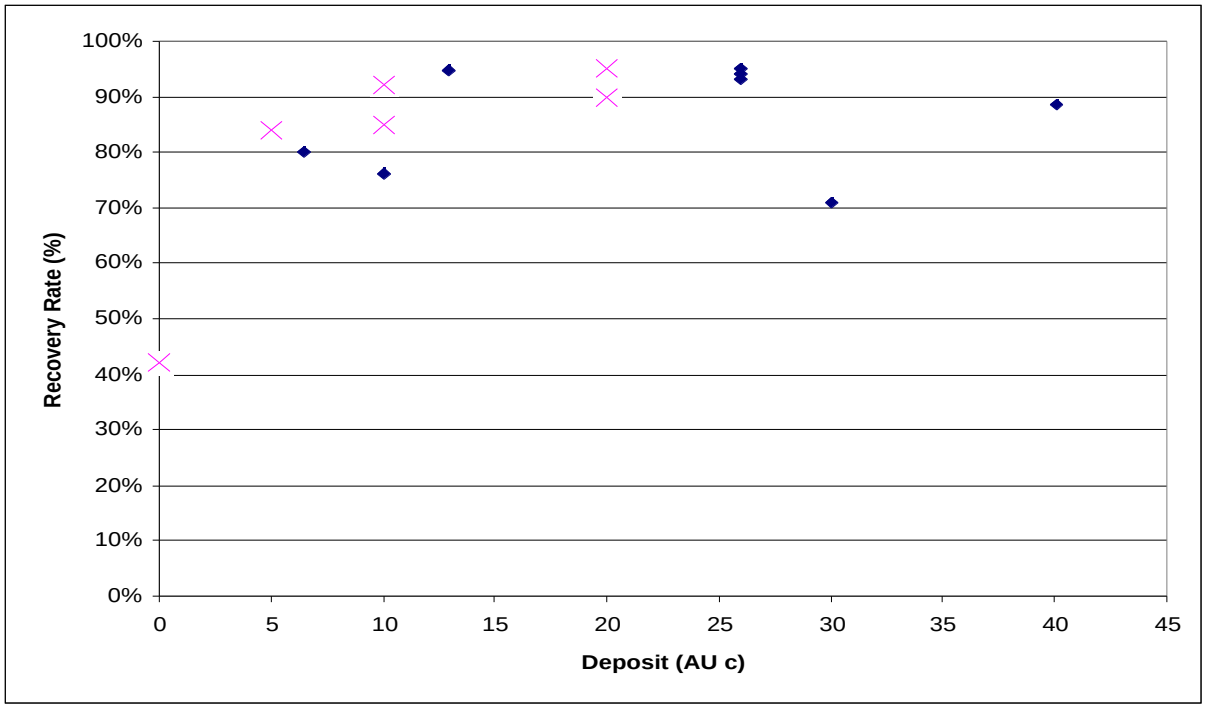


Figure 3.2-3: Glass recovery and deposit level for collection centre systems.

On graphs diamonds represent current international data. Squares represent the assumed recovery rates used by the CDL Review.

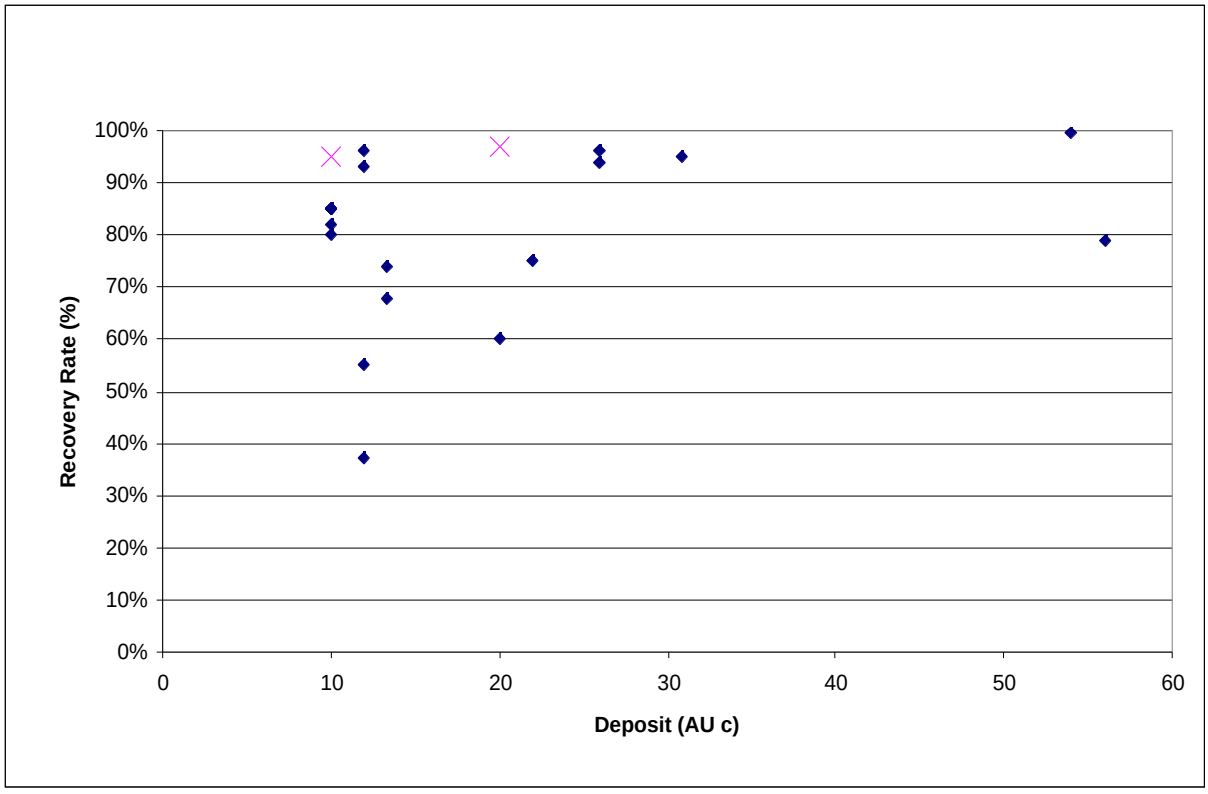


Figure 3.2-4: Glass recovery and deposit level for POS systems.

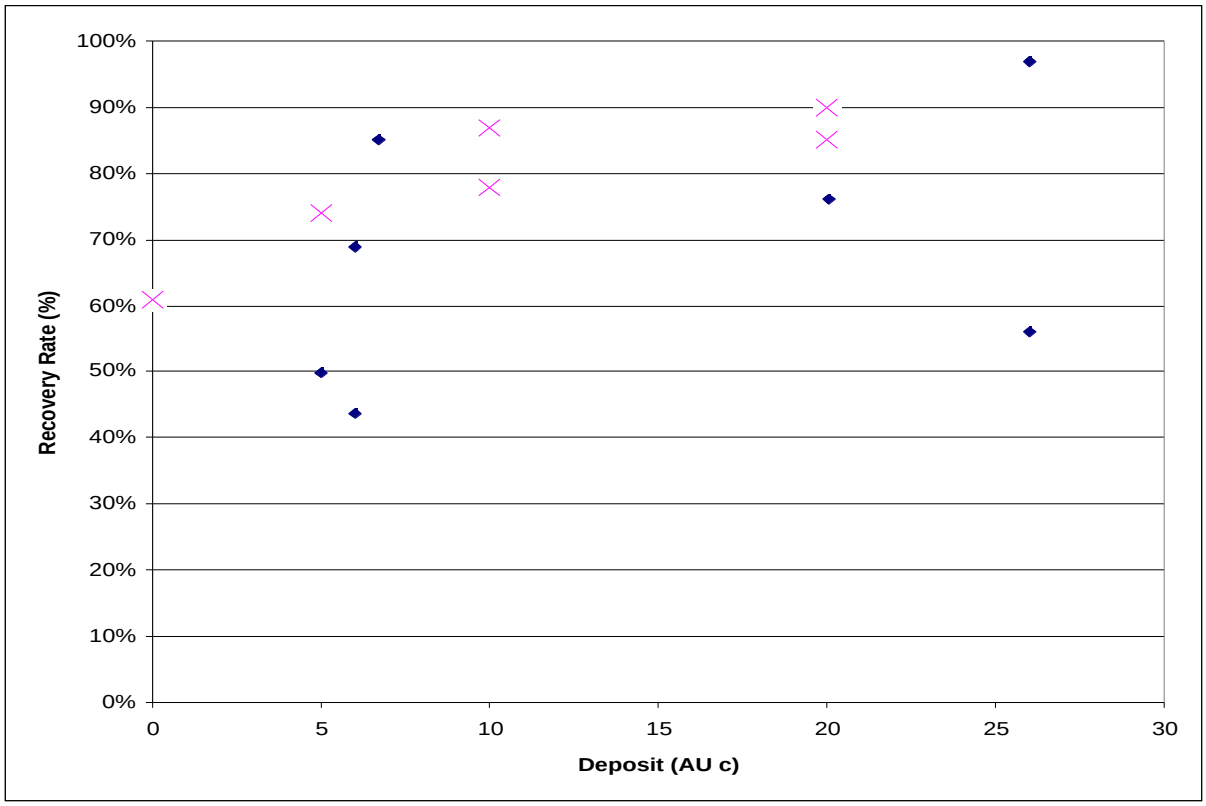


Figure 3.2-5: PET recovery and deposit level for collection centre systems.

On graphs diamonds represent current international data. Squares represent the assumed recovery rates used by the CDL Review.

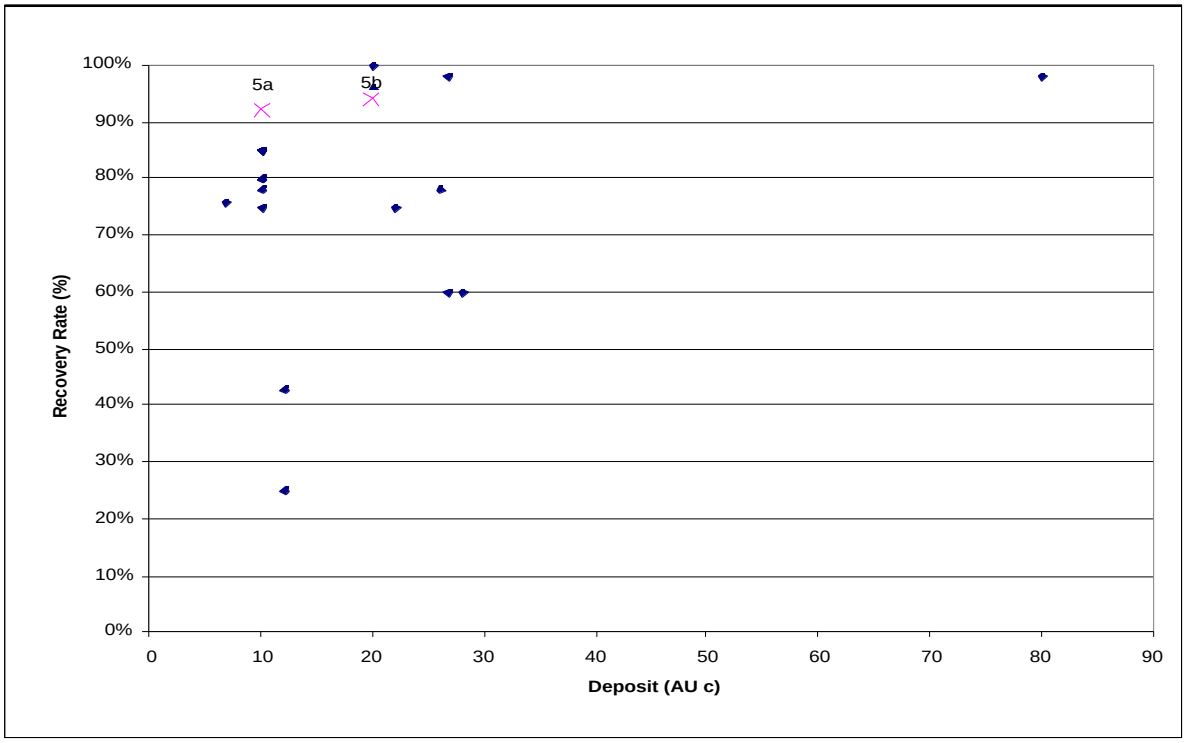


Figure 3.2-6: PET recovery and deposit level for POS systems.

Other Materials

Due to lack of data for HDPE, LPB and steel containers, the recovery rate was assumed to be the same as that for PET.

Split Among Alternative Material Flow Paths

The CDL Review attempted to model not only overall recovery rates, but also relative size of the following production, recycling and disposal streams:

- at home consumption;
- away from home consumption;
- household garbage disposal;
- household kerbside recycling;
- away from home garbage disposal (e.g. in parks or restaurants);
- away from home recycling;
- returns to collection centres under CDL systems; and
- returns to retailers (POS) under CDL systems.

The modelling of the relative size of the different material flow paths was based on a detailed analysis of the current situation in NSW (see *Section 2.9: Container Packaging: Materials*) combined with case studies of key international examples. The used container material flows for the case studies on which the various options were modelled are summarised in *Tables 3.2-2* & *3.2-3*. The systems used as case studies are described in more detail in *Section 2.1: Container Deposit Legislation - International*.

Mass balance equations were used to integrate the information about consumption and disposal patterns in NSW with the interstate and international case studies used.

Deposit level (AUD)	Material	Overall recovery rate	Depot recovery rate	Kerbside recovery rate	% to landfill
California[1]		Relates to Options 4d-e			
4.9 cents for < 24 oz. 9.8 cents for > 24 oz.	Aluminium	80%	68%	12%	20%
	Glass	60%	49%	11%	40%
	PET	65%	53%	12%	35%
South Australia[2]		Relates to Options 4a-c			
5 cent deposit	Aluminium	86%	84%	2%	14%
	Glass	84%	74%	10%	16%
	PET	74%	65%	9%	26%
Alberta[3]		Relates to Options 4a-c			
6.3 cent deposit on < 1 litre, 25.3 cent deposit on > 1 litre 12.6 cent deposit on beer	Aluminium	84%	52%	30%	16%
	Glass	79%	51%	28%	21%
	PET	80%	52%	28%	20%

Table 3.2-2: Summary of deposit levels and recovery rates for collection centre CDL systems used as case studies for Options 4a-e. Extrapolated results are shown in italics.

Deposit level (AUD)	Material	Overall recovery rate	Depot recovery rate	POS recovery rate	Kerbside recovery rate	% to landfill
British Columbia[4]						
6.3 cents < 1 litre	Aluminium	88%	66%	18%	4%	12%
12.6 cents	Glass	52%	39%	10%	3%	48%
25.3 cents > 1 litre	PET	63%	47%	13%	3%	37%
Michigan[5]						
19.5 cents for all	Aluminium	99%	0%	99%	0%	1%
containers	Glass	99%	0%	99%	0%	1%
	PET	99%	0%	99%	0%	1%
Oregon[6]						
5.8 cents for standardised	Aluminium	90%	0%	88%	2%	10%
Refillable bottles;	Glass	90%	0%	88%	2%	10%
9.7 cents for non refillable and	PET	90%	0%	88%	2%	10%
non standardised containers						

Table 3.2-3: Summary of deposit levels and recovery rates for POS CDL systems used as case studies for Options 5a and 5B.

3.2.4 Results

This section provides a summary of the results of modelling of material flows for each of the options. These results are expressed as percentages for the total amounts collected and as a breakdown of the total amount collected through: kerbside recycling, collection centres, point of sale, and landfill. A breakdown is also provided for the total amount in tonnes of material per year, and in millions of used containers recovered for each of the options. Full details of the total amount produced, recovered, and landfilled, in tonnes per annum and by number of containers is provided in *Appendix E*. The following section provides a summary of the results of the material flow modelling undertaken by the CDL Review. At home and away from home splits in material flows have been omitted for the sake of simplicity.

3.2.4.1 Production Estimates

Table 3.2-4 shows the estimated production of container materials in NSW in 2003, based on modelling of container flows and the breakdown by container material type. The methodology for establishing this data is provided in *Section 2.9: Container Packaging - Materials*. The production estimates are a key input to the used container material flows that are presented under subsequent subheadings.

Material	Production (tonnes/a)	Production (millions of containers/a)
Paper	1,122,000	n/a
Aluminium	13,379	894
Glass	267,165	1,278
PET	26,434	772
HDPE	15,094	302
Other plastic	4,208	84
LPB	10,921	280
Steel	1,009	14
Total	**1,460,211**	**3,625**

Table 3.2-4: Estimated total material production in tonnes and beverage container numbers for 2003

Note that steel is low in *Table 3.2-4* due to the low representation of beverage containers in the steel can market. For all other materials, non-beverage containers represent a minority (less than 20 percent) component of container material usage.

3.2.4.2 Recovery Rates – Aggregated Over all Materials

Table 3.2-5 and *Figure 3.2-7* shows the overall recovery rates for each of the modelled options by weight and by container number. The information in *Table 3.2-6* is shown graphically in *Figure 3.2-7.*

Option	Recovery rate for all materials including all paper (% by weight)	Recovery rate for containers only (% by weight)	Recovery rate (%) by container number
1a	0	0	0
1b	18	0	0
2a	39	20	27
3a	55	43	48
3b	57	50	53
4a	64	82	80
4b	65	84	82
4c	66	89	88
4d	66.5	91	90
4e	67	94	93
5a	67	94	94
5b	68	96	95

Table 3.2-5: Recovery rates for each modelled option by weight and container number. Paper includes paper, cardboard, and newsprint.

Table 3.2-5 shows that CDL systems (Options 4a-4e and 5a & 5b) are expected to achieve higher overall recovery rates than the current system. Of the CDL systems modelled, POS systems (Options 5a&b) are expected to achieve higher recovery rates than collection centre systems due to their increased convenience.

Note that in Option 1b, only paper is recycled. The recycling rate for paper was estimated to be 23 percent which results in a 23 percent by mass recycling rate averaged over paper and containers.

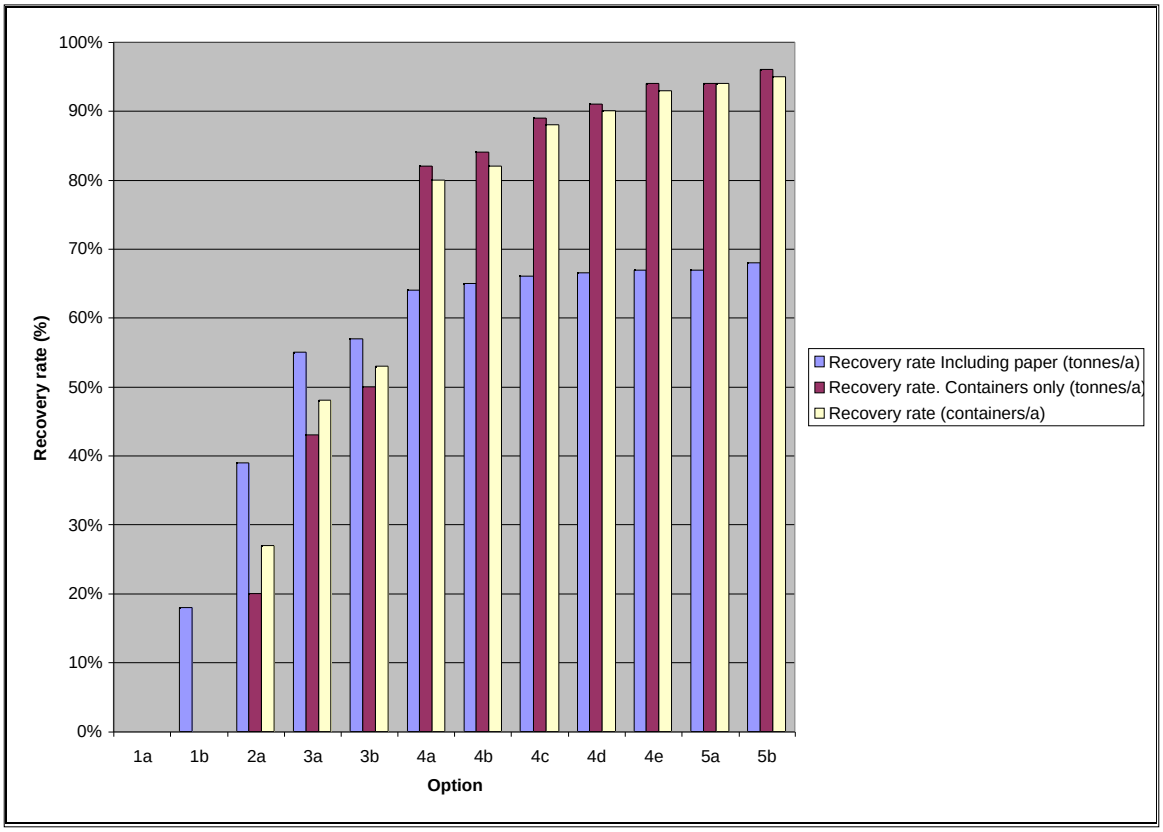


Figure 3.2-7: Recovery rates in tonnes/annum and containers/annum for each of the modelled options.

3.2.4.3 Recovery Rates – By Material

Figure 3.2-7 shows that across all scenarios, as there is an increase in the deposit level there is a subsequent increase in the recovery rate of the materials. In scenario 4 it is shown that the closer together collection centres are situated, the higher the rate of recovery for all materials. There is also a slightly higher recovery rate for all materials in mandatory point of sale systems when compared to the collection depot systems, the current system, and best practice current systems.

Table 3.2-4 and *Figure 3.2-8* shows the percentage recovery of each material type for each option.

Option	Paper	Aluminium	Glass	PET	HDPE	Other plastic	LPB	Steel
1a	0%	0%	0%	0%	0%	0%	0%	0%
1b	23%	0%	0%	0%	0%	0%	0%	0%
2a	45%	52%	18%	27%	20%	0%	8%	16%
3a	59%	59%	42%	61%	47%	0%	20%	39%
3b	59%	67%	50%	47%	50%	50%	45%	50%
4a	59%	84%	84%	74%	74%	74%	74%	74%
4b	59%	85%	85%	78%	78%	78%	78%	78%
4c	59%	90%	90%	85%	85%	85%	85%	85%
4d	59%	92%	92%	87%	87%	87%	87%	87%
4e	59%	95%	95%	90%	90%	90%	90%	90%
5a	59%	95%	95%	92%	92%	92%	92%	92%
5b	59%	97%	97%	94%	94%	94%	94%	94%

Table 3.2-6: Recovery rates by material type for each of the scenario options.

Of note in *Table 3.2-6* are the reasonably high expected return rates for paper & cardboard and aluminium under a non-deposit collection centre system (Option 2a).

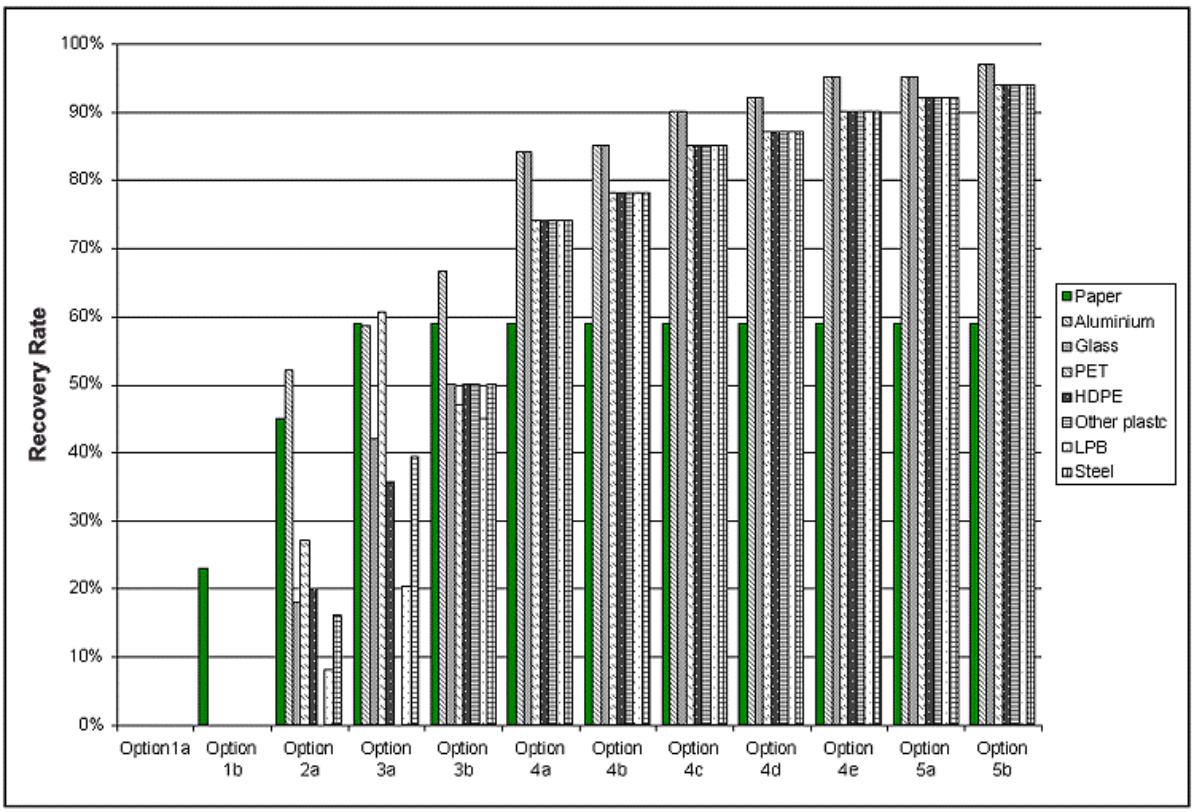


Table 3.2-8: Recovery rates by material type for each of the options

3.2.4.4 Material Flows to Kerbside, Collection Centre, POS & Landfill

Table 3.2-7 shows the recovery rates (percentages) at kerbside, collection centres, POS, and landfill, for each of the modelled options. This is shown to give an overall view of where in the CDL system each of the containers is returned.

Of note in *Table 3.2-7* is the distribution of returns for recycling under the current system in NSW (Option 3a). The results show that paper & cardboard and aluminium are returned predominantly through collection centres or depots, for the other materials, returns are predominantly through the kerbside recycling system. The high collection centre or depot returns under the current system are due to higher participation of the non-residential sector in recycling these materials.

Note that 'paper' includes all paper materials including newsprint, paper packaging and cardboard. Newsprint recycling rates are considerably higher than the levels for all paper materials.

Option	1a LF	1b PK	2a DO	3a CK	3b IWRP	4a CDL	4b CDL	4c CDL	4d CDL	4e CDL	5a POS	5b POS
Aluminium												
Kerbside	0	0	0	13	13	15	11	5	10	5	3	2
Collection Centre	0	0	52	46	53	69	74	85	82	90	25	25
Point of Sale	0	0	0	0	0	0	0	0	0	0	67	70
Landfill	100	100	48	42	34	16	15	10	8	5	5	3
Glass												
Kerbside	0	0	0	41	45	12	9	5	10	5	3	2
Collection Centre	0	0	18	2	5	72	76	85	82	90	25	25
Point of Sale	0	0	0	0	0	0	0	0	0	0	67	70
Landfill	100	100	82	58	50	16	15	10	8	5	5	3
PET												
Kerbside	0	0	0	57	39	15	10	5	9	5	3	2
Collection Centre	0	0	27	4	8	59	68	80	78	85	24	22
Point of Sale	0	0	0	0	0	0	0	0	0	0	65	70
Landfill	100	100	73	39	53	26	22	15	13	10	8	6
HDPE												
Kerbside	0	0	0	46	48	15	10	5	9	5	3	2
Collection Centre	0	0	20	2	2	59	68	80	78	85	24	22
Point of Sale	0	0	0	0	0	0	0	0	0	0	65	70
Landfill	100	100	80	53	50	26	22	15	13	10	8	6
Other Plastic												
Kerbside	0	0	0	0	50	15	10	5	9	5	3	2
Collection Centre	0	0	0	0	0	59	68	80	78	85	24	22
Point of Sale	0	0	0	0	0	0	0	0	0	0	65	70
Landfill	100	100	100	100	50	26	22	15	13	10	8	6
LPB												
Kerbside	0	0	0	20	45	15	10	5	9	5	3	2
Collection Centre	0	0	8	0	0	59	68	80	78	85	24	22
Point of Sale	0	0	0	0	0	0	0	0	0	0	65	70
Landfill	100	100	92	80	55	26	22	15	13	10	8	6
Steel												
Kerbside	0	0	0	39	50	15	10	5	9	5	3	2
Collection Centre	0	0	16	0	0	59	68	80	78	85	24	22
Point of Sale	0	0	0	0	0	0	0	0	0	0	65	70
Landfill	100	100	84	61	50	26	22	15	13	10	8	6
Paper												
Kerbside	0	23	0	23	23	23	23	23	23	23	23	23
Collection Centre	0	0	45	36	36	36	36	36	36	36	36	36
Point of Sale	0	0	0	0	0	0	0	0	0	0	0	0
Landfill	100	77	55	41	41	41	41	41	41	41	41	41

Table 3.2-7: Overall recovery rates (percentages) at kerbside, collection centres, depots, point of sale and landfill.

Detailed data tables showing the total tonnages and container numbers in each area for each of the modelled options, shown in are in *Appendix E,* also include graphical representations of each of the options.

3.3 Whole of Society Costs and Benefits

As explained in the introduction to *Section 3*, the formal cost-benefit analysis (CBA) conducted by the CDL Review comprised of two components; whole of society (efficiency) analysis, and stakeholder (distributional) impact analysis. *Section 3.3 Whole of Society Costs and Benefits* covers each of the impacts that were included in the analysis of the overall efficiency and cost to NSW of the various options.

3.1.1 Household Garbage and Kerbside Recycling Services

This chapter explains why household garbage and kerbside recycling services were included in our analysis, how it was included and what results were obtained. The significance of these results to the overall costs and benefits of the different scenarios is discussed briefly here and is expanded in *Section 3.5. Summary of Whole of Society Costs and Benefits*. The impact of the introduction of CDL on the economics of kerbside recycling in NSW is discussed under *Section 3.5.1. Impact on Kerbside Recycling and Councils.*

3.3.1.1 Household Waste Services and CDL

Garbage Collection

As explained in previous sections, Container Deposit Legislation needs to be considered in the broader context of waste management in NSW. The costs of garbage to society are often considered mainly in terms of landfill disposal costs. However, the cost of garbage collection is an important financial aspect of waste management in its own right and it is a cost that would be impacted by the introduction of CDL.

The introduction of CDL in NSW would be expected to impact the costs of household garbage collection by reducing the amount of container material that households dispose of via their garbage bins. Theoretically this means that garbage collection trucks will fill less quickly and be able to service more households in a single trip. This means that collection times, and therefore collection costs, would be expected to decrease. However, the modelling undertaken by the CDL Review found that the decreases in collection costs predicted under CDL were insignificant compared to those for the current kerbside system. This result is explained later in this section.

Kerbside Recycling

The growth of kerbside recycling has been largely responsible for increased recycling rates in NSW over the last decade and kerbside recycling is generally considered a valuable service. The introduction of container deposit legislation would affect kerbside recycling by decreasing the amount of container materials that householders leave for kerbside collection. There is concern that the resulting decreased yield of recyclable material will negatively effect the economics of kerbside recycling and may lead to the service being downgraded or discontinued in some local government areas. This issue is discussed further under heading *3.6.1 Impact on Kerbside Recycling and Local Government.*

For the purposes of the cost-benefit analysis, the CDL Review assumed that kerbside recycling services would be maintained essentially in their current form if CDL were introduced in NSW. Under this assumption, the costs of kerbside recycling services could be expected to decrease for the same reason that garbage collection costs were expected to decrease. That is, less container material would be expected to be placed in kerbside recycling bins for collection, and therefore collection trucks would fill less quickly, and the total collection time and cost would decrease. As will be discussed below, this decrease is only observed to the extent that container material volume is the limiting factor for truck collection times. In addition to the cost savings expected for collection, there will also be savings in sorting costs as less material is sorted either at kerbside or at materials recovery facilities (MRFs).

This cost benefit analysis considers the impact of CDL on society as a whole, and then analyses the distributional impact on selected key stakeholder groups such as manufacturers, consumers and councils. The analysis does not consider the economic impact on recycling contractors or MRF operators, except in terms of employment impacts. The reduction in sorting costs are based on the MRCM model. An analysis of the internal economics of MRFs is beyond the scope of this Review.

3.3.1.2 Method of Determining Garbage and Kerbside Recycling Costs

Garbage Collection

The components of garbage collection that were included in the formal CBA component of the CDL Review are:

- garbage trucks;
- maintenance and fuel for garbage trucks;
- bins for collection of garbage; and
- labour.

Note that landfill disposal costs are not included in the 'garbage collection' costs. They were included in the cost-benefit analysis but are discussed separately under heading *3.3.3 Landfill Costs*.

Costs were estimated by applying an adapted version of the Australian Waste Recycling and Cost Model (WRCM) to the garbage and recycling flows in the residential sector for each option (see *Section 3: 3.2 Scenario Description and Material Flows*). The WRCM has been developed by the Co-operative Research Centre for Waste Management and Pollution Control and has been used extensively in previous cost-benefit analyses of waste management alternatives for NSW and Australia (Nolan-ITU/SKM, 2001; BIEC, 1997).

The WRCM is designed to predict the cost of both garbage and kerbside recycling services for an individual local government area. To obtain estimates for NSW as a whole, a single, representative set of input data was used, and the results scaled to the number of households in NSW. Key inputs to the model are shown in *Table 3.3-1*. The error introduced by the use of a single representative set of input data was found to be acceptably small for the purposes of the CDL Review, particularly as the error was systematic and would not affect relative costs of the different options modelled. For example, when bin size is changed from 240L to 140L and the number of crew per truck is changed from three to one, the total costs predicted by the WRCM for each option change but the relative costs remain unaltered. For further details of the assumptions and inputs to the WRCM see *Appendix F*.

Input Variable	Value Used
Area to which services are supplied	60 sq km
Number of households	14,000
Population	37,300
Type of bins	240L mobile garbage bin (MGB)
Type of truck	Single compaction truck with 3 crew
Frequency of collection	Weekly
Mass of waste put out for collection per household	See explanation following

Table 3.3-1: Inputs to WRCM model for calculation of cost of household garbage collection.

The **mass of waste collected from each household** was determined using a combination of WCRM default values and recycling material flows as described under heading *3.2 Scenario Description and Container/Material flows*. The process is described diagrammatically in *Figure 3.3-1*. Note that for Options 4a-5b the 'diversion rates from landfill' referred to in *Figure 3.3-1* are the sum of kerbside recycling and household returns to places of redemption.

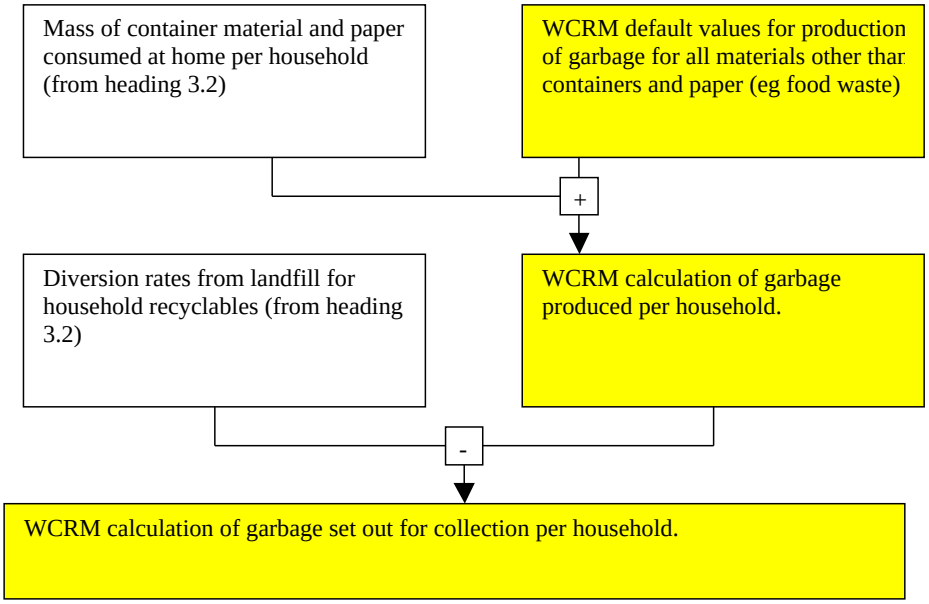


Figure 3.3-1: Derivation of household garbage set-out rates.

Kerbside Recycling

The major cost components for kerbside recycling that were included in the CDL Review's cost-benefit analysis were:

- recycling collection trucks;
- maintenance and fuel for garbage trucks;
- bins for collection of garbage;
- labour for collection, and;
- sorting costs.

Kerbside recycling costs under each option were obtained by applying an adapted version of the Australian Waste Recycling and Cost Model (WRCM) described above. The application of the model to kerbside recycling differed slightly from its application to garbage collection in that for the kerbside calculations two different collection systems were modelled. The results used in the CBA are a weighted average of the results obtained from the WRCM for the two systems. The systems used were selected because together they are representative of the systems serving approximately 70 percent of the NSW population (Nolan-ITU/SKM, 2001, p25; BIEC, 1997, p11). The weighting of results is proportional to the approximate share of the NSW kerbside market that each system is expected to have in 2003. The expected share reflects the trend towards the use of mobile garbage bins for recyclables in recent years (Nolan-ITU, 1998, p16 & 41). Note that there has reportedly been a more recent trend towards the use of separate MGBs for paper and container collection (Stephen Moore, pers. comm. 17 April 2001). This trend could decrease the share of both crate and split MGB systems by 2003. The CDL Review was,

however, unable to obtain data that would allow the prediction of the market share of separate MGBs in 2003.

Input Variable	Value Used System 1 (52% weighting)	Value Used System 2 (48% weighting)
Area to which services are supplied	60 sq km	60 sq km
Number of households and population	14,000	14,000
Population	37,300	37,300
Type of bins	One 50L crate for paper One 50L crate for containers	240L split paper/containers mobile garbage bin (MGB)
Type of Truck	Open split truck with 3 crew	Single compaction truck with 1 crew
Frequency of collection	Each bin fortnightly on alternating weeks	Fortnightly
Mass of recyclables put out for collection per household (varies in accordance with the material flows for each option modelled)	Total returns to kerbside for NSW (from ***Section 3.2 Scenario Description and container/material flows***) divided by no of households in NSW.	Total returns to kerbside for NSW (from ***Section 3.2 Scenario Description and container/material flows***) divided by no of households in NSW.

Table 3.3-2: Summary of key values used for inputs to the WRCM model.

3.3.1.3 Results

The results obtained from the WCRM for garbage and recycling costs are summarised in *Tables 3.3-3* and *3.3-4* respectively. From *Table 3.3-3* it can be seen that cost savings in garbage collection under a CDL system are expected to be negligible in comparison to savings generated by the current kerbside system. Both CDL and the current kerbside system produce savings of approximately $44m p.a. relative to the hypothetical situation in which no household recycling is undertaken.

The reason that the increased diversion of container material from household garbage under a CDL system is unlikely to result in garbage collection cost savings compared to the current system are:

1. CDL mainly increases recycling rates through improved non-residential recycling. Relatively minor increased diversion of household recyclables from the garbage stream are expected due to the already high rates of household recycling in NSW.
2. Container materials are relatively light and make up only a small proportion of the total mass of garbage collected from households.
3. The WRCM underestimates the effect of removing container material as it assumes that garbage density does not vary in line with the composition of materials removed by recycling. This means that the model underestimates the impact of removing light but voluminous material such as plastic containers.
4. Landfill disposal charges are not included in the garbage collection cost. See heading *3.3.3 Landfill Costs*.

	Garbage collected (mill tonne/yr)	Cost of collection $m/yr)	Financial benefit relative to garbage only ($m/yr)	Truck loads of recyclables diverted from garbage Stream (p.a.)
Garbage only	3.19	224	0	0
Paper only at kerbside	2.00	181	43	902
Drop off centres only	1.95	183	41	1,186
Current kerbside	1.87	180	44	1,526
CDL (all options)	1.85 – 1.86	180	44	1,734

Table 3.3-3: Garbage collection costs for all households in NSW under various options.

Table 3.3-4 summarises the predicted costs of kerbside recycling services under the different scenarios modelled by the CDL Review. The results in the table show that unlike garbage collection costs, kerbside collection and sorting costs would be significantly reduced under a CDL system. A financial benefit of $18-20m per annum across NSW is estimated compared to the current kerbside system. The savings are the result of collection vehicles filling less quickly and being able to service more households in a single trip. This means that fewer trips are required on average, and labour, fuel, and other hourly costs are reduced. For some local government areas the reduction in trips will mean that a smaller fleet of trucks is required and fixed capital costs will also be reduced.

The savings predicted are believed to be conservative as neither the frequency of kerbside collection nor the bin set out rate were decreased for the CDL scenarios. Councils may be able to reduce the frequency of collection, particularly where a weekly service is currently offered, as bins are likely to fill more slowly. Decreased frequency of collection of container materials would be particularly feasible where separate bins are provided for paper and containers. Separate collection allows container collection frequency to be reduced without affecting paper collection. The current trend towards separate MGBs for paper and container recyclables (Stephen Moore, pers. comm. 17 April 2001) would allow Local Government to take advantage of the cost savings from a reduced container collection frequency without compromising the paper recycling service.

An additional cost saving factor that was not included in the CDL Review's estimates is the potential for decreased set out rates under CDL, as the proportion of households who fill their recycling bin will decrease. Sensitivity analysis conducted showed that reductions in kerbside collection frequency and set out rates would produce significantly larger cost savings than those presented in *Table 3.3-4.*

	Container material collected from kerbside (tonne/yr)	Total recyclables[1] collected from kerbside (tonne/yr)	Cost of collection and sorting ($m/yr)	Financial benefit relative to current kerbside ($m/yr)
Landfill only	0	0	0	148
Paper only at kerbside	0	258	77	71
Drop off centres only	0	0	0	148
Current kerbside	134	392	148	0
Kerbside 2003 IWRP	123	381	143	5
CDL intermediate 5¢	43	301	131	18
CDL intermediate 10¢	31	289	130	18
CDL intermediate 20¢	17	275	129	19
CDL convenient 10¢	33	291	130	18
CDL convenient 20¢	17	275	129	19
CDL POS 10¢	10	268	128	20
CDL POS 20¢	7	265	128	20

Table 3.3-4: Kerbside collection and sorting costs for whole of NSW under various options.

3.3.1.4 Discussion

As mentioned previously, the WRCM is designed for use by individual Councils or by groups of Councils with shared waste service provision. It is not designed to estimate the aggregate impacts of government policy changes, and therefore the results obtained when using it for such purposes should be quoted with caution. Despite this, the WCRM is the best tool currently available in Australia, and has been used in other major studies (BIEC 1997b; Nolan-ITU, 1998; Nolan-ITU/SKM, 2001).

In applying the WRCM model to the CBA we are seeking to estimate the way in which garbage and recycling collection costs vary with changes in householder recycling behaviour. For the hypothetical Council modelled in the CDL Review, a drop in kerbside recycling, cost equivalent to $18m pa across NSW, occurs when we move from the current situation to the first of the CDL options (see *Table 3.3-4*). However, the cost then remains at a plateau as diversion from kerbside increases with increased intensity of CDL system. For garbage the cost decreases in a series of steps from landfill only to current kerbside, but then remains at the current kerbside level as we move to the CDL systems (see *Table 3.3-3*).

The plateau effects observed in both kerbside and garbage collection costs is due to the fact that decreased container material set out for collection will not always produce a decrease in the time required to complete a collection run (i.e. collect from all households in the collection area). Each collection run requires a certain number of 'trips' by one or more trucks to complete. A trip involves leaving the home

[1] Total recyclables is container material plus paper and cardboard.

base, travelling to the collection area, collecting bins, and then travelling either to home base or to the MRF before returning to the collection area. A trip may be defined either by the time taken to collect bins exceeding the length of the working day, or by the truck becoming full.

There are therefore three potential reasons a decrease in container material collected may not translate into a decrease in collection time (and cost). The first is simply that the decrease in mass or volume may be less than a truckload. In this case the final trip of the collection run is still required, but the last load is not full. The second reason is that trucks may be filling with paper (which we have assumed is not affected by CDL). This is possible where split paper-container MGBs and split compaction trucks are used. The third reason that collection times may not decrease is that the amount of material set out per household is so low that trucks run out of time before they fill up. The number of trips required is therefore determined only by the amount of time taken per household and the number of households. Indeed it is this third phenomena that is the principal cause of the cost savings plateau that is observed for recycling collection in the options modelled by the CDL Review.

3.3.2 Costs of Non-Residential Garbage and Recycling Services

Though the effects of CDL on domestic garbage and recycling services are often discussed, the primary impact of such legislation would actually be in the non-residential sector. Modelling undertaken for the CDL Review (see heading *3.2 Scenario Description and Container/Material Flows*) shows that approximately 50 percent of potentially deposit bearing containers are consumed away from home and are not part of the domestic waste stream. Only 26 percent of these containers are currently recycled, but under a CDL system it is estimated that this fraction would increase to between 82 percent and 96 percent. This corresponds to an increase in mass of container materials recycled in the non-residential sector of 157,000 tonnes pa, compared to the potential increase in residential recycling of only 25,000 tonnes pa of container materials.

For the purposes of the CDL Review, non-residential recycling and disposal of containers applies to all containers that are consumed away from home, including both public place use and commercial premises use. Containers used in public places are assumed to either end up in Council litterbins or in the litter stream. The impacts of CDL on this portion of the container material flow have been considered under heading *3.3.4 Litter Costs*. The cost of collecting containers and associated garbage disposed of on commercial premises or at special events is the subject of the current heading.

3.3.2.1 Method of Determining the Non-Residential Costs

Unlike in the household sector discussed under the previous heading, the type, amount and method of collection of non-residential waste is highly heterogeneous. It would therefore have been inappropriate and inaccurate for the CDL Review to attempt to estimate the total costs of garbage and recycling collection for the non-residential sector. Instead, a model for determining the costs associated with the management of used beverage containers alone was developed. The model is necessarily a vastly simplified representation of waste management in the non-residential sector and the results achieved should be considered estimates only.

The model assumes that both garbage and recyclables are collected by 22m_ capacity trucks that serve several locations in a single trip. Decreases in the number of containers landfilled under the different options are assumed to translate to an equivalent reduction in the volume of garbage collected by the garbage trucks. Similarly, increases in the number of containers recycled are assumed to lead to an increase in the volume of recycling collected by the recycling trucks.

Garbage Collection Costs

The CDL Review made the conservative assumption that reductions in the volume of garbage collected would only decrease labour costs. Potential savings in capital costs were neglected as they are harder to estimate and are likely to be small relative to labour cost savings.

Figure 3.3-2 describes the method used to estimate the reduction in labour cost associated with non-residential garbage collection. The underlying logic of the method is that reducing the amount of containers that are present in the garbage collected will lead to a reduction in the total number of garbage collection trips made by trucks across NSW[2].

A reduction in the average garbage volume collected at each premise will allow an increase in the average number of premises that can be serviced per trip. This means that all premises can be serviced with a lower total number of trips across NSW.

The number of trips required will not decrease directly in proportion to the decrease in volume collected because the system is not absolutely economically efficient. Not all garbage truck operators can optimise their client base to ensure that every truck is exactly full when it returns from a trip. In order to account for this stickiness, it has been assumed that the reduction in garbage collection trips is only 50 percent of the reduction in volume of garbage collected.

[2] A 'trip' involves travel from the home location of the garbage truck, to pick up one or a number of locations, before travelling to the drop-off point (e.g. landfill or transfer station), and then returning either to the home location or to another set of pick-up locations.

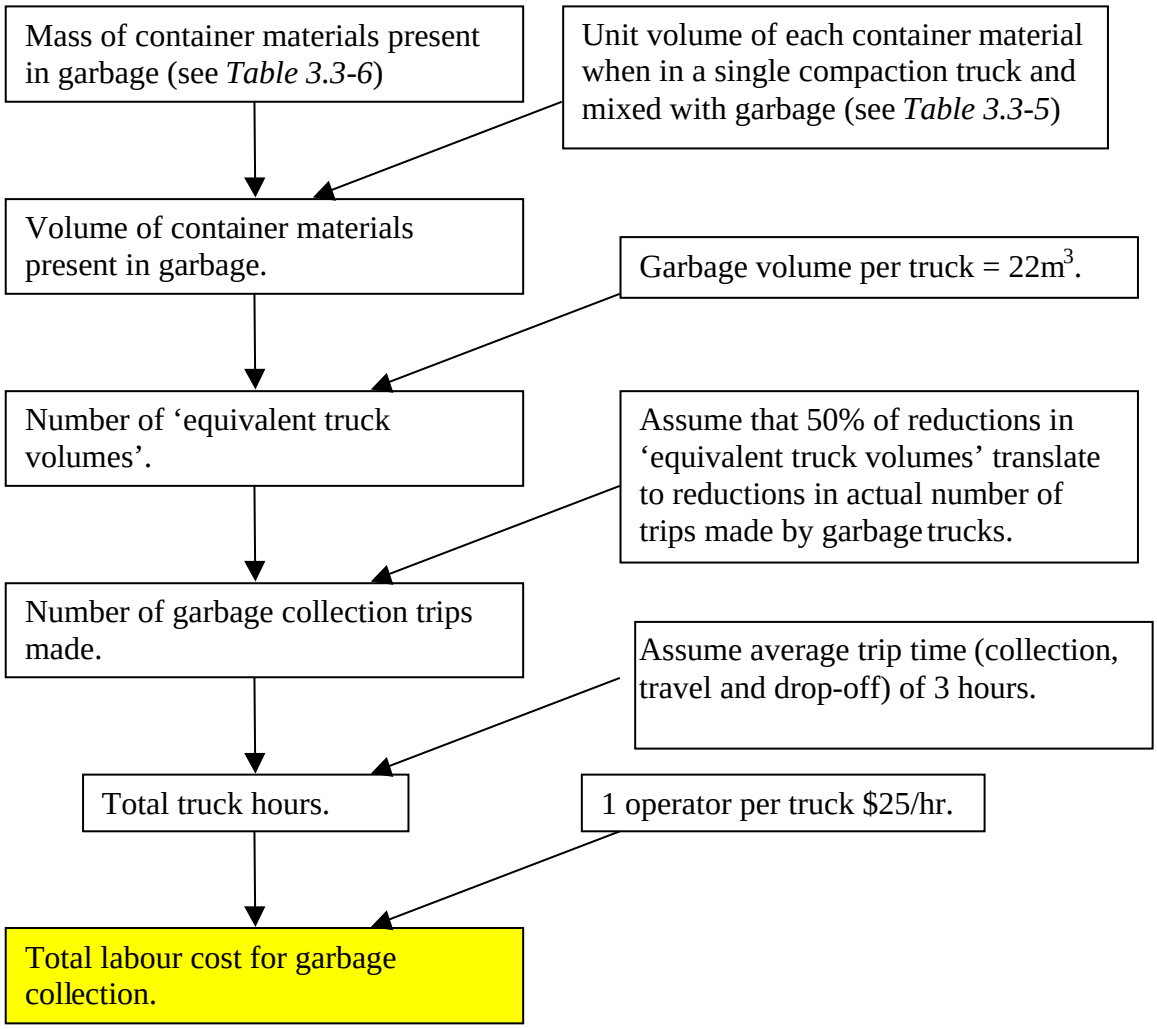


Figure 3.3-2: Overview of method for the calculation of reduction in labour cost for non-residential garbage collection.

The unit volume of the different container materials when mixed with garbage in a compaction truck was assumed to be half the unit volume for the same material when in a compaction truck containing recyclables only. The lower unit volume when mixed with garbage accounts for other items such as food waste filling the voids between containers in the truck. The unit volumes for containers in a recycling compaction truck were obtained from the WRCM's default data.

Material	Compacted volume in garbage (m^3/tonne)	Compacted volume in recycling (m^3/tonne)
Glass	0.75	1.5
Aluminium cans	4.8	9.6
PET	11.35	22.7
HDPE	13.15	26.3
PVC	9.40	18.8
LPB	3.35	6.7
Steel cans	2.60	5.2

Table 3.3-5: Unit volume of container materials in recycling and in garbage

Source: WCRM model "Other Data" sheet.

Recycling Collection Costs

The costs of increased collection of recycling from commercial premises have been calculated assuming that the collections are made by a fleet of standard $22m^3$ garbage/recycling trucks similar to those that are used for household kerbside collection. This assumption would not be valid for large producers of container waste (such as pubs and clubs), however, most of these premises already have recycling collection in place. The *marginal* increase in container recycling under a CDL system would therefore largely occur from smaller premises whose collection may reasonably be approximated by a fleet of $22m^3$ trucks.

There is likely to be a small fraction (5-10 percent) of the containers recycled from commercial premises that are returned by means that are cheaper than organised collection (e.g. by employees in their private car). This fraction is difficult to estimate and the conservative assumption is therefore made that all containers are returned via an organised collection system.

Given the above assumptions, the first few steps in calculation of recycling collection costs proceeds in a manner similar to that for the garbage collection costs. The method used is summarised in *Figure 3.3-3.*

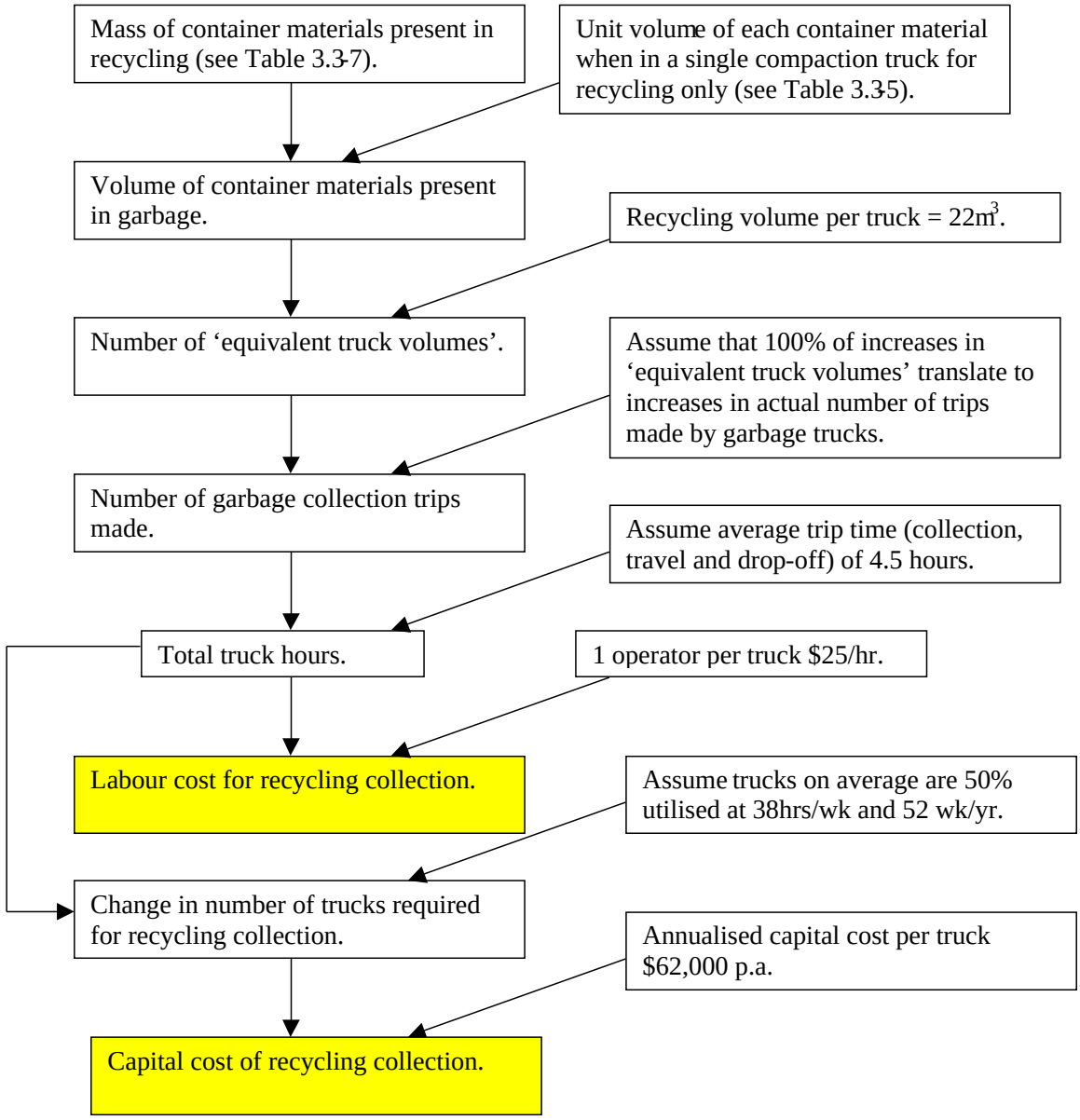


Figure 3.3-3: Overview of method for the calculation of reduction in labour cost for non-residential garbage collection

The key differences between the calculation of garbage collection cost and the calculation of recycling collection cost (illustrated by *Figures 3.3-1 & 3.3-2*) are that:

- recycling collection cost includes capital costs associated with increasing the size of the fleet of collection trucks in NSW; and
- it has conservatively been assumed in the case of recycling that 100 percent of increases in 'equivalent truck volumes' of recyclables translate into increased number of collection trips.

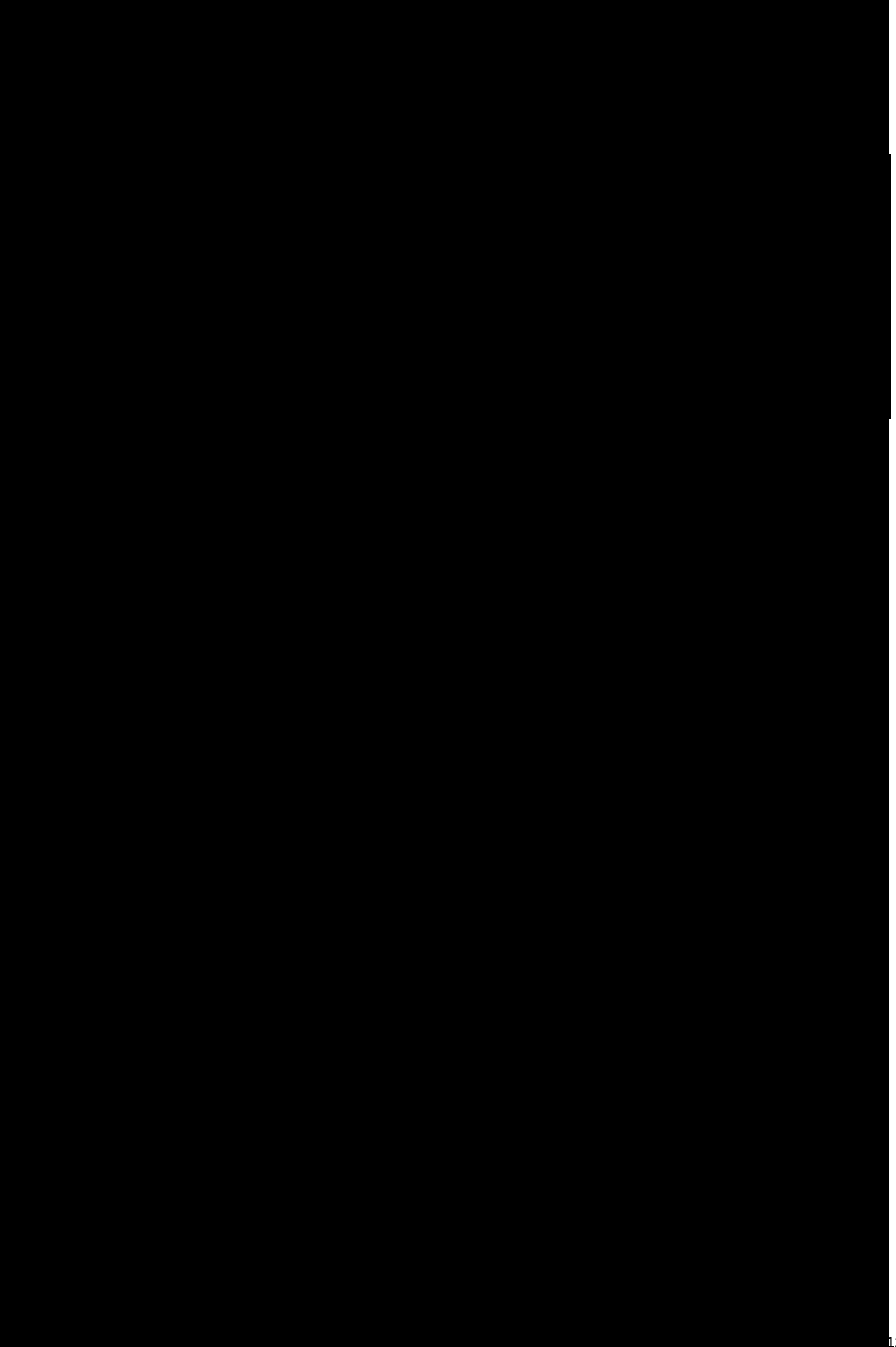
3.3.2.2 Results

Table 3.3-6 summarises the results obtained for garbage collection costs. Note that the relative costs of different options have more meaning than the total costs, given that the total costs are only costs for one small part of the total garbage stream.

	Mass of container material in garbage ('000 tonne/yr)	Volume of container material collected ('000 m^3/yr)	Total cost of collecting container materials in garbage ('000 $/yr)	Financial benefit relative to landfill only ('000 $/yr)
Landfill only	174	340	579	0
Paper only at kerbside	174	340	579	0
Drop off centres only	139	257	438	142
Current kerbside	162	291	497	83
Kerbside 2003 IWRP	127	248	423	156
CDL intermediate 5¢	36	82	140	439
CDL intermediate 10¢	39	85	145	434
CDL intermediate 20¢	23	47	81	499
CDL convenient 10¢	17	39	66	514
CDL convenient 20¢	11	27	46	534
CDL POS 10¢	9	23	39	540
CDL POS 20¢	6	16	28	552

Table 3.3-6: Garbage collection costs attributable to container material under various options.

Table 3.3-6 summarises the results obtained for garbage collection costs. Note that the relative costs of different options have more meaning than the total costs, given that the total costs are actually only costs for one small part of the total garbage stream.



from the implementation of CDL. However, the estimated reduction in waste to landfill is still a major component, due to the pressure for waste minimisation.

Metropolitan Sydney faces the pressure of limited landfill capacity, primarily due to community opposition towards the creation of new sites, and high volumes of waste. Four times as much waste is produced in the Greater Sydney region than in the rest of NSW (Wright, 2000, p29).

Higher container recovery rates through CDL would divert containers from both the domestic and commercial waste streams. The benefit to the community will depend on the avoided cost, or marginal cost of landfill and the amount of waste diverted.

3.3.3.2 Method of Determining the Landfill Costs and Benefits

In relation to landfill disposal, the financial benefit of the introduction of CDL is simply the product of the unit cost of landfill disposal and the mass of container material that is diverted by the CDL system. For the purposes of the cost-benefit analysis, the CDL Review has considered marginal costs that could be expected to result from the introduction of CDL over an approximately twenty-year time frame. To calculate the financial benefits of reduced landfilling, therefore, the CDL Review applied the long-term marginal unit cost of landfill disposal.

Estimating Long-term Marginal Unit Cost

Long-term marginal costs will be somewhere between average costs and short-term marginal costs. The average cost of landfill is the total annual costs divided by the annual tonnage of waste. According to Wright (2000) the fixed component of landfill cost for the Sydney region is approximately $57 per tonne. The marginal transport costs vary throughout the Sydney region, but the current average Sydney-wide transfer and transport cost is $15 per tonne. The transport cost is expected to increase in the future to $43 per tonne as new landfills will be located further from Sydney. (Wright, 2000 p39).

	Fixed Costs	Transport (marginal)	Proportion of Total Costs
Current	$57	$15	21%
Future	$57	$43	43%

Table 3.3-8: Sydney wide fixed and variable (transport related) disposal costs.

Over time, a consistent reduction in waste generation can reduce some of the fixed costs. Reductions arise from the deferral of expansion of landfill facilities, which means that the marginal cost will be higher than the variable, or short run marginal cost. This will also be true in country centres where new landfill capacity is required at high cost, as is the case on the far north coast of NSW.

In this review we have assumed that landfill costs across NSW are $60 per tonne. This is consistent with or conservative relative to other estimates including BIEC (2000) who used $60, BBRU (1989) who used $68 and Wright (2000) who approximated an average of $100.

Estimating the Marginal Cost of Landfilling Container Material

The marginal cost of landfilling container material under each option modelled by the CDL Review was obtained by simply multiplying the mass of container material sent to landfill by the assumed marginal cost of landfill disposal of $60 per tonne.

3.3.3.3 Results

Table 3.3-9 summarises the mass of container material and marginal cost of landfill disposal for each of the options modelled by the CDL Review.

	Container material disposed to landfill ('000 tonne/yr)	Total recyclables[3] disposed to landfill ('000 tonne/yr)	Reduction of cost of landfilling container material ($m/yr)	Reduction of cost of landfilling all recyclable materials ($m/yr)
Landfill only	338	1,460	0	0
Paper only at kerbside	338	1,202	0	15
Drop off centres only	271	889	4	34
Current kerbside	194	654	9	48
Kerbside 2003 IWRP	168	628	10	50
CDL intermediate 5¢	60	520	17	56
CDL intermediate 10¢	55	515	17	57
CDL intermediate 20¢	37	497	18	58
CDL convenient 10¢	30	490	19	58
CDL convenient 20¢	20	480	19	59
CDL POS 10¢	19	479	19	59
CDL POS 20¢	12	472	20	59

Table 3.3-9: Landfill disposal costs for whole of NSW under various options.

3.3.4 Costs of Litter

The purpose of this section is to explain why litter collection and management costs were included in our analysis, how it was included, and what results were obtained. The significance of these results to the overall costs and benefits of the different scenarios is discussed briefly here and is expanded in *Section 3.5 – Summary of Whole of Society Cost-Benefit Analysis.*

3.3.4.1 Definition and Scope

Determining the potential contribution of implementing CDL to litter is included in the Terms of Reference of the CDL Review. In the 1970s, both in South Australia and other areas, CDL was often introduced with the objective of litter reduction. Though litter reduction would be unlikely to be the primary reason for the introduction of CDL in NSW today, it remains an important benefit that should be considered in the cost-benefit analysis (CBA).

[3] Total recyclables is used beverage container material plus post consumer paper and cardboard.

The CDL Review's formal CBA included a relatively narrow definition of the costs and benefits associated with litter and litter management. It considered only expenditure by local government and did not account for expenditure by other levels of government, non-government organisations, private sector or individuals. This being said, the CDL Review's investigation of litter management costs is more comprehensive than most previous studies and the total cost estimates obtained were significantly higher than those reported in previous studies. Litter management expenditure by local government was considered in the following four categories:

- public place litter bins;
- litter collection and street sweeping;
- litter collection from stormwater systems; and
- other litter management (such as litter education and penalty notices).

Important social costs and benefits related to beverage container litter that were considered by the CDL Review but not included in its formal CBA are:

- an improvement in the visual amenity through a reduction in containers used in the litter stream; and
- a potential reduction in personal injury (mainly from broken glass) and damage to tyres (Porter, 1978; Ackerman, 1995; Dewees, 1998 and Stutz *et al*, 2000).

It should be noted that while these two benefits of litter reduction cannot be adequately measured in dollar values they are not necessarily insignificant (Ackerman 1997) and could potentially be greater than the financial benefits for other litter components included in the CBA. This is discussed further is *Section 3.3.4.Litter Collection Costs.*

3.3.4.2 Litter Cost Methodology

According to Porter (1978), for the assessment of the costs of litter collection, the important characteristics of litter are number, volume, weight, and sharpness. As discussed previously (see *Section 2.5 Litter*), the most comprehensive litter surveys in Australia have been based on litter counts expressed as percentages (KAB 1992, 1994, 1996). In order to assess the cost of used container material litter collection and management, data from the various visible litter surveys was further analysed and converted to volumes (see *Appendix I*). As is common practice, cigarette butts were excluded from litter count surveys as it was felt they would skew the results of analysing beverage containers in the litter stream for the purpose of this review.

Information detailing local government expenditure on litter collection and management, and the accuracy of the data that does exist is questionable as a majority of the figures are based on estimates and may not have included the entire range of costs associated with litter collection and management is limited. The CDL Review therefore conducted a survey of NSW councils to estimate their total expenditure on litter collection and management and the potential reduction in such costs if CDL were implemented in NSW (see *Appendix G* for a copy of the survey).

Appropriate local government employees were surveyed and the information obtained from the survey was analysed in light of the understanding of litter composition gained through the literature review discussed in *Section 2.5: Litter* (see *Appendix H* for further details of the analysis conducted).

Note that only financial costs associated with litter management have been included in the CDL Review's formal cost-benefit analysis. This means that social benefits such as improved visual amenity due to reduced litter presence have not been included. The CDL Review considers that not including social and environmental costs of litter and litter management leads to a significant underestimate of the benefits of

CDL. However, the CDL Review was unable to obtain a reliable estimate of the value of social costs such as visual amenity and did not wish to jeopardise the integrity of the overall cost-benefit analysis by including them. Social and environmental costs and benefits are discussed further later in this section.

3.3.4.3 Results

Results used in CBA

Table 3.3-10 summarises both the estimated current expenditure of local government on litter collection and management and the financial savings of litter reduction due to the introduction of CDL. Note that the different scenarios for the implementation of CDL are all assumed to have the same effect on litter. The cost savings of $4.5 million per annum are therefore assumed to apply to all the CDL options (Options *4a-e & 5a-b*).

Litter control & management	$/annum
Public place litter bins	125,000
Litter collection & street sweeping	337,000
Stormwater and litter	23,000
Other litter management costs	43,000
TOTAL expenditure per LGA	528,000
TOTAL estimated litter collection and management expenditure for all LGAs in NSW	$91.8m/annum
Estimated marginal reduction in the cost of litter collection and management if CDL were implemented	$4.5m/annum

Table 3.3-10: Breakdown of litter control and management costs for NSW local governments and the estimated marginal reduction in such costs under CDL.

The total marginal cost of beverage container litter incurred by NSW councils of $4.5 million equates to approximately $1.78 per household per year. The breakdown of marginal costs for each component of litter collection and management (see *Section 3.3.1.1*) is provided in *Appendix H*.

Other Significant Costs

In addition to the marginal cost associated with councils' collection and management of litter, the total cost of litter collection and management to local government was determined. This was found to be approximately $92 million per annum. This is important in determining the potential relative reduction in litter costs due to CDL in NSW.

Other costs associated with litter but which are not included in the CBA are reduced visual amenity and the increased risk of physical injury and damage to tyres (mainly due to glass cuts). These may result in significant costs, however due to the complexity of quantifying these costs they have not been used in the CBA.

Visual amenity

While the estimated marginal savings to local government litter expenditure appear relatively small at $4.5 million (which represents only a five percent reduction), it is feasible to suggest a major saving or benefit of litter reduction that has not been quantified in the CBA is increased visual amenity. Few studies around the world have attempted to quantify such a benefit in economic terms, however the willingness to pay for such a reduction in litter is strongly indicated by a number of current litter management costs incurred in NSW. These include:

- volunteer litter collectors and organisers of the annual Clean Up Australia day, who's time commitment annually is the equivalent of approximately $17 million[4] in NSW;
- NSW local government commitment and expenditure on litter collection and management, estimated at around $92 million per annum;
- state and local government expenditure on stormwater management of more than $25 million per annum (a proportion of which is attributable to litter)[5]; and
- Keep Australia Beautiful's commitment to litter awareness and improvement, estimated at around $50 million per annum for the whole of Australia (KAB, 2000).

Such expenditures by society on litter awareness and reduction indicate a strong willingness to pay to see litter removed from the environment. In economic terms the benefit of increased visual amenity is likely to be much greater than the $4.5 million benefit estimated based only on a reduction in Council litter clean-up costs.

The reduction in visual amenity of public spaces as a result of litter is much more difficult to quantify in practical terms, though some studies such as Porter (1978) have attempted to do so. It is complicated because the magnitude of aesthetic disutility will vary depending on location. As one CDL stakeholder representative noted the aesthetic, cost per container would be greater on a beach or National Park than a highway or football stadium.[6]

It is important to consider that the public perception of the percentage of beverage containers in the litter stream is often greater than its percentage by actual litter counts. The McGregor surveys (1994) found that retailers perceived the number of beverage containers in the litter stream to be around 35 percent. Of the 200 local councils surveyed across Australia, 85 percent felt that beverage containers were one of the most prevalent types of litter (McGregor, 1994a). The litter composition surveys from annual Clean Up Australia days indicate almost double the proportion of beverage containers in the litter stream (around 20 percent beverage containers) compared to KAB visible litter surveys. One explanation is that beverage containers are large and have a high visual impact compared to their counts, weight or volume in the litter stream. Beverage containers are generally more durable, rigid and buoyant than other consumer waste products in the litter stream. Hence, they are more visually offensive as litter and each beverage container removed from the litter stream would result in a relatively greater benefit than other litter items in terms of increasing visual amenity.

In the CDL Televote Survey conducted as part of the Review, litter reduction was the second most frequently quoted reason why CDL should be introduced. One in four of the survey respondents, who expressed support for CDL, stated that they did so because of the litter benefits. For comparison, the most

[4] Based on a valuation of people's time at $12.35 per hour.

[5] Richard McManus, Stormwater Trust, pers. comms, 12 May 2001, combined spending of $82 over three years.

[6] Matthew Warren, personal communication, 27/11/00.

cited reason (92 percent) was for waste reduction and recycling (see *Volume III: Consultation and Social Research, Section VIII Social Research – Televote & Citizens Jury*). This further supports the notion that there is a strong willingness among the community to pay to see a reduction in litter.

Physical injury and infrastructure damage

Physical injury and infrastructure costs are largely related to broken glass bottles. Such litter may cause accidents to children, puncture tyres, and cause farm damage (Ackerman 1995). In Boston's Massachusetts General Hospital, a study was undertaken on the incidence of glass related lacerations before and after the implementation of Massachusetts' Bottle Bill. The study concluded that there was a 60 percent reduction in such incidences and concluded this could be attributed to implementation of the container deposit system (cited in Ackerman, 1995). It should be noted that this reduction in glass cuttings might also be attributed to other factors. For example, the percentage of both plastic bottles and cans with non-detachable opening devices in the soft drink and beer market have increased, thus reducing the percentage of glass bottles and the associated safety hazards of glass cuttings and metal tabs from soft drinks cans (Dewees, 1998).

Broken glass can damage the tyres of bicycles, cars, lawn mowers, and other vehicles (Ackerman 1995). In Australia it has been estimated that the cost of glass-damaged tyres is in the order of $10 million annually (Bicycle Federation of Australia, 1999). According to the Bicycle Federation of Australia this cost includes replacement costs of damaged tyres and inner tubes, time lost for repairing the damage, and the cost of seeking alternative travel when tyres are damaged. Farm damage includes the cost of damaged equipment and time lost repairing it, contaminated feed, and the illness or death of livestock. However, studies of farm damage due to beverage container litter originate in the US. It should be noted that the extent of damage is highly dependent on both the proximity of farms to highways/roads and population centres. Farm damage in NSW may be significantly less because of lower population densities.

According to Dewees (1998) it is difficult to quantify the social cost or externalities of litter, and the existing data is far from robust. Assessing the litter reduction benefits of the Michigan Bottle Bill, Stutz and Gilbert (2000) found the prevention of injury and farm damage were two and three times (respectively) greater that the benefits of litter pick-up and management. In this *Section 3.3.4* of The CDL Review, the only benefits of litter reduction quantified are the reduction in litter collection and management costs, while the benefits of reduction in both injury prevention and increased visual amenity are discussed qualitatively.

3.3.4.4 Discussion

Comparison of Total Cost Estimate with other Estimates

When compared to the figures in the literature, the data from the CDL Review's LGA litter cost survey indicate that total expenditure on litter collection by NSW local governments is higher than previously determined, as summarised in *Table 3.3-11*. See *Appendix G* for ISF's Survey of Litter Costs provided to NSW local Governments and *Appendix H* for details of the methodology for analysis of the litter costs.

Source	Average expenditure per council	Total NSW expenditure ($m/a)
PCA (1994)	>$115 000	$2
KAB (1994)	$80 000	$14
BRRU (1989)	$98 000 - $156 000	$17 – 27
McGregor (1994)	$189 000[9]	$33
ISF (2001)	$523 000	$92

Table 3.3-11: Comparison of litter costs incurred by NSW Councils.

The variation in estimates may be explained by *Table 3.3-11* the types of litter costs included. Previous litter cost surveys are likely to have only included the costs of litter collection and street sweeping, and not included other costs such as cleaning litter from stormwater, and public place litter bins, or other litter management costs such as litter education or litter penalty notification and enforcement. ISF's litter costs survey did include such these and the estimation yielded is thus higher.

Note that all of the above figures refer to expenditure by local government. While it is likely that the major cost of litter collection and management in NSW is largely incurred by local governments, non-government organisations such as Keep Australia Beautiful (KAB) and Clean Up Australia (CUA) also have significant expenditure. KAB's estimate of national expenditure on litter by all stakeholders and levels of government is in the order of 'hundreds of millions' of dollars.[7]

Comparison of Marginal Savings Estimate with other Estimates

The financial benefit (or marginal costs) of estimated litter reduction were found to be relatively minor compared to other financial benefits addressed in the CBA. The total marginal benefit would be approximately $4.5 million for NSW, which equates to approximately a five percent reduction in litter collection and management costs.

We are aware of no other Australian studies that quantify the financial benefits of litter reduction for NSW. However, several councils and groups of councils provided information to the CDL Review via their submissions. One NSW metropolitan local government estimates its own financial litter reduction benefits would be in the order of $1 million, given a 50 percent reduction in litter (LGSA submission to the CDL Review). This is a high estimate given that the removal of all beverage containers from the NSW litter stream would result in approximately a 10-15 percent decrease in litter by count (KAB, 1996), and approximately 25-30 percent by volume, neither of which equate to 50 percent (see *Appendix I*). Some local governments spend more on a per capita basis on litter collection and management than others. For example, member councils of the Sydney Coastal Councils Group (SCCG) manage litter from stormwater sources that can end up as beach or foreshore litter. According to the Local Government and Shires Association's submission[8] the sixteen member councils of the SCCG spend in the order of $13.4 million annually. This figure is equivalent to $837,500 per council, compared to the NSW-wide average of $552 000 per council estimated in this survey.

[7] KAB Homepage, http://www.kabnational.org.au/stats.shtml).

[8] LGSA submission, 2001.

3.3.4.4 Conclusion

There was a large variation in the reported expenditure and expected savings on litter management for the councils surveyed. There is also a significant amount of variation in the estimates of total litter management costs for NSW that have been made by various authors. The CDL Review's estimate of total litter management expenditure is significantly higher than those given in other sources. However, in terms of the cost-benefit analysis for CDL, it is only the savings in litter management costs that are of significance.

The savings predicted by the CDL Review are actually surprisingly small, and indeed are unlikely to affect the overall cost-benefit balance for CDL. Given that CDL has been implemented and enjoys significant public support in several jurisdictions around the world almost entirely on a litter management basis, suggesting that the social benefits of a reduction in litter are far more significant than the financial benefits associated with a reduced need for litter management. The reason for this is partly because many social costs are not captured in the financial cost of its management, and partly because litter management costs do not decrease linearly in proportion to decreases in the litter present. For example, the expenditure by both state and local governments in NSW on stormwater management would be unlikely to decrease by fifteen percent even if the amount of litter present in stormwater decreased by fifteen percent. This is an important example of the difference between analyses based on marginal costs, and those based on average costs.

One means of reconciling the difference between the high total expenditure on litter and the low marginal savings in litter management costs is to consider the average costs and value the litter reduction as a proportion of the total expenditure. For example, if we assumed a 10% reduction in the visual impact of litter due to CDL, we would value the litter reduction at ten percent of the NSW population's total spending on litter management of approximately $150 million. This would provide an estimate of the value of improvement in visual amenity due to CDL of $15 million per annum.

3.3.5 Infrastructure Costs

This section describes the costs of establishing and operating the infrastructure for a CDL system.

The infrastructure requirements will vary for each of the options for implementation of CDL that have been considered as part of this Review (see *Section 3.2: Scenario Description and Container/Material Flows* for full description of the CDL options considered). The implementation options considered include the following three types of systems:

- Depot based system: using existing licensed waste facilities and establishing new facilities where necessary. This scenario is based on the South Australian system and has been labelled CDL intermediate, due to the intermediate spacing of depots, and is represented by Options 4a-c, which differ in the level of the deposit. It involves spacing depots such that they are within 5km in the Sydney metropolitan area, and would involve approximately 100 staffed depots, including 50 new and 50 modified existing facilities in the metropolitan area, and 112 modified existing facilities in rural towns and cities in NSW.
- Convenience Centres: these are small collection centres located in 'Convenience Zones' such as supermarket carparks. This scenario is based on the Californian system and labelled 'CDL convenience', with two options of a 10¢ deposit and a 20¢ deposit. There would be approximately 800 such collection centres located in NSW, with 500 of these being in the metropolitan area.

- Point of sale: this scenario involves a return to retailer system, or the use of reverse vending machines (RVMs). This scenario is called CDL POS and has been modelled with a 10¢ deposit and a 20¢ deposit.

For each of these scenarios separate costings have been undertaken for metropolitan and rural based facilities, due to the difference in land values, retail leasing costs, and staffing levels at depots.

3.3.5.1 Depot Based System

The cost of establishing new facilities and upgrading older facilities is based upon advice from industry, quotes from suppliers, and the literature. In describing the capital and operating costs of depots the following areas have been considered:

- location and siting;
- design and construction;
- operation and management.

Location and Siting of Facilities

The location of facilities has been based on a spacing similar to that which applies in the Adelaide metropolitan area. In Adelaide there are 30 depots, spaced such that most people are within 5km. They are usually conveniently located on major roads. There are a further 70 depots in country towns. In NSW it has been assumed that in many cases existing licensed waste facilities including drop-off centres would be adapted for use. The location and number of such facilities has been identified as part of this analysis (Nolan 1998:94, EPA 2000). A summary of the existing facilities and the number that would be required is summarised in *Table 3.3-12*. The assumed population density for depot spacing is 2,000 people per square kilometre, or 50,000 per depot. This population density is approximately the same as Auburn or Bankstown LGA, and significantly less than Ashfield (5,300) or Randwick (3,500).

Parameter	Sydney region	Rest of NSW	Total
Population	4,041,381	2,370,299	6,411,680
Number of households	1,493,200	923,600	2,416,800
Existing depots or other licensed facilities	24	152	176
Proposed number of depots	81	152	233
New depots required	57	0	57
Existing depots to be modified	24	152	176

Table 3.3-12: Summary of the existing depots and the number required for Options 4a-c.

Capital and operating costs

Capital costs for design and construction of existing and new depot facilities includes the following components:

- planning and approvals;
- land (equivalent to half an acre or 2,025 square metres);
- building works including office area and equipment storage area;

- after hours security and fencing, and;
- plant and equipment (including storage bins, forklift, conveyor and baling machine).

The values for these items vary between metropolitan and rural depots, and are summarised in *Table 3.3-13*.

Capital cost component	New – metro	New – rural	Existing – metro and rural
Planning, design and approvals	$30,000	$30,000	$15,000
Land (average land value)	$464,333	$63,964	-
Building works – shelter or warehouse factory and office/amenities	$140,000	$140,000	$20,000
After hours security and fencing	$30,000	$30,000	$30,000
Plant – forklift	$50,000	$50,000	-
Plant – pick line, conveyor	$8,000	$8,000	$8,000
Plant – HBM horizontal baler 30/35 CX and glass compactor	$55,000	$55,000	$55,000
Storage – skip bins	$42,000	$42,000	$48,000
Total	**$819,333**	**$418,964**	**$176,000**
Equivalent annualised cost ($/a)	**$77,000**	**$40,000**	**$16,600**
Without land	**$355,000**	**$355,000**	**-**

Table 3.3-13: Capital cost components.

These capital costs have been incorporated in the cost-benefit analysis as an annualised cost at seven percent over 20 years.

Operating costs for existing and new depot facilities include the components shown in *Table 3.3-14*.

Operating cost component	Metro	Rural
Labour	$150,000	$75,000
Labour – on costs	$37,500	$18,750
Overheads for plant and equipment	$10,000	$10,000
Maintenance	$10,000	$10,000
Subtotal	**$207,500**	**$113,750**

Table 3.3-14: Operating costs for depot facilities.

The total costs associated with the new and existing depots is summarised in *Table 3.3-15* and *Table 3.3-16.*

	Land cost	Total capital cost	Labour cost	Total operating cost	Total annual costs	Employment
New	$464,333	$819,333	$187,500	$207,500	$284,839	6
Existing	$0	$176,000	$187,500	$207,500	$224,113	6

Table 3.3-15: Capital and operating costs per depot for metropolitan depots.

	Land cost	Total capital cost	Labour cost	Total operating cost	Total annual costs	Employment
New	$63,964	$418,964	$93,750	$113,750	$153,297	3
Existing	$0	$176,000	$93,750	$130,363	$130,363	3

Table 3.3-16: Capital and operating costs per depot for rural depots.

The BIEC submission to the CDL Review (C4ES 2000) assumed the costs shown in *Table 3.3-17* for metropolitan depots in a similar configuration.

	Total capital cost ($)	Total operating cost ($/a)	Total annual costs	Results for CDL Review (see above)
New	$300,000	$150,000	$180,000	$284,839
Existing	$200,000	$150,000	$170,000	$224,113

Table 3.3-17: Capital and operating costs per depot for metropolitan depots estimated in the BIEC submission (C4ES 2000 pxii).

3.3.5.2 Convenience Centres

Options 4d and 4e have been based on the establishment of collection centres in 'convenience zones', usually located at or near supermarket car parking areas. This system is based on the arrangement in California, a unique system of 'convenience zone' recycling infrastructure that is based in grocery store parking lots (see *Section 1.1.3*)[9]. For NSW it has been assumed, based on the number of supermarkets, that approximately 800[10] collection centres would be constructed, split between the metropolitan and regional areas in accordance with population. The establishment costs would be lower than the large scale depots considered in Options 4a-c, but the overall costs would be higher due to the number of centres and the assumption that a minimum of two fulltime staff would be needed per centre.

Establishment costs for these collection centres include the following:

[9] In the Californian system, a convenience zone is the area within half a mile (800 metres) of a supermarket, or a zone designated by the California Department of Conservation in areas with no supermarkets. A supermarket is considered a convenience zone area if it is a full line, self service retail store with gross annual sales of $2m or more, and sells dry grocery, canned goods, or non food items and some perishable goods.

[10] In NSW and ACT there are approximately 460 Coles, Woolworths, Franklins, Bi-Lo stores, plus 300 IGA stores. As noted in *Section ll*, the retail sector is becoming increasingly concenrated in ownership, with Coles-Myer and Woolworths controlling 70% of the market, and the number of retail outlets per capita is steadily falling.

Capital

- location;
- car park area and access requirements for customers and transportation vehicles on and off site;
- storage bins for sorted materials;
- building and office facility for redemption and transactions (4.8m by 2.5m);
- a baler for compaction of plastic material;
- storage for security of plant and equipment.

Operation

- supervision and labour for handling and transactions
- overhead costs

Capital cost component	Metro ($)	Rural ($)
Planning, design and approvals	$15,000	$15,000
Land [10 car space = 120 m^2]	$100,000	$39,000
Building works [4.8m x 2.5m office = 1 carspace]	$80,000	$80,000
After hours security and fencing	$15,000	$30,000
Plant – HBM horizontal baler 30/35 CX and glass compactor	$55,000	$55,000
Storage – skip bins	$42,000	$42,000
Subtotal	**$307,000**	**$261,000**
Without land	**$207,000**	**$222,000**

Table 3.3-18: Capital costs associated with establishment of convenience zone collection centres.

Capital cost component	Metro ($/a)	Rural ($/a)
Labour – wages and earnings	$50,000	$37,500
Labour – on costs	$12,500	$9,375
Overheads for plant and equipment	$10,000	$10,000
Maintenance	$10,000	$10,000
Subtotal	**$82,500**	**$66,875**

Table 3.19: Capital costs associated with establishment of convenience zone collection centres.

The costs per collection centre are summarised in *Table 3.3-20*.

	Land cost ($)	Total capital cost ($)	Labour cost ($/a)	Total operating cost (S/a)	Total annualised cost ($/a)
Metro	$100,000	$307,000	$62,500	$82,500	$111,479
Rural	$39,000	$261,000	$46,875	$66,875	$91,512

Table 3.3-20: Capital costs associated with establishment of convenience zone collection centres.

3.3.5.3 Point of Sale

Most of the costs associated with Point of sale (POS) are variable costs, and include:

- labour for handling and storage.
- lease cost or opportunity cost of storage space for redeemed used containers.
- interest on deposits float.
- pest control.
- cleaning.

The capital costs associated with point of sale are minimal, and include extra storage bins for redeemed used containers.

The major cost is the handling time, per container. Values have been reported in the literature, and are summarised in *Table 3.3-21*. This Review has chosen three seconds per container, with sensitivity testing at five seconds. The average handling time will have decreased since these literature values were appropriate, due to the major improvements in labour productivity in recent years in retailing, especially in supermarkets.

Study	Seconds per container	Hourly Wage (1993 $)	Cost per container (3¢)
Porter (1978)	12	$6.70	2.47
Case & Company (1980)	7.5	$21.20	4.19
Rockefeller Institute (1985)	N/A	N/A	3.60
Food Marketing Institute (1986)	5	$15.90	3.70

Table 3.3-21: Comparison of literature values for container handling time at point-of-sale (cited by Tellus Institute 1995).

Source: Tellus Institute 1995, ***The Costs and Benefits of Bottle Bills***

The salary level for a shop assistant, based on the relevant award was used for costing the labour. This equates to $12.05 per hour, based on $458 for a 38-hour week.

The balance of the costs were estimated for a retail outlet that redeems approximately 10,000 containers per week. Many of these costs would not apply to smaller retailers. These costs are shown in *Table 3.3-22* for metropolitan and rural retail outlets.

Operating cost component	Metro cost ($/a)	Rural cost($/a)
Storage space lease costs (stacked 1m high)	$2,227	$1,294
Interest on 30 days float	$454	$369
Cleaning	$1,440	$1,440
Pest control	$1,040	$1,040

Table 3.3-22: Estimated balance of operating costs, excluding labour costs at three seconds per container, for a retail outlet redeeming 10,000 containers per week.

In addition it is estimated that such a retail outlet would have capital costs for storage bins of approximately $3,000.

3.3.5.4 Reverse Vending Machines

The reverse vending machine (RVM) is similar in concept to a conventional drink/snack vending machine, except that instead of delivering a beverage or snack item upon insertion of the specified fee, the machine accepts used beverage containers and delivers a receipt or cash refund.

The RVM has been in use for several decades overseas, however its design has been continually modified and refined. Today RVMs are used extensively in Western European countries and some North American States and provinces which have some form of a deposit-refund system for beverage containers. The largest manufacturer of the machines is TOMRA Inc. who supplies both Europe and America with machines and additional network infrastructure. Other leading manufacturers include Repant (European) and Envipco (US) (see *Appendix J* for more details of Reverse Vending Machines).

For the purpose of this Review, RVMs are considered a potential cost saving option for retailers when utilised as an alternative to labour and storage, where this is cost-effective. Most models are only capable of accepting round containers at present. Their use is greater in Europe and in Michigan, than in (for example) British Columbia, due to the higher population densities in the former. RVMs are capable of handling 1 million containers per year.

3.3.5.5 Summary of Infrastructure Costs

Table 3.3-23 summarises the infrastructure capital and operating costs for the CDL options modelled in this Review.

Option label	Option short description	Total collection point cost ($m/a)	Total POS cost ($m/a)	Total annual cost ($m/a)	Land cost ($m)	Capital cost (Sm)	Labour cost ($m/a)	Operating cost ($m/a)
4a	Intermediate 5¢	41	0	41	28	76	29	35
4b	Intermediate 10¢	41	0	41	28	76	29	35
4c	Intermediate 20¢	41	0	41	28	76	29	35
4d	Convenient 10¢	83	0	83	62	232	45	61
4e	Convenient 20¢	83	0	83	62	232	45	61
5a	POS 10¢	12	55	66	0	17	26	53
5b	POS 20¢	12	59	71	0	17	30	57

Table 3.3-23: Infrastructure capital and operating costs for various CDL options.

There are several trends or implementation issues that may act to reduce some of these costs.

Firstly, if a CDL system were implemented, the land value costs may be met by a council in the case of depots (Options 4a-c) or a retailer in the case of Option 4d and 4e where car park areas are involved. This will reduce the cost significantly.

Secondly, there is emerging interest in the construction and use of customer-friendly depots (drop-off centres) as an important element of an integrated waste minimisation strategy, even in the absence of a CDL system. Waste Boards in NSW have particularly supported this idea (WSWB, 2000; Nolan-ITU, 1998) as a way of retrieving hard waste and bulky items. The construction of such centres will have synergistic cost reduction benefits for CDL infrastructure. The literature on these proposals is based on one depot per 100,000 people or one depot per 65,000 households, placing them within 10-20 km of most people, at least in the metropolitan area.

3.3.6 Implementation Costs

The implementation costs discussed in this section are:

- labelling
- administration costs
- auditing
- education and advertising

Determining the costs of implementation components for CDL in NSW is difficult, as such costs will be system-specific. It has been assumed that the total implementation costs will amount to $4 million per

year. This estimate is consistent with economic analysis in Hudson (2000) of South Australia's implementation costs and with relative costs of some European CDL systems (Vanthournout, 1998, p41, 49,61, 67). The breakdown of the cost estimates is provided in *Table 3.3-24* below.

Component cost	Annualised cost ($m/annum)	Assumptions and Comments
Labelling	$0.4	Assumes $4 million for set-up costs (label design, plates, printing)
Administration	$1.9	Assumes 10 staff, overheads for the administrative authority, plus the equivalent for industry.
Auditing	$0.5	Estimate; supported by results for SA CDL in Hudson (2000).
Education & Advertising	$1.2	Estimated based on Sydney Water and EPA marketing costs for similar programs.
TOTAL	**$4.0**	-

Table 3.3-24: Breakdown of costs and assumptions for implementation of CDL in NSW.

3.3.6.1 Labelling

If CDL were to be introduced in NSW, the cost of re-labelling all beverage containers to be included in the system should be accounted for. It is estimated that the cost of such re-labelling would amount to somewhere in the order of $4m, or $0.38m per annum in annualised terms. New design, plate construction and printing would be required, however ongoing printing costs would be the same as under current printing operations.

3.3.6.2 Administration Costs

Administration costs include enforcement, record keeping, licensing of collection centres, interpretation of the regulation, dealing with queries, and ensuring the appropriate containers display the refund amount.

3.3.6.3 Auditing Costs

It is assumed that auditing will be structured to maximise efficiency. *Section 4.3: Administrative Systems* discusses the issues of auditing and system efficiency. Auditing will need to be conducted on materials recovered from kerbside recycling schemes and total materials recovered through the CDL system. Auditing should not be carried out by brand owner, but by container counts. Counting can be performed by weighing when large numbers of containers are involved.

3.3.6.4 Education Campaigns

Education, awareness, and advertising are essential for any system to be integrated in an existing societal structure. The issue of education is discussed further in *Section 4.10: Education and Information*.

3.3.6.5 Discussion of Sensitivity

The literature available suggests that admin and other costs can add between five and twenty percent to the cost of the CDL system. Applying these boundary values to the CDL options modelled by the CDL Review, the administrative, educational and other costs could be as low as $2 million p.a. or as high as $12 million p.a. Note, however, that the higher costs reported in literature included a significant

educational expenditure. This expenditure is likely to be balanced by decreased need for anti-litter education campaigns and other waste awareness campaigns currently running in NSW.

3.3.7 Costs of Consumer Travel to Return Containers

The purpose of this section is to explain why consumer travel was included in our analysis, how it was included, and what results were obtained. The significance of these results to the overall costs and benefits of the different scenarios is discussed briefly here and is expanded in *Section 3.4: Summary of Whole of Society Costs and Benefits.*

3.3.7.1 Introduction

The transport of containers to collection points by consumers is an inherent characteristic of deposit-refund systems. The additional car travel resulting from these trips is sometimes viewed as a potential major disbenefit of container deposit systems. In particular it is sometimes claimed that transport costs significantly reduce the environmental benefits that result from increased reuse and recycling. Many investigations of the costs of CDL (e.g. Ackerman, 1997: C4ES, 2000), however, assume zero net travel increase. The current review has estimated the per capita increase in travel that could be expected under a CDL system and the financial and environmental cost of the additional travel. This section relates to the financial costs only. The environmental costs have been included in the life cycle assessment (LCA) of each option that is presented in *Section 3.4: Environmental Costs.*

Experience in places that have CDL systems indicates that consumers will dispose of deposit bearing containers by one of the following means:

- garbage,
- kerbside,
- donation to charity or other person collecting containers,
- making a special trip (often by car) to place of redemption, or
- returning containers as part of another trip (e.g. shopping).

The latter two of these means will result in a marginal increase in consumer travel and are the subject of this chapter. The components of financial cost associated with consumer travel that have been considered in the CDL Review are described below.

3.3.7.2 Method of Determining the Financial Cost of Consumer Travel

The CDL Review calculated the marginal cost of consumer travel to return containers based on an estimate of the additional private vehicle kilometres travelled under CDL systems. Different implementation scenarios for CDL (represented by the CDL Review's Options 4a-e and 5a-b) were found to result in significantly different consumer travel outcomes.

The major components of the financial cost of consumer travel are:

- value of consumers' time spent travelling;
- fuel, and;
- vehicle depreciation.

The latter two components have been included in the formal CBA in the CDL Review. The former component, though potentially large, has not been included in the formal CBA due to the difficulty of valuing consumers' time. The value of consumers travel time is, however, is discussed in *Section 3.6.4 Impact on Consumers*.

Additional Vehicle Kilometres Travelled

The additional distance travelled by consumers returning deposit-bearing containers is primarily determined by:

- the proportion of households that make trips by car to return containers;
- the average distance from home to the place of redemption;
- how often people return containers;
- the number of trips that are solely for the purpose of returning containers, and;
- the distance between the point of collection and other destination for trips that are shared between container return and another purpose (e.g. shopping).

The latter two points are the most difficult to estimate and for the purposes of the CBA have been combined and termed 'proportion of trip attributable to CDL'. The equation describing the extra consumer travel is thus:

$$VKT\ (NSW) = R_P \leftrightarrow HH \leftrightarrow (2 \leftrightarrow d) \leftrightarrow N_{Trips} \leftrightarrow P_{CDL}$$

Where:

R_P is the average participation rate over all households in NSW (i.e. proportion returning containers by car)

HH is the number of households in NSW,

d is the average one-way distance to the collection centre from households (by road),

N_{Trips} is the average number of trips to the collection centre per household per year,

P_{CDL} is the proportion of trips that are attributable to CDL.

Cost of Fuel

The fuel component of the cost of consumer travel has been calculated based on the additional vehicle kilometres travelled, the average fuel efficiency of domestic vehicles, and the cost of petrol.

Fuel Cost = VKT / Eff x PP

Where:

VKT is the extra distance travelled by consumers by private vehicle (km/yr),

Eff is the average fuel efficiency of NSW domestic vehicles (km/L), and

PP is the price of fuel ($/L).

Vehicle Depreciation

Depreciation = VKT x DR

Where:

VKT is the extra distance travelled by consumers by private vehicle (km/yr), and

DR is the rate of depreciation of vehicle value per km travelled.

Values used in CBA

Tables 3.3.-25 & 3.3-26 summarise the values that were used in the CBA for each CDL option. The household participation rates shown are based on consumer behaviour and preferences as reported by C4ES (2000 p.ix) for South Australia, and as indicated by the Televote conducted for the CDL Review (see *Volume III Section 7*). Average distances from households to places of redemption have been calculated based on the number and location of collection centres under each option (see under *Heading: 3.3.5 Infrastructure Costs*). The proportion of trips attributable to CDL is the least reliable of the parameters used in the calculation of consumer travel. It has been based on reported behaviour in South Australia (C4ES, 2000 p.ix), as well as household travel patterns for the greater Sydney region provided by the NSW Department of Transport (2001). Note that for the POS options, consumers can return containers either to retailer or to collection centres. Where consumers return containers to retailer, the additional travel is assumed to be zero as customers would be travelling to the retail outlet anyway.

Households in NSW	Trips per year	Average fuel efficiency	Average fuel cost	Depreciation rate
2,536,400	12	0.1L/km	$1/L	$750/1500km

Table 3.3-25: Constants used in the calculation of consumer travel costs.

	Household participation rate (%)	Distance to place of redemption (km)	Proportion of trips for CDL (%)
Option 4a: CDL intermediate 5¢	35	5	30
Option 4b: CDL intermediate 10¢	50	5	30
Option 4c: CDL intermediate 20¢	65	5	30
Option 4d: CDL convenient 10¢	85	3.5	8.5
Option 4e: CDL convenient 20¢	90	3.5	8.5
Option 5a: CDL POS 10¢	2.4[1]	5	30
Option 5b: CDL POS 20¢	2.5	5	30

Table 3.3-26: Values used in the calculation of consumer travel costs under various options.

1. The household participation rate for the two point of sale Options (5a &5b) represents the proportion of households that return containers through collection centres. Note that under a point of sale system the significant majority of households would choose to return containers to retailers rather than collection centres. The figures of 2.4% and 2.5% were obtained by multiplying the household participation rate for Option 4a by the ratio of the mass of container material returned through depots in Option 4a and the POS options.

	Additional consumer travel (km/hh/yr)	Financial cost of travel ($m/yr)
No CDL, No kerbside, depot only	7.8	9
CDL intermediate 5¢	12.2	13
CDL intermediate 10¢	17.5	19
CDL intermediate 20¢	22.7	25
CDL convenient 10¢	6.1	7
CDL convenient 20¢	6.5	7
CDL POS 10¢	0.9	1
CDL POS 20¢	0.9	1

Table 3.3-27: Consumer travel costs for whole of NSW under various options.

3.3.7.3 Discussion

The results in *Table 3.3-27* indicate that consumer travel is a relatively minor financial cost. Sensitivity testing was undertaken to determine the impact of altering the assumptions regarding the proportion of trips attributable to CDL. The testing showed that even if all consumers returned their containers only by making special trips for the sole purpose of container return, then the cost of consumer travel would be $83million.

To put these results in perspective, for the Sydney Region the current average weekday vehicle kilometres travelled is 77.8 million kilometres (NSW Dept of Transport, 2001). Therefore, our upper bound for the most driving intensive scenario, represents only a 0.15 percent increase in vehicle kilometres travelled.

3.4 Environmental Costs

This section describes the environmental impacts associated with the implementation of container deposit legislation in NSW, the methodology that has been used for quantifying these impacts, and the estimated costs and benefits associated with them.

The environmental impacts include:

- decreased environmental impacts from the production and transport of virgin container materials;
- decreased transport-associated environmental impacts arising from decreased collection of garbage from households and kerbside recycling, and;
- increased transport-associated environmental impacts attributed to the taking of containers to collection centres or point-of-sale, and the transport of container materials from these locations to end-users.

There are two key components of the methodology associated with quantifying these costs.

Firstly, life cycle assessment was used to determine the indicative environmental impact associated with the reduction of resource extraction and refining, material production, transport, and disposal of container materials. In this Review, the environmental impacts for various scenarios have been assessed to provide a comparison between options for different impact categories.

Secondly, economic values are ascribed to the environmental impacts in the many different impact categories. This is done using publicly available values for the cost of regulating pollutants where such data is available locally, or where it does not exist, using international values. In this review, adjusted results obtained from the recently published *Independent Assessment of Kerbside Recycling in Australia* (Nolan-ITU/SKM, 2001) have been used to value environmental impacts. However, Nolan-ITU/SKM note in their report that the valuation data was developed specifically for the inventory used in that report. Its application in the CDL Review is therefore subject to errors arising from any incompatibility between the inventories used for the streamlined environmental impact assessments conducted by each.

The LCA and environmental valuation methodology used by the CDL Review are described in more detail under *Headings 3.4.2* and *3.4.3*. *Heading 3.4.1* describes two previous studies that have established a precedent for the assessment of the environmental benefits of recycling used by the CDL Review.

Note that this Review makes the following assumptions:

- The used container materials are recycled, rather than refitted or used for energy recovery, in the case of the plastics. The Nolan ITU/SKM (2001) report concluded that waste to energy had reduced environmental benefits relative to recycling. Conversely, recent European studies (see Section 2.4) indicate that the use of refillable containers has increased environmental benefits.
- That the Australian materials recycling industry has the capacity to recycle all the used container materials that will be recovered through the CDL options. Sources at Visy indicated that this was likely to be the case for glass. Other materials are less problematic.

3.4.1 The CDL Review's Life Cycle Assessment

As part of the CDL Review, a streamlined life cycle assessment (SLCA) of the various options for implementing CDL was undertaken. The CDL Review's LCA was undertaken by the Centre for Design at RMIT University, leaders in Life Cycle Assessment of waste and recycling in Australia, and authors of the recently released *Life Cycle Assessment of Paper and Packaging Waste Management Scenarios in Victoria* (Grant et al., 2001b) and the soon to be released *Report for Life Cycle Assessment for Paper and Packaging Waste Management Scenarios in New South Wales* (Grant et al., Draft 2001a). The SLCA undertaken for the CDL Review was conducted using SimaPro™ software and the inputs to the modelling represented the best available data for waste life cycle inventories in Australia at this time.

The objectives of the CDL Review's SLCA were:

- to determine the relative impact of various scenarios across the categories of environmental impact;
- to determine the influence of vehicle use on the overall environmental impact;
- to determine the relative impacts of the recovery of different materials from the waste stream.

3.4.1.1 LCA Methodology

Life cycle assessment is a method that has been developed over the last ten years to analyse the environmental impacts of products or processes. As the name would suggest, the main feature of the methodology is that it involves quantifying the environmental impacts from the beginning of the product's life to its ultimate disposal and all the steps in between, including transport of materials and products. LCA quantifies material and energy use and the generation of waste and pollution for a large number of pollutants and resources and categorises them into groups including:

- greenhouse gas emissions;
- embodied energy;

- smog precursors;
- water use; and
- landfill impacts.

The methodologies of life cycle assessment and life cycle impact assessment are formalised as international standards[11], and there are established procedures for the selection of impact categories, assigning values to the impact categories, and calculation of the results.

The SLCA conducted for the CDL Review considered the above impacts from the point at which a beverage container became a used beverage container through to either 100 years after disposal to landfill or to the point at which it has been reprocessed into recyclate material. For container material that is recycled, 'virgin credits' are subtracted from the life cycle impact for the recycling process. The virgin credits represent the life cycle impact of the production of an amount of virgin material equivalent to the amount of recyclate material that is obtained.

The major stages of the life cycle for containers that are recycled or landfilled are summarised in *Table 3.4-2* and *Table 3.4-3* respectively.

Life cycle stage	Comments
Concentration of materials	This includes kerbside recycling collection, commercial recycling collection, consumer returns to collection points, and transport of containers collection by retailers to larger recycling depots.
Bulk transport of materials to reprocessor	Transport from large recycling depots or materials recovery facilities (MRFs) to reprocessors (e.g. VISY)
Reprocessing into recyclate	Processing of collected materials.
Subtracted virgin credits	This accounts for the saved impacts from mining, manufacture and transport of raw materials into a product equivalent to the recyclate.

Table 3.4-2: Life cycle stages for recycled containers and paper products.

Life cycle stage	Comments
Garbage Collection	This includes a component of residential and non-residential garbage collection.
Bulk transport to disposal site	From MRF or transfer station to landfill.
100yr landfill impact	Includes degradation and leachate production. For paper there is a positive impact component from degradation to methane, some of which is assumed to be captured and used for energy production.

Table 3.4-3: Life cycle stages for recycled containers and paper products.

The life cycle inventory data used for the CDL Review's LCA is derived from data developed in the draft *Report on Life Cycle Assessment for Paper and Packaging Waste Management Scenarios in New South*

[11] ISO 14 040 (1997) 'Environmental Management - Life Cycle Assessment—Principles and Framework' and ISO 14 042 (2000) 'Environmental Management—Life Cycle Assessment—Life Cycle Impact Assessment'.

Wales (Grant et al., Draft 2001a) The reader is referred to that document for further details of the method and assumptions used.

Streamlined components of LCA

Given the timeframe and resources available, and the scale of assessment being undertaken, the life cycle assessment was streamlined in the following ways:

- No new data was developed. The availability of the Victorian and New South Wales LCA (Grant et al. Draft 2001; Grant et al 2001b) data meant that good data on material collection and processing were available.
- No sensitivity analysis was undertaken, beyond that done as part of the Victoria Kerbside study.
- Only limited reporting of results and model assumption has been undertaken.

Compliance with ISO14040 series standards on LCA

The Victorian and New South Wales projects (Grant et al. 2001a; Grant et al. 2001b), from which the CDL Review's SLCA draws its inventory data, are generally compliant with all aspects of ISO14042, including the provisions for comparative assertions released to the public. The provisions for comparative assertions include requirements that a study:

- not use a weighted or single indicator to present the results;
- undertake a range of sensitivity and data quality checks; and
- undergo a peer review process.

The CDL Review's SLCA itself is only partially compliant with these requirements because it:

- has used single indicator results, as did the *Independent Assessment of Kerbside Recycling in Australia* (Nolan-ITU/SKM, 2001), but has supported this information with specific impact data for a number of other indicators;
- includes only limited sensitivity analysis and data checking;
- has not been peer reviewed by an expert in LCA.

ISO14042 also requires that data quality and indicator selection should be consistent with the goal and scope of the project. Given the breadth of the study and the quality of data available for the economic and environmental modelling, the data and procedures used in this SLCA were appropriate to the goal of identifying indicative environmental impacts of each option.

3.4.1.2 SLCA Results - Standard Indicator Approach

Streamlined life cycle assessment was conducted for four of the ten options for used beverage container management that were modelled by the CDL Review. The four options used in the SLCA were Landfill Only (Option 1a), Current Kerbside (Option 3a), CDL Intermediate Depots 5¢ (Option 4a) and CDL Point of Sale 10¢ (Option 5b). These four options were chosen to illustrate the no recycling case, the current situation, and the weak and strong forms of container deposit legislation.

It should be noted that in regard to the life cycle impacts using the standard indicator approach, a positive value or result means that there has been a negative effect on the environment. This is because the

impacts measure estimated quantities. For example, the greenhouse impact is measured in tonnes of greenhouse gas emissions produced.

Impact of Each Option by Material

Table 3.4-4 and *Figures 3.4-1* to *3.4-5* summarise the life cycle impacts of each option for five key indicators: greenhouse contribution, embodied energy demand, smog precursor emissions, embodied water use, and solid waste production. *Figures 3.4-1* to *3.4-5* also illustrate the contribution of each type of container material to the overall impact. Impacts associated with paper have not been included in the charts, as paper tends to dominate the effects. The omission of paper does not affect the conclusions with regards to the benefits or otherwise of CDL as paper recycling is assumed to be unchanged from the current kerbside system (Option 3a) to the situation that applies under CDL (Options 4a & 5b).

	Option 1a Landfill Only	Option 3a Current Kerbside	Option 4a CDL intermediate 5¢	Option 5b CDL POS 20¢
Greenhouse ('000 tonnes p.a.)	14	-140	-260	-321
Embodied Energy (PetaJ p.a.)	0.114	-2.418	-4.287	-5.247
Smog Precursors (tonnes p.a.)	5	-87	-183	-240
Embodied Water Use (ML p.a.)	-26	-12,370	-17,853	-20,495
Solid Waste ('000 tonnes p.a.)	335	169	27	-30

Table 3.4-4: Summary of environmental impacts by standard indicator category.

The net impacts for the recycling Options (3a, 4a, 5b*)* usually have a negative value. This indicates that the avoided impacts from not having to manufacture as much packaging material from virgin materials (represented as negative value impacts) are sufficiently large to outweigh both the impacts of the recycling process and the impacts of landfilling the fraction of materials that are not recycled under that option.

It is evident from the results presented that increasing the amount of container material recycled (as we move from Option 1a to 3a, 4a and 5b) leads to increasing environmental benefit across all the indicators. Interestingly, the particular material that is responsible for the majority of the benefit varies between indicators. For example, aluminium recycling has a large environmental benefit in terms of avoided greenhouse impact (see *Figure 3.4-1*), and HDPE recycling dominates the environmental benefit in terms of avoided smog precursors (see *Figure 3.4-3*).

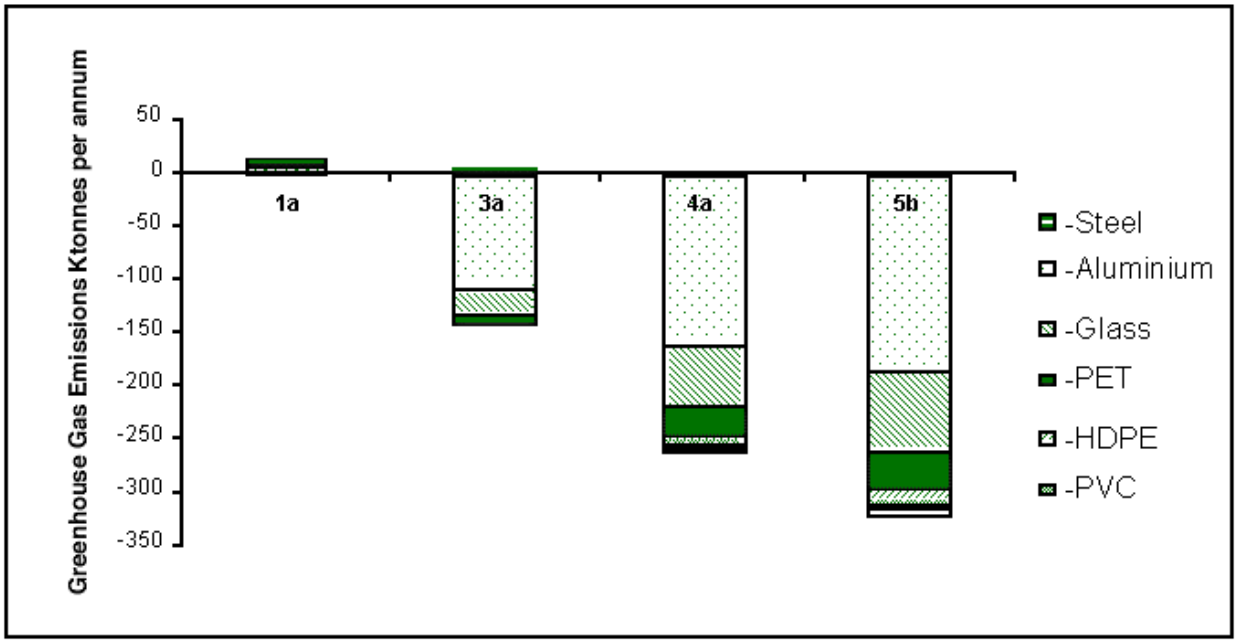


Figure 3.4-1: Greenhouse gas emissions for selected options.

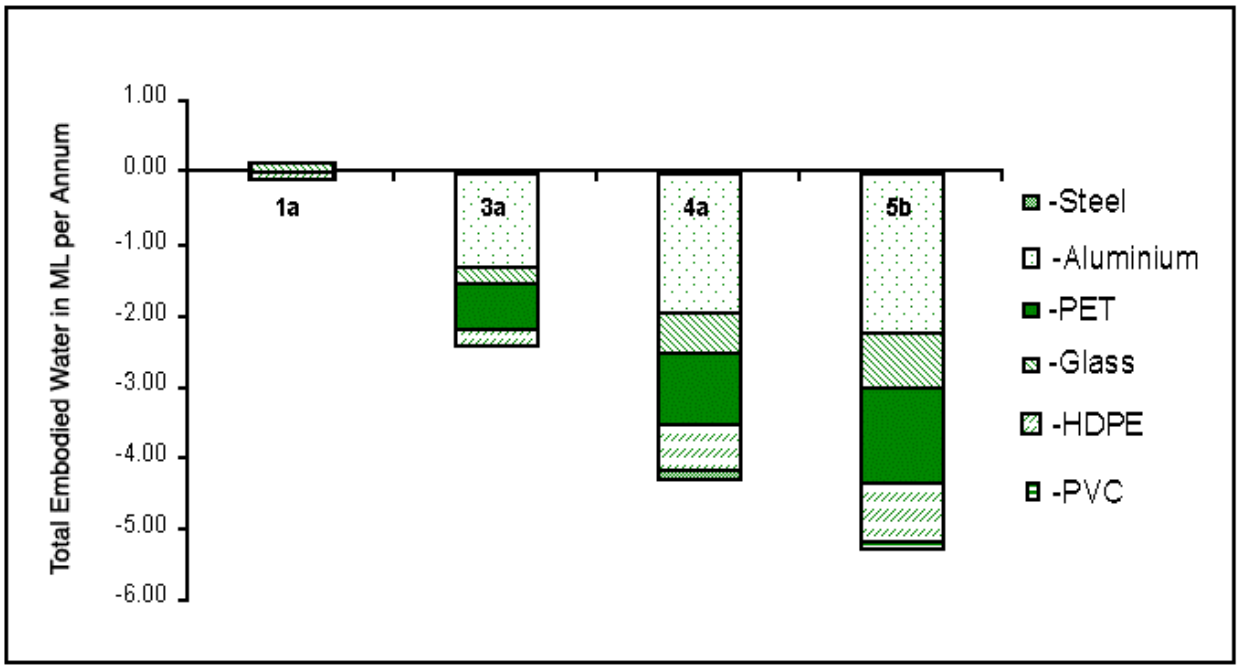


Figure 3.4-2: Embodied energy demand of selected options.

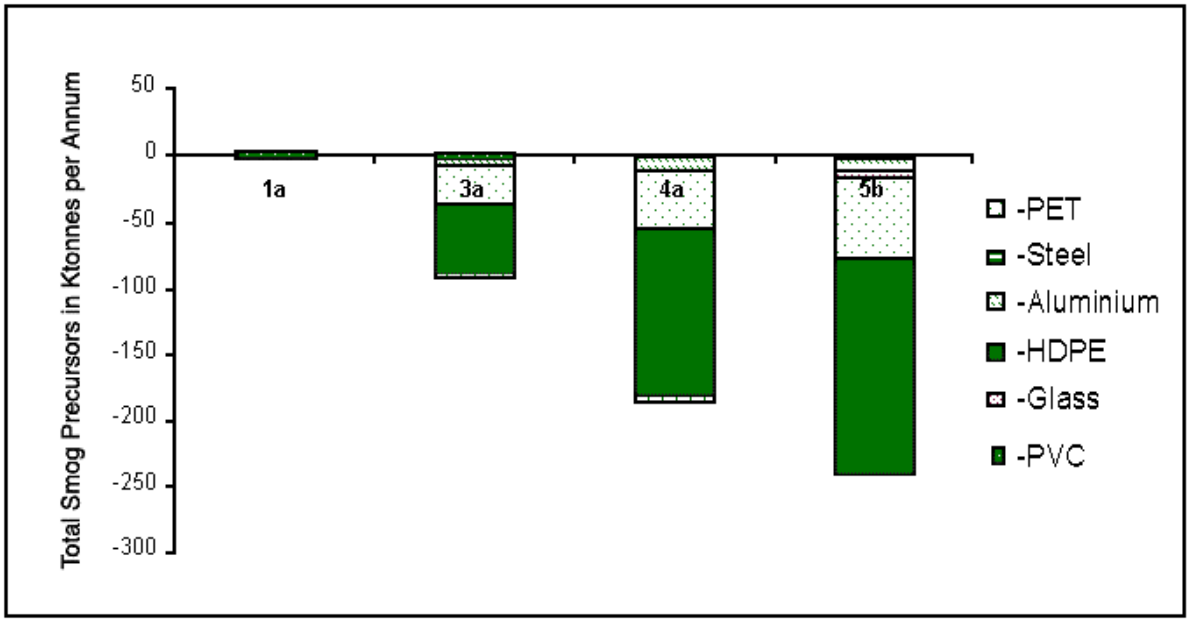


Figure 3.4-3: Smog precursor emissions for selected options.

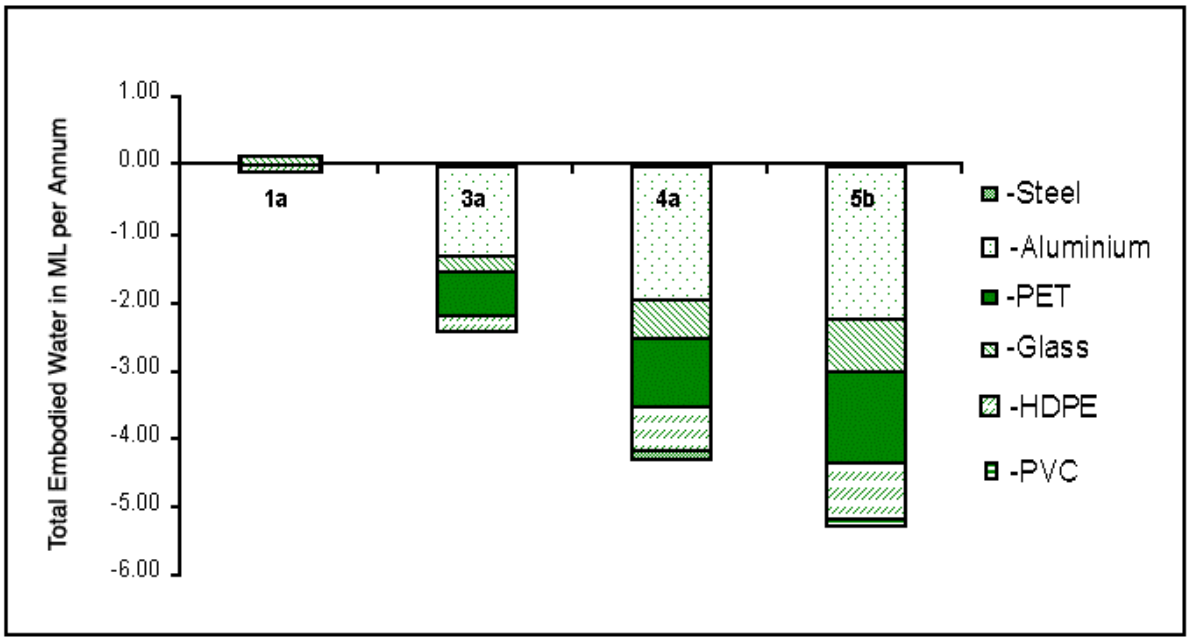


Figure 3.4-4: Embodied water use for selected options.

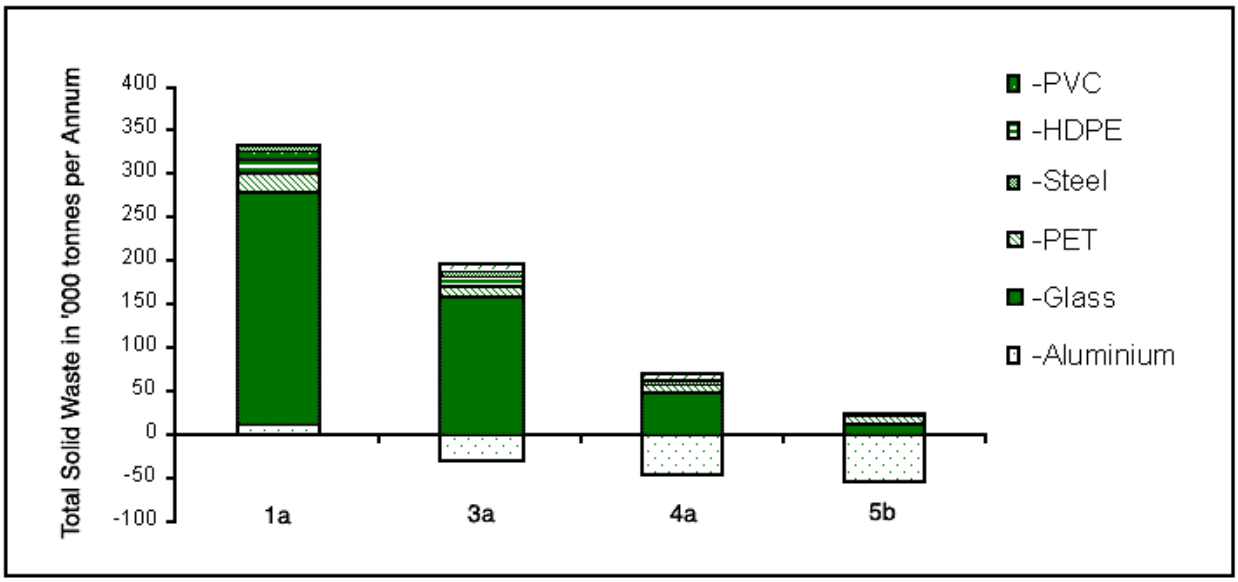


Figure 3.4-5: Solid waste production for selected options.

Energy Impact by Category

The CDL Review has applied SLCA to assess the impact created by consumers driving private vehicles to return containers to collection points. Some commentators have raised the concern that this additional transport impact may outweigh the environme ntal benefits of the introduction of CDL. *Table 3.4-5* summarises the energy impact of four options (Options 1a, 3a, 4a & 5b) overall as well as by energy use category.

Two important observations can be made from *Table 3.4-5*. Firstly, transport energy is a relatively small component of the overall energy impact. Secondly, CDL actually reduces the transport energy demands in comparison to the current kerbside system. This reduction is the result of a decrease in the total amount of time required to collect used container material via kerbside collection. In other words, it is more energy efficient for consumers to return containers, usually when they are on their way to some other destination, than it is for large trucks, that spend a significant portion of their running time idling while bins are emptied, to collect them from households.

Energy Impact (MJ p.a.) by Category	Option 1a Landfill only	Option 3a Current Kerbside	Option 4a CDL Intermediate 5¢	Option 4b CDL POS 20¢
Transport	140	856	667	590
Electricity (delivered)	-2,510	-736	-828	-794
Electricity conversion losses	-5,140	-1,450	-1,640	-1,550
Fuel extraction & delivery	-66	-20	-125	-194
Process heat	20	-7,570	-8,090	-8,290
Feedstock	0	-859	-1,530	-1,960
Other	776	-171	-354	-802
Total	-6,780	-9,950	-11,900	-13,000

Figure 3.4-5: Energy impact in MJ p.a. by energy category for four key options.

Note that the results in *Table 3.4-5* include impacts associated with paper as well as container materials.

3.4.2 Economic Valuation

The CDL Review estimated the equivalent economic value of the environmental impacts quantified by the SLCA. The valuation was based on the best information currently available in Australia, however, economic valuation of environmental impacts is a complex task and the results obtained should be considered indicative of the size and relative magnitude of impacts, rather than precise values.

The economic valuation of life cycle impacts was achieved by multiplying the size of each impact (e.g. tonnes of greenhouse gases emitted) by the unit value of the impact (e.g. in dollars per tonne emitted). The size of the impacts was determined using the system boundary and inventory data discussed previously for the standard indicator approach under heading *3.4.2: The CDL Review's Life Cycle Assessment*. The unit valuation of impacts was based on the values used by Nolan-ITU/SKM Economics in their *Independent Assessment of Kerbside Recycling in Australia* (Nolan-ITU/SKM, 2001). It should be noted that the values used by Nolan-ITU/SKM were not intended for application in other studies. Their application in this review may therefore have introduced some errors, particularly in regard to the relative benefit of landfilling versus recycling paper. Since the latter comparison is not the subject of this review, and all other relative values are less ambiguous and conservatively calculated, it is considered justifiable to apply these valuations.

In order to be consistent with the Nolan-ITU/SKM valuation, life cycle impacts for the CDL Review's economic valuation of environmental impacts were grouped into the following categories:

- Greenhouse gas production;
- Mineral resource consumption;
- Oil and gas consumption;
- Air toxics emissions;
- Water toxics emissions;
- Solid waste production;
- Timber impact; and
- Noise Impact.

Note that these categories are not exactly the same as the impact categories used in the standard indicator approach under heading *3.4.2: The CDL Review's Life Cycle Assessment*.

3.4.2.1 Economic Valuation of Impacts by Material

Table 3.4-6 summarises the valuation of environmental impact from recycled and virgin materials on a material specific basis for the current kerbside system (Option 3a). The difference between the virgin and recycled material impacts represents the environmental benefit of recycling a tonne of material. This benefit accounts for a large component of the benefits observed for the recycling Options under the next heading. Note that while the results in *Table 3.4-6* are for the current kerbside system, they would be almost identical on a per tonne basis as those for the CDL options. The only difference between the different recycling options on a per tonne basis is the transport involved in the collection process. As we have seen for energy in *Table 3.4-5*, transport (of which collection is a component) is a relatively small component of the overall impacts.

Material	Recycled Material Impact ($/tonne)	Virgin Material Impact ($/tonne)	Recycling Benefit ($/tonne)
Newsprint[1]	477	881	404
Corrugated Board[2]	303	311	8
Glass[3]	84	248	163
Aluminium[4]	163	3,214	3,051
HDPE[5]	333	413	80
PET[6]	300	2,096	1,796
PVC[7]	265	31,196	30,931
Steel[8]	282	839	558

Table 3.4-6: Economic valuation of environmental impacts by material.

1. Product taken to the newsprint roll. Newsprint is usually a mix of recycled and virgin material in Australia.

2. Product taken to the production of corrugated board. Corrugated board is often a mix of recycled and virgin material in Australia.

3. Product taken to the production of molten glass (pre bottle formation). Glass is always a mix of virgin and recycled material.

4. Product taken to the production of aluminium ingots. Aluminium scrap comes from many sources and this number relates to kerbside source material in Sydney only. Aluminium often includes a mix of recycled and virgin material.

5. Product taken to the production of HDPE granulate. Recycled product may have more limitation than virgin. High energy savings are partly due to feedstock energy in virgin material.

6. Product taken to the production of PET granulate. High-energy savings are partly due to feedstock energy in virgin material.

7. Product taken to the production of PVC flake. High energy savings are partly due to feedstock energy in virgin material.

8. Product taken to the production of steel slab. Steel scrap comes from many sources and this number relates to kerbside source material in Sydney only. Steel is often a mix of recycled and virgin material in Australia.

It can be seen from *Table 3.4-6* that per tonne of material recycled, PVC, aluminium, and PET have the largest benefit valuation. The high environmental cost associated with virgin PVC is due to the high valuation by Nolan-ITU/SKM of chlorine emissions (in salt form) to waterways. Sensitivity testing has, however, been conducted to ensure that the PVC valuation does not have a significant impact on the estimation of costs and benefits of CDL.

3.4.2.2 Economic Valuation of Impacts of Different Options

Figure 3.4-6 summarises the economic valuation of the environmental impacts of four of the CDL Review's seven modelled options. The four options used were Option 1a – Landfill Only, Option 3a - Current Kerbside, Option 4a - CDL Intermediate 5¢, and Option 5b – CDL POS 10¢.

When reading *Figure 3.4-6* it is important to remember that the environmental impacts are shown as costs. Therefore, a negative cost (bar below the zero line) represents an environmental benefit.

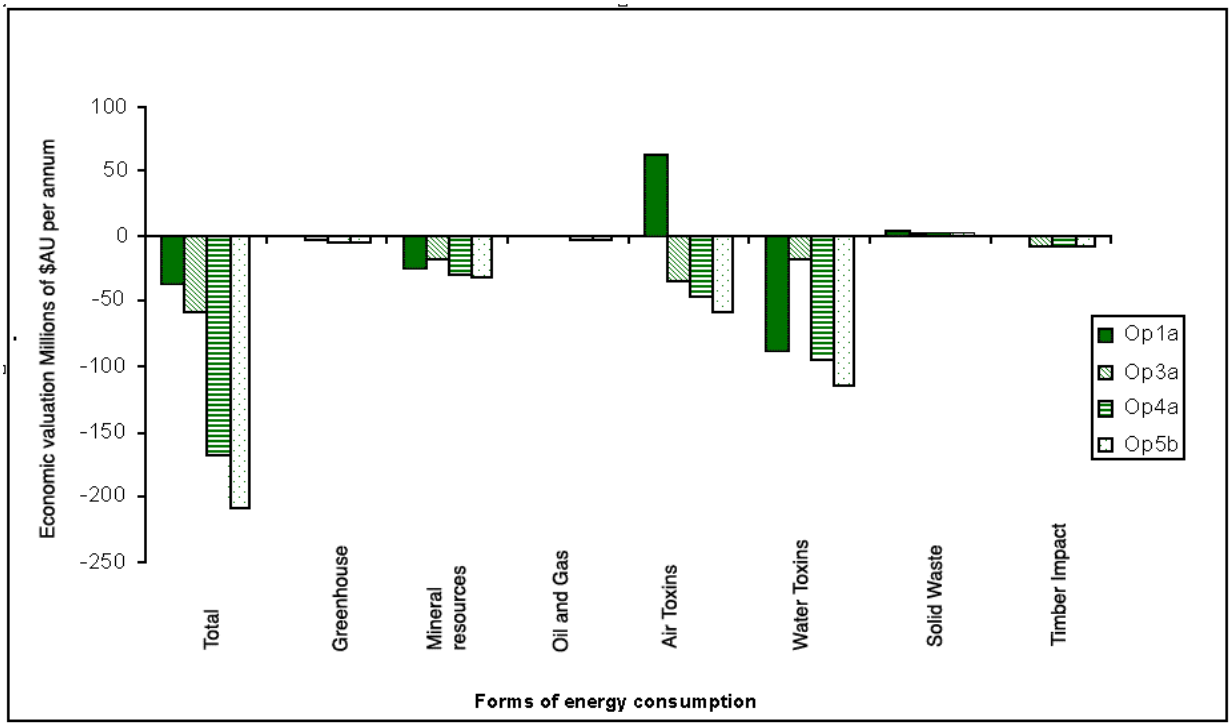


Figure 3.4-6: Valuation of environmental impacts of different options.

It can be seen from *Figure 3.4-6* that the CDL options (4a and 5b) have larger environmental benefit than either Landfill Only (Option 1a) or Current Kerbside (Option 3a) across all impact categories. Perhaps surprisingly, Landfill Only produces greater environmental benefit than Current Kerbside in both the Mineral Resources and Air Toxics categories. The reason for this is that paper in landfill produces an environmental benefit based on the assumption that some of the methane produced from its decomposition is used as an energy source via landfill gas capture. For these two categories, the benefits obtained from recycling containers by kerbside do not compensate for the loss of the benefit gained from landfill decomposition of paper. Overall, however, the Current Kerbside option can be seen to have a greater environmental benefit than the Landfill Only option.

A further interesting observation is that solid waste impacts account for only a small fraction of the total. Thus it can be seen that the environmental benefits of recycling go well beyond preservation of limited landfill capacity.

3.4.2.3 Discussion

The report of the *Independent Assessment of Kerbside Recycling in Australia* (Nolan-ITU/SKM, 2001) claims that the results of that study are conservative, as suggested by the sensitivity testing undertaken as part of the study, and by a comparison with results used in other international studies. The study and the report were extensively peer reviewed and have received widespread endorsement from both government and industry[12].

The results obtained in the CDL Review are even more conservative in respect to the benefits of recycling than those obtained by the Nolan-ITU/SKM study. Differences between the *Independent Assessment's* results and the CDL Review's results are largely due to the fact that the CDL Review was able to draw its data from newer inventory data with a greater degree of Australian content. The

[12] See Gavin Williams, CEO Packaging Council of Australia speech at launch of report, Jan 17 2001, http://www.packcomm.com.au/speechpage.html, accessed March 20 2001.

Independent Assessment did not present LCA results across other impact categories. Key components that were valued more conservatively in respect to recycling benefit by the CDL Review's SLCA compared to the Nolan-ITU/SKM (2001) valuation include:

- landfill degradation of paper, leading to energy production from methane;
- lower particulate emissions from virgin product systems; and
- possibly higher chloride emissions from electricity generation (which lower recycling benefits).
- some resources valuations are not included in this assessment, as they were not documented in the Nolan-ITU/SKM study such as iron ore.

Given these limitations, there are still clear directions provided by the SLCA results in terms of where the benefits arise from the different CDL options. The results are consistent with the Nolan and EcoRecycle studies, which found avoided virgin material production from recovery to be the most dominant aspect when looking at the life cycle benefits, while the other impacts are distributed between collection impacts and reprocessing of the recycled materials.

3.5 Summary of Whole of Society Costs and Benefits

This section provides a summary of the economic costs and benefits (including environmental externalities) of implementing the various CDL options, in absolute terms; relative to a landfill-only scenario, and also relative to the current kerbside system.

3.5.1 Costs Included in Whole of Society Costs and Benefits

As explained in *Section 3.1: Introduction and Methodology*, analysis of the whole of society costs and benefits of different options provides a measure of the overall allocative efficiency of each option. Whole of society costs and benefits consider impacts in total and do not include transfer payments between different stakeholder groups. Transfer payments not considered in the whole of society analysis include the financial flows associated with the deposit itself, including unredeemed deposits, and the price paid by end users to buy the recycled materials that have been collected.

The financial costs included in the whole of society analysis of the current and alternative future waste and recycling systems are presented in *Table 3.5-1*. For a more detailed description of these costs see *Section 3.1: Introduction and Methodology*.

Cost Item	Cost / Benefit
C1	Financial cost of household garbage collection
C2	Financial cost of household kerbside recycling collection
C3	Financial cost of non-residential garbage collection
C4	Financial cost of non-residential recyclables collection
C5	Financial costs of landfill
C6	Financial costs associated with the infrastructure and labour for a deposit and refund system
C7	Other financial costs of a deposit and refund system
C8	Costs of litter collection and disposal

Table 3.5-1: Cost categories for the financial costs included in the whole of society cost-benefit analysis.

3.5.1.1 Other Costs and Benefits

The estimated value of the environmental costs and benefits associated with various options has also been calculated and is used for a comparison with the financial costs consistent with the need to incorporate externalities where they can be determined. These are described in detail in *Section 3.4* and summarised below. The environmental costs are a major component of the benefits of recovering used container materials, whether by the current kerbside system or a combined kerbside and CDL system.

The aggregate contribution of unpaid labour in the current kerbside recycling system, for rinsing, sorting, storing and moving using containers, is substantial, and has been estimated in *Section 3.4.* The CDL options will result in an increase in this contribution, and it has also been estimated when considering the implications of CDL for consumers. As a non-monetised cost, it has not been directly included in the whole of society cost-benefit analysis. The estimates of the value of this time have been incorporated as an additional consideration for sensitivity testing. The estimates are nearly $300m per year for the current kerbside system, with an additional $50m to $100m per year for the combined kerbside plus CDL scenario depending on the option.

The financial costs of litter reduction have been estimated, based on a survey of council staff in NSW, and included in the formal analysis. However, the visual amenity value of litter reduction, which may be far more significant than the direct financial costs, has not been included due to uncertainty in its measurement. However, as a guide to the potential magnitude of this factor, the voluntary attendance at the annual Clean-Up Day indicates that citizens are willing to volunteer time with an equivalent value of $10-20m[13] on at least one occasion each year to achieve a reduction in litter.

The value of recyclable materials was not included in the whole of society costs. It was not included because it is assumed that the price of recyclate will, under reasonable market conditions, be equal to the price of virgin material, i.e. assuming that the market price paid for recyclable material is a fair price. This assumption is likely to be highly conservative given the oligopolistic nature of the market. The sale value of recyclate is, however, included in the analysis of the impacts of costs and benefits from the perspective of councils.

A final important clarification with regard to the costs listed in *Table 3.4-1* is that the values used are costs, rather than charges. For example, the cost of landfill only includes the cost of those components that vary with weight or volume of material disposed to landfill, and not the price charged at the gate.

3.5.2 Annual Costs and Benefits Relative to Current System

Table 3.5-2 summarises the relative financial and environmental costs of two combined kerbside and CDL systems (Options 4a and 5b), compared to current kerbside (Option 3a). *Tables 3.5-3* and *3.5-4* give a breakdown of the financial and environmental costs respectively, relative to landfill only. The net financial costs of the current kerbside system, relative to landfill only is approximately $41 million per annum as shown in *Table 3.5-3.*

[13] Based on 240,000 people attending in NSW in 2001 for 3-6 hours plus voluntary organisation time, costed at a rate of $12 per hour.

Scenario label	Scenario short description	Net financial cost relative to current kerbside ($m/a)	Net environmental benefit relative to current kerbside ($m/a)
4a	CDL intermediate 5¢	32	109
5b	CDL POS 20¢	47	149

Table 3.5-2: Summary of financial and environmental costs and benefits relative to current kerbside.

These results show that the net environmental benefits of increased recovery and recycling of used container material exceed the net financial costs of establishing a combined kerbside-CDL system by a factor of 3. The breakdown of the financial costs for the various options is provided in *Table 3.5-3* below.

Option Label	Option short description	Change in collection cost for garbage ($m/a)	Change in collection for non-res. Garbage ($m/a)	Change in landfill costs ($m/a)	Change in litter management costs ($m/a)	Change in cost of kerbside recycling ($m/a)	Change in collection and sorting cost for non-res recycling ($m/a)	Direct CDL costs ($m/a)	Net financial costs ($m/a)
1a	Landfill Only	0	0	0	0	0	0	0	0
1b	Paper Kerbside	-44	0	-15	0	77	0	0	13
2a	Centres Only	-41	< -1	-34	0	0	3	4	-80
3a	Current Kerbside	-44	< -1	-48	0	148	2	0	41
3b	2003 IWRP	-45	< -1	-49	0	143	3	0	34
4a	CDL intermediate 5¢	-44	< -1	-56	-5	130	8	58	72
4b	CDL intermediate 10¢	-45	< -1	-57	-5	130	8	64	76
4c	CDL intermediate 20¢	-44	< -1	-58	-5	129	9	70	81
4d	CDL convenient 10¢	-44	< -1	-58	-5	129	10	94	107
4e	CDL convenient 20¢	-44	< -1	-59	-5	129	10	94	106
5a	CDL POS 10¢	-44	< -1	-59	-5	128	11	71	83
5b	CDL POS 20¢	-44	< -1	-59	-5	128	11	76	87

Table 3.5-3: Breakdown of financial costs and benefits relative to landfill only.

The components of the costs and benefits are described in the relevant parts of this section of the report.

The net environmental benefits for the four options which were the subject of the SLCA for this Review have been summarised in *Table 3.5-4* by impact category.

Economic value of relative environmental impact ($m p.a.)	Option 1a Landfill Only	Option 3a Current Kerbside	Option 4a CDL Intermediate 5¢	Option 5b CDL POS 20¢
Greenhouse gas production	2	< - 1	-3	-5
Mineral resource consumption	-22	-17	-28	-32
Oil and gas consumption	<1	< 1	-1	-1
Air toxic emissions	64	-34	-46	-57
Water toxic emissions	-87	-15	-93	-114
Solid waste production	6	3	2	1
Timber impact	0	-7	-7	-7
Total	-36	-60	-167	-207

Table 3.5-4: Breakdown of net environmental benefits by impact category.

Table 3.5-5 shows the breakdown of the costs by category for all options relative to current kerbside (Option 3a).

Option label	Option short description	Change in collection cost for garbage ($m/a)	Change in collection for non-res. Garbage ($m/a)	Change in landfill costs ($m/a)	Change in litter management costs ($m/a)	Change in cost of kerbside recycling ($m/a)	Change in collection and sorting cost for non-res recycling ($m/a)	Direct CDL costs ($m/a)	Net financial costs ($m/a)
3a	Current Kerbside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3b	2003 IWRP	-0.55	-0.07	-2.06	0.00	-5.12	1.54	0.00	-6.27
4a	CDL intermediate 5¢	0.12	-0.36	-10.73	-4.54	-17.51	6.59	58.12	31.69
4b	CDL intermediate 10¢	-0.93	-0.35	-11.14	-4.54	-18.32	6.54	63.89	35.13
4c	CDL intermediate 20¢	0.52	-0.42	-12.59	-4.54	-19.35	-7.76	69.66	41.04
4d	CDL convenient 10¢	0.55	-0.43	-13.13	-4.54	-18.18	8.04	93.87	66.18
4e	CDL convenient 20¢	0.69	-0.45	-13.94	-4.54	-19.35	8.42	94.27	65.10
5a	CDL POS 10¢	0.68	-0.46	-14.03	-4.54	-19.83	9.54	71.38	42.74
5b	CDL POS 20¢	0.81	-0.47	-14.57	-4.54	-20.07	9.78	75.62	46.55

Table 3.5-5: Breakdown of financial costs and benefits relative to the current kerbside system.

As indicated in *Table 3.5-5*, the reduction in landfill costs and reduction in kerbside recycling and sorting costs dominate the financial benefits of the combined kerbside-CDL options, while the direct costs of CDL dominates the financial costs relative to current kerbside.

The unit costs and benefits of the combined kerbside-CDL options (Options 4a-e & 5a-b) have been calculated. The unit cost of container recovery can be calculated by comparing the costs of CDL plus kerbside with container collection, with the collection of paper only at kerbside. The latter was calculated using the IWRCM model. The benefits have been calculated by the marginal increase in environmental benefit for the additional containers recovered by combined kerbside CDL options, relative to current kerbside (Option 3a).

Option label	Option short description	Unit net financial cost of recovering used containers (¢/container)	Unit net environmental benefit of recovering used containers (¢/container)	Unit net financial cost of recovering used containers ($/tonne)	Unit net economic benefit of recovering used containers ($/tonne)
3a	Current Kerbside	1.6		193	
4a	CDL intermediate 5¢	2.0	9.2	214	814
4b	CDL intermediate 10¢	2.1		222	
4c	CDL intermediate 20¢	2.1		229	
4d	CDL convenient 10¢	2.9		305	
4e	CDL convenient 20¢	2.8		292	
5a	CDL POS 10¢	2.1		221	
5b	CDL POS 20¢	2.1	8.4	228	817

Table 3.5-6: Unit net financial costs and unit net environmental benefits associated with recovery and recycling of containers by a range of options, including current kerbside and combined kerbside and CDL options.

These results show that the net environmental benefits of combined kerbside and CDL options, when expressed on a per container, or per ton of used container material basis, are considerably higher than the costs of container recovery by any means. It also means that the value of the net environmental externality associated with the disposal of a container to landfill is approximately 8-9¢. That is, from the point of view of society as a whole, it is worth spending at least 8-9¢ to keep one container out of landfill. These results also show that the net cost of doing so using a combined CDL and kerbside strategy would be between 2 and 3 ¢/container.

3.5.3 Sensitivity Testing

Sensitivity testing has been undertaken on a number of key input parameters to determine whether the overall result would be significantly different within reasonable variations in these input values.

An appropriate approach to sensitivity testing, described well in EPA (2000:28), is to:

- focus on key variables;
- present the results clearly;
- identify switch points;
- assess the need for more detailed analysis.

The key variables in terms of assessing the net economic benefit of CDL plus kerbside options, relative to the current situation, are:

- the cost of establishing depots and collection centres and particularly the cost of staff to handle containers;
- the handling time per container for the point of sale option;

- the unit environmental cost of unrecovered containers, equivalent to the environmental cost of virgin material production;
- the reduction in the cost of kerbside recycling and sorting;
- landfill costs and benefits;
- the net financial and environmental cost of transport for redeeming containers.

In terms of their magnitude or relative uncertainty, the costs and benefits associated with the following components are less significant in terms of the impact on the overall net benefit:

- litter collection and management costs and benefits;
- reduction in garbage collection costs;
- miscellaneous implementation costs associated with a CDL system, such as administration, labelling and education.

Table 3.5-7 shows the results of sensitivity testing using the key variables listed above. The threshold values for a reversal of the net benefit associated with the CDL plus kerbside option is shown for these key variables. A composite result is also provided in which all variables are altered by a reduced amount to determine the 'switch point'.

Cost Category	Sensitivity Test	Result	Notes
Depot costs	Increase cost of depot establishment and operation.	Switch point requires an increase of 2.9 times estimated values, i.e. trebling of labour and other running costs.	The estimated costs of depots are already higher than those estimated by representatives of the industry and those used in a key industry submission (BIEC 2000).
Time for handling container in POS Option	Increase the estimated handling time per container for point of sale return transaction.	Switch point requires a handling time of 13 seconds per container.	The literature shows handling times decreasing to 5s in 1986 with gains to less than 3 expected due to technology and store layout changes.
Net environmental benefits	Decrease environmental benefits for each option proportionally.	Switch point requires the environmental benefits to be reduced to 30% of estimated values.	The LCA impact values are more conservative than the Nolan- ITU/SKM (2001) results, and the Nolan ITU environmental values are stated as being conservative.
Recycling and sort cost reduction	Assume the reduction is zero.	Does not reach switch point.	The IWRCM model results suggest that there will be significant savings due to the low weight to volume ratio of containers.
Landfill cost reduction	Assume the reduction is zero.	Does not reach switch point.	Results are already conservative, since weight rather than volume has been used, and a weighted average of metro and rural costs reduces this value to approximately $60/tonne.
Litter cost reduction	Assume the reduction is zero	Does not reach switch point	Results are already conservative.
All cost reductions	Assume the reduction of all three above is zero.	Does not reach switch point.	The net environmental benefits outweigh the direct costs of a combined CDL and kerbside option even if the financial benefits are neglected.

Table 3.5-7: Sensitivity testing for switch points at which the net environmental benefits outweigh the net financial costs of the various options. These have been tested on Option 4a and 5b.

3.6 Impacts on Stakeholders – Distributional Impacts

Impacts of the introduction of container deposit legislation (CDL) on various stakeholder groups have been examined both quantitatively and qualitatively. Australian and international literature has been reviewed, and stakeholder costs and benefits have been included in the cost-benefit model. Stakeholders were grouped as:

- suppliers and manufacturers of products that may attract a deposit (Suppliers/Manufacturers);
- retailers of products that may attract a deposit (Retailers);
- local government;
- collection centre operators;
- consumers of potentially deposit bearing products (consumers);
- charities and NGO's (Charities); and

- low- income groups.

Distributional impacts on employment, in terms of location and type of employment lost or created by the introduction of container deposit legislation (CDL) have also been considered in this section.

An important stakeholder group in respect to CDL that has not been included in the analysis of distributional impacts consists of environmental organisations. This group has not been considered here because the distributional impacts considered are only financial and social (social not including environmental). In respect to financial and social impacts, environment groups are not considered major stakeholders in relation to CDL. Environmental impacts have been discussed previously in *Section 3.4*.

3.6.1 Kerbside Recycling and Local Government

This section provides background information, analysis, and conclusions regarding one of the most significant and contested areas of the Independent Review, that is, the potential impact of the implementation of container deposit legislation on the system of kerbside recycling that is in place in NSW.

Section 2: 2.7 describes and analyses the historical development of kerbside recycling in NSW and other states, and the results in terms of yield and cost.

Determining the impact of CDL on kerbside is made difficult by the fact that most places in the world where CDL has been introduced have done so at a time prior to the introduction or expansion of kerbside recycling. Therefore empirical results are not available for the situation which would apply in the case of NSW where, if CDL were introduced, it would be following the establishment of one of Australia's oldest and best performing kerbside recycling systems.

The costs and benefits to local councils from the implementation of CDL arise from a number of competing factors. These include:

- a reduction in collection costs for kerbside recycling due to a reduction in used container material collected;
- a reduction in sorting costs at material recovery facilities due to a reduction in the commingled used container material collected;
- a reduction in the garbage collection costs due to the reduced amount of container material collected;
- a reduction in waste disposal charges due to reduced waste being disposed to landfill;
- a reduction in the value of recyclable materials collected at kerbside;
- the deposit value associated with deposit bearing containers placed in kerbside recycling; and
- a reduction in litter collection costs.

The cost-benefit analysis modelling has resulted in estimates of all these costs for the various options. The methodology that has been used for the various costs and benefits has been described in *Section 3.1*, which described the whole of system costs.

3.6.1.1 Results

The results for the modelling of the costs and benefits of a CDL and kerbside system from the perspective of councils have been presented in two ways. Firstly, the additional costs and benefits that the various options, including the current kerbside system, will have relative to a landfill-only scenario. This approach mirrors that used in the *Independent Assessment of Kerbside Recycling in Australia* (Nolan-

ITU/SKM, 2001). Secondly, the results have been shown as an increase or decrease in costs relative to the current kerbside system.

Table 3.6-1 shows the changes in the costs for these various components relative to the current kerbside collection costs, for the various options. Options 4a-e and 5a-b are the CDL options, and option 3b is increased kerbside recovery consistent with meeting the IWRP targets in 2003. These relative costs are also shown in *Figure 3.6-1*.

Option label	Change in collection cost for garbage ($m/a)	Change in disposal charge for garbage ($m/a)	Change in collection and sorting cost for kerbside collection ($m/a)	Change in Litter Management Costs ($m/a)	Change in materials value for kerbside collection ($m/a)	Value of deposits in kerbside collection ($m/a)	Net cost of Option ($m/a)
1a	44.45	5.65	-148.01	0.00	-20.21	0.00	-77.69
1b	0.94	5.65	-71.03	0.00	-15.05	0.00	-49.39
2a	2.97	4.33	-148.01	0.00	-20.21	0.00	-120.49
3a	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3b	-0.04	0.48	-5.12	0.00	1.01	0.00	-5.69
4a	0.12	-0.27	-17.51	-4.54	-9.06	25.17	-38.30
4b	-0.93	-0.62	-18.32	-4.54	-10.76	35.87	-49.53
4c	0.52	-0.69	-19.35	-4.54	-12.86	36.25	-47.46
4d	0.55	-0.73	-18.18	-4.54	-10.81	34.80	-46.90
4e	0.69	-0.88	-19.35	-4.54	-12.86	36.11	-47.33
5a	0.68	-0.87	-19.83	-4.54	-13.74	10.88	-21.70
5b	0.81	-1.01	-20.07	-4.54	-14.18	14.50	-25.13

Table 3.6-1 The relative costs and benefits of various modelled options by cost category, from the perspective of councils in NSW, compared to current kerbside recycling

In summary, these results indicate that a CDL system, operating in conjunction with kerbside recycling (Options 4a-e and 5a-b) would provide net financial benefits to councils equivalent to between $22 million per annum to $50 million per annum, or about $8.50 to $20.00 per household per year reduction in rates, depending on the option. The breakdown is also shown graphically in *Figure 3.6-1* below.

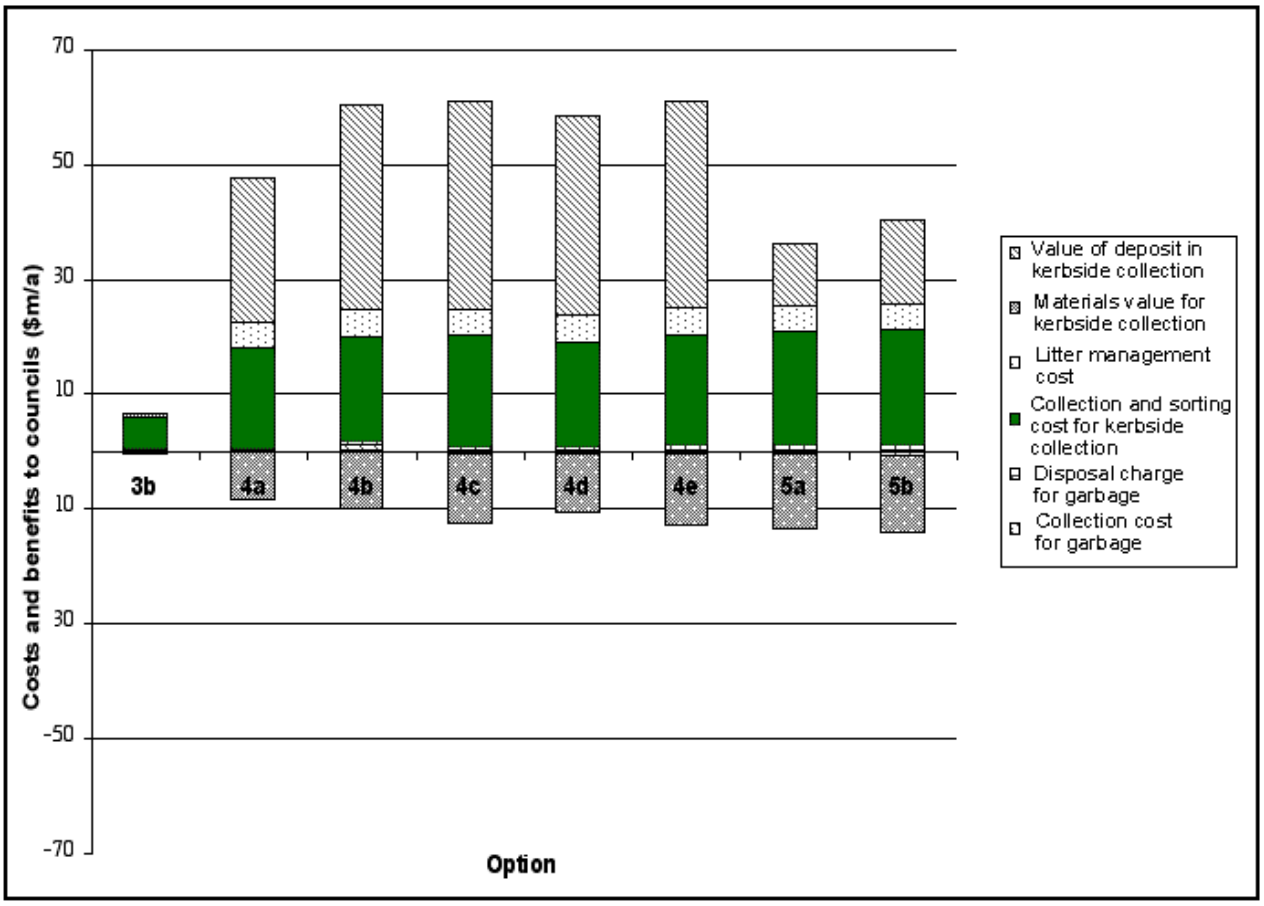


Figure 3.6-1: The relative costs and benefits of various modelled options by cost category, from the perspective of councils in NSW, compared to current kerbside recycling.

The major concern regarding the impact of CDL on kerbside is usually expressed as the reduction in material value, that is, the price fetched by the recyclable container material that is diverted from the kerbside stream to depots, collection centres or point of sale. The maximum value of diverted materials is $14m/a for Option 5b. The reduction in the cost of kerbside recycling, landfill charges and litter management more than outweigh this cost, and then the value of deposit bearing containers remaining in landfill adds to the benefits.

Note that the landfill charge used in the model is $42/tonne, which is a weighted average of the Sydney charge (currently $57/tonne) and a rural value assumed to be $20/tonne. This is considered a conservative value. The value of deposits remaining in kerbside has been based on the percentage of used containers disposed to kerbside in South Australia and international examples. These results may be conservative, due to the relatively higher incomes in Sydney particularly, and the long experience with kerbside recycling, although it is likely that organised pilfering from kerbside is likely to occur in the inner city where crate systems predominate. Pilfering is far less likely where mobile garbage bins are used.

Option Label	Short description	Net cost of option ($m/a)	Unit cost of option ($/hh/a)	Unit cost of option (c/container)
1a	Garbage Only	-77.69	-30.63	NA
1b	Paper Kerbside	-49.39	-19.47	NA
2a	Centres Only	-120.49	-47.51	NA
3a	Current kerbside	0.00	0.00	0.00
3b	2003 IWRP	-5.69	-2.24	-0.43
4a	CDL intermediate 5¢	-38.30	-15.1	-7.61
4b	CDL intermediate 10¢	-49.53	-19.53	-13.81
4c	CDL intermediate 20¢	-47.46	-18.71	-26.18
4d	CDL convenient 10¢	-46.90	-18.49	-13.48
4e	CDL convenient 20¢	-47.33	-18.66	-26.21
5a	CDL POS 10¢	-21.70	-8.55	-19.95
5b	CDL POS 20¢	-25.13	-9.91	-34.66

Table 3.6-2: A summary of the relative costs and benefits from the perspective of councils in NSW of various modelled options, compared to current kerbside recycling.

Comparing the overall relative costs and benefits of various options relative to landfill only (Option 1a) shows that all options have a lower cost to councils than kerbside recycling. These results are shown in *Figure 3.6-2* and *Table 3.6-3*.

Two issues are worth noting here;

1. The costs and benefits described in this section will depend on the contractual arrangements that a council has with the kerbside contractor and MRF operator. Such contracts typically have a 5-7 year time frame, and so there would be a delay in a council accruing the modelled benefits, depending on the timing of the introduction of CDL and of the contract conditions and timing.

2. This cost benefit analysis draws a boundary on modelling the distributional impacts at councils, consumers, manufacturers and retailers. The reduction in container material collected at kerbside will reduce the costs of this service to councils, whether they use day labour (in which case this will occur immediately) or whether they use contractors (in which case there will be a delay until the contracts are renewed or renegotiated). This analysis does not consider the impact on the economics of individual non-council recycling contractors or MRF operators, although it does estimate employment impacts. The costs and benefits to these parties will depend on a range of factors including their relative involvement in handling and processing deposit-bearing container material.

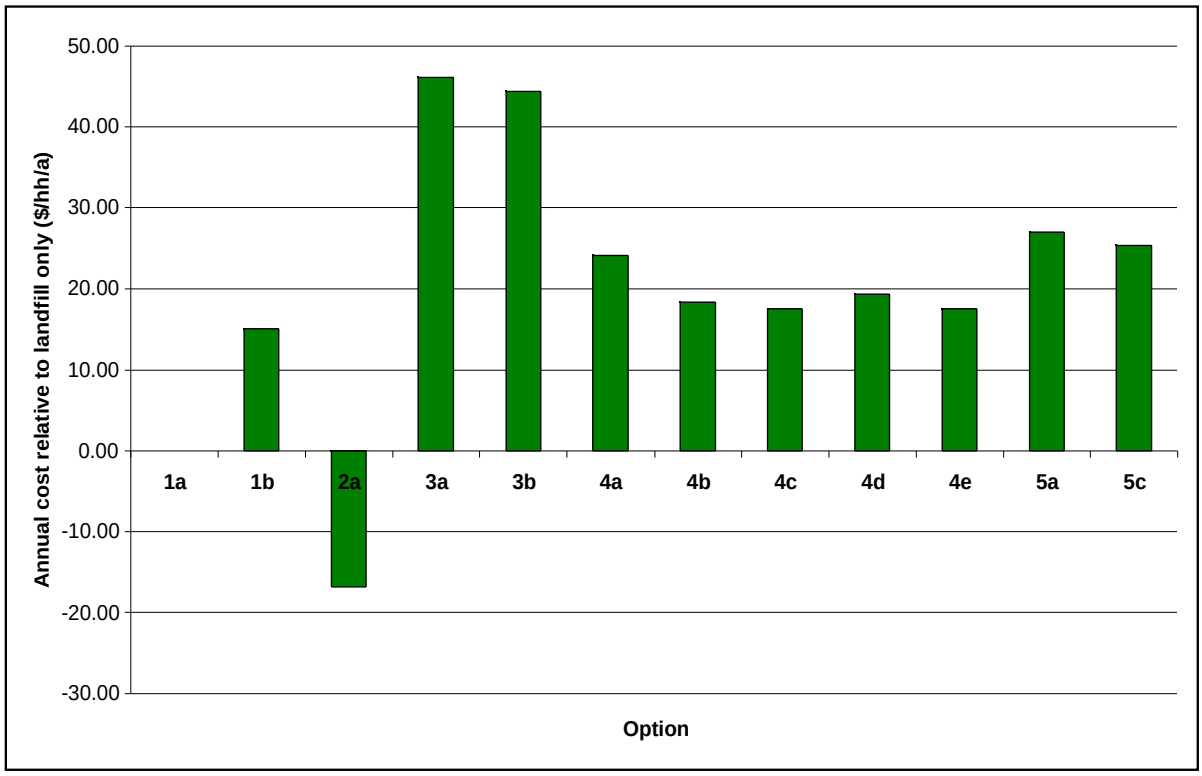


Figure 3.6-2: Overall cost of various options from the perspective of councils in NSW, relative to a landfill only option.

Option label	Short description	Net cost of option ($m/a)	Unit cost of option ($/hh/a)
1a	Garbage Only	0.00	0.00
1b	Paper Kerbside	38.63	15.23
2a	Centres Only	-42.80	-16.87
3a	Current Kerbside	118.12	46.57
3b	2003 IWRP	114.45	45.12
4a	CDL intermediate 5¢	61.70	24.32
4b	CDL intermediate 10¢	47.07	18.56
4c	CDL intermediate 20¢	44.94	17.72
4d	CDL convenient 10¢	49.60	19.56
4e	CDL convenient 20¢	45.07	17.77
5a	CDL POS 10¢	68.95	27.18
5b	CDL POS 20¢	64.63	25.48

Table 3.6-3: Overall cost of various options from the perspective of councils in NSW, relative to a landfill only option.

3.6.1.2 Impact of CDL on Newsprint Recovery

New South Wales has a very high recovery rate for old newsprint, at approximately 75% in 2000. The frequency and convenience of kerbside collection is a major factor in this recovery rate, and therefore it would be important to ensure that CDL did not compromise this success. The modelling and analysis that has been undertaken in this Review indicates that the introduction of CDL will ultimately improve the financial performance of kerbside recycling by reducing its costs, through reduced costs of kerbside collection and through the value of unredeemed deposits in the material collected at kerbside. There would be no financial justification for any council to reduce the frequency and convenience of kerbside collection of paper as a result of the implementation of CDL.

3.6.1.3 South Australian Kerbside Recycling

There has been considerable debate regarding the performance of kerbside recycling in South Australia and the impact of CDL. For example, it has been claimed that:

> *"…deposits not only divert material away from kerbside recycling, but they change the behaviour of individuals to all recycling. It is possible individuals place a premium on recycling materials which have a deposit. They may switch their recycling behaviour towards refund containers. It is also possible some may associate recyclability of an item with whether it has a deposit. Hence glass jars and newspapers which do not have deposits may be disposed of via the waste stream"* (Warren, 1995 in BIEC, 2000b).

Much of the data relating to the performance of recycling in South Australia has failed to adequately account for all the material being recycled through depots, in addition to that recovered from kerbside recycling. *Figure 3.6-3* shows results for recycling from both sources, compared to the amount of garbage, relative to NSW performance. For all materials except paper and cardboard, South Australia recycles a greater proportion than NSW. Paper yield is increasing significantly in recent years as council recycling systems improve. The hypothesis that the existence of CDL in South Australia is the direct cause of the reduced paper recovery rate, rather than differences in level of service, history of kerbside recycling and market factors is not supported by the fact of significantly increased paper yields in South Australia in recent years.

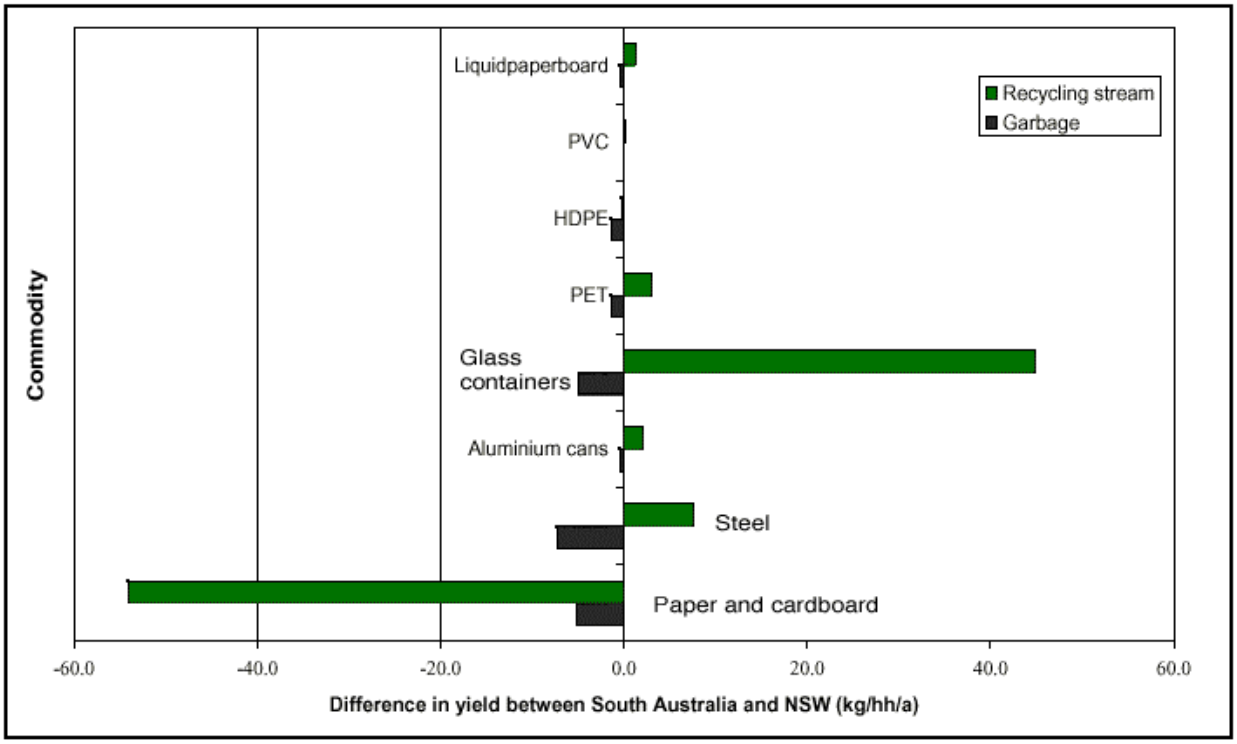


Figure 3.6-3: Difference in recyclable yield between South Australian and NSW households, as well as the weight of recyclable commodities disposed of to landfill. (Recyclers of South Australia 1999, Recycle 2000 (1998), BIEC (1997d), http://recyclesa.com.au/tonnages.htm [accessed 12/5/01]

It is difficult to sustain the notion that the introduction of CDL in NSW would reduce the level of paper recycling in circumstances where the frequency and convenience of recycling services for paper were maintained.. In the CDL Televote Survey, participants were asked whether they believed their recycling behaviour would change in relation to non-deposit materials if CDL were introduced. 97 percent of respondents stated that it would not.

3.6.2 Suppliers/Manufacturers

This section describes the potential impacts of a container deposit and refund system on manufacturers and distributors of products to which the system applies, usually beverage fillers and suppliers.

In most such systems, beverage fillers pay handling fees, in the form of a unit cost per container, to either retailers or depot operators to run the system. These handling fees are either included in the price of the product or reduce the profit of the firm involved. If the price of products is increased by the amount of the handling fee, there may also be a decrease in demand for the product, the magnitude of which is dependent on the price elasticity of demand. This will impact on the supplier in reduced sales revenue, and also to the retailer through reduced margins. This section reports on estimates of the handling fees and reduced sales, and the impact on suppliers.

The handling fees that would be paid can be estimated from the total cost of establishing and operating the collection system, as described in *Section 4.6*, plus a suitable profit margin. The average profit margin for the waste and recycling industry is approximately ten percent, therefore the per-container handling fees would be likely to be as shown in *Table 3.6-5*, assuming that retailers would also claim a ten percent profit margin on the handling costs of used containers. These results are likely to be overestimates due to:

- the inclusion of a range of costs that may be borne by parties other than the suppliers, including land costs for depots and supermarket convenience zones, some of which may be borne or shared by local councils or retailers respectively;
- the possibility that suppliers may absorb some of these costs in the form of reduced profits, rather than increased prices;
- the fact that this cost-benefit analysis is limited to estimates of the compliance costs, rather than a partial or general equilibrium which will result in an over-estimate of costs since 'producers and consumers' adaptation to the system to reduce costs has not been included (US EPA, 2000).

Option label	Option short description	Estimated handling fee (¢/container)
4a	Depots intermediate 5¢	1.6
4b	Depots intermediate 10¢	1.6
4c	Depots intermediate 20¢	1.5
4d	Convenience centres 10¢	2.9
4e	Convenience centres 20¢	2.8
5a	Point of sale 10¢	2.2
5b	Point of sale 20¢	2.3

Table 3.6-5: Approximate per container handling fees for various CDL options.

3.6.2.1 Reduced Sales of Products

If these handling fees are passed through in their entirety to consumers in the price of products, there may be a response in terms of decreased demand for these products. This depends on the price elasticity of demand for these products.

The literature on the price elasticity of demand for the products likely to be covered by a deposit and refund system is very limited. There have been some studies of the price elasticity of demand for alcoholic beverages due to interest in the impact of excise. These results suggest that the demand for most alcoholic beverages is inelastic within reasonable limits, in other words, that there is an insignificant variation in demand for the likely increases in price. The report of the BRRU (1989) refers to, and uses, a demand elasticity[14] of -0.7 for soft drink and -0.5 for beer. In this analysis, the value –0.5 has been used for the purpose of modelling the impact. It is expected that these results will give significant overestimates of the reduction in sales, due to the following:

- this value of demand elasticity for alcoholic beverages is in conflict with, and significantly higher than a number of other results in the literature;

[14] The price elasticity of demand is the number ε such that $\varepsilon = \frac{\Delta d}{d} \Big/ \frac{\Delta p}{p}$, where Δd is the change in demand for the product, from a current demand d, and Δp is the change in price for the product, from a current price p. Hence, if the elasticity of demand is -0.5, a 1% increase in price will result in a 0.5% decrease in demand.

- if the deposit and refund system is applied to all beverages, not just beer and soft drink, the likely substitutable products would also be subject to an increase;
- other products which are significant proportions of the beverage market that have been included in this analysis, such as milk and milk products, would be expected to have a lower price elasticity of demand than (for example) soft drinks;
- other factors are likely to dominate demand for such products, including in the case of soft drink, the weather, marketing and brand image.

Table 3.6-6 shows the decrease in revenue for beverage fillers and distributors if the price elasticity in demand for the whole range of beverages considered was -0.5, and the average price of a product was approximately $2.

Option label	Option short description	Cost to manufacturers if costs absorbed ($m/a)	Cost to manufacturers if costs passed on to consumers and sales reduce ($m/a)	Approximate percentage of current revenue
4a	Depots intermediate 5¢	47	29	-0.37%
4b	Depots intermediate 10¢	47	29	-0.36%
4c	Depots intermediate 20¢	47	27	-0.33%
4d	Convenience centres 10¢	94	52	-0.65%
4e	Convenience centres 20¢	94	50	-0.63%
5a	Point of sale 10¢	75	40	-0.50%
5c	Point of sale 20¢	80	42	-0.52%

Table 3.6-6: Approximate costs to manufacturers for various CDL scenarios.

Note that this assumes a price elasticity of demand of -0.5 across all relevant products, and that all costs are passed on to consumers.

The percentage reduction in revenue is based on an estimate of total revenues for the beverage industry of $8 billion per year for the NSW market. It also assumes that there would be no cost sharing for the direct costs of CDL with stakeholders upstream or downstream of the beverage fillers and distributors. That is, if retailers or the packaging industry itself shared the cost, these costs would be lower still. Similarly, as noted above, if local councils supported the establishment of depots by providing land this would reduce costs significantly. These results compare with the current expenditure on kerbside recycling by councils in NSW of approximately $100m per annum, and the commitment by the packaging supply chain to provide $17.45m Australia-wide over three years ($2 million per annum in NSW on a *pro-rata* basis) towards kerbside recycling under the terms of the National Packaging Covenant.

Figure 3.6-5 shows the change in the sharing of costs between manufacturers and local government. This highlights the extent to which CDL would involve an increased sharing of the responsibility for used container material between these two sectors. The cost to local government shown here is the net cost of container collection compared to paper collection at kerbside only.

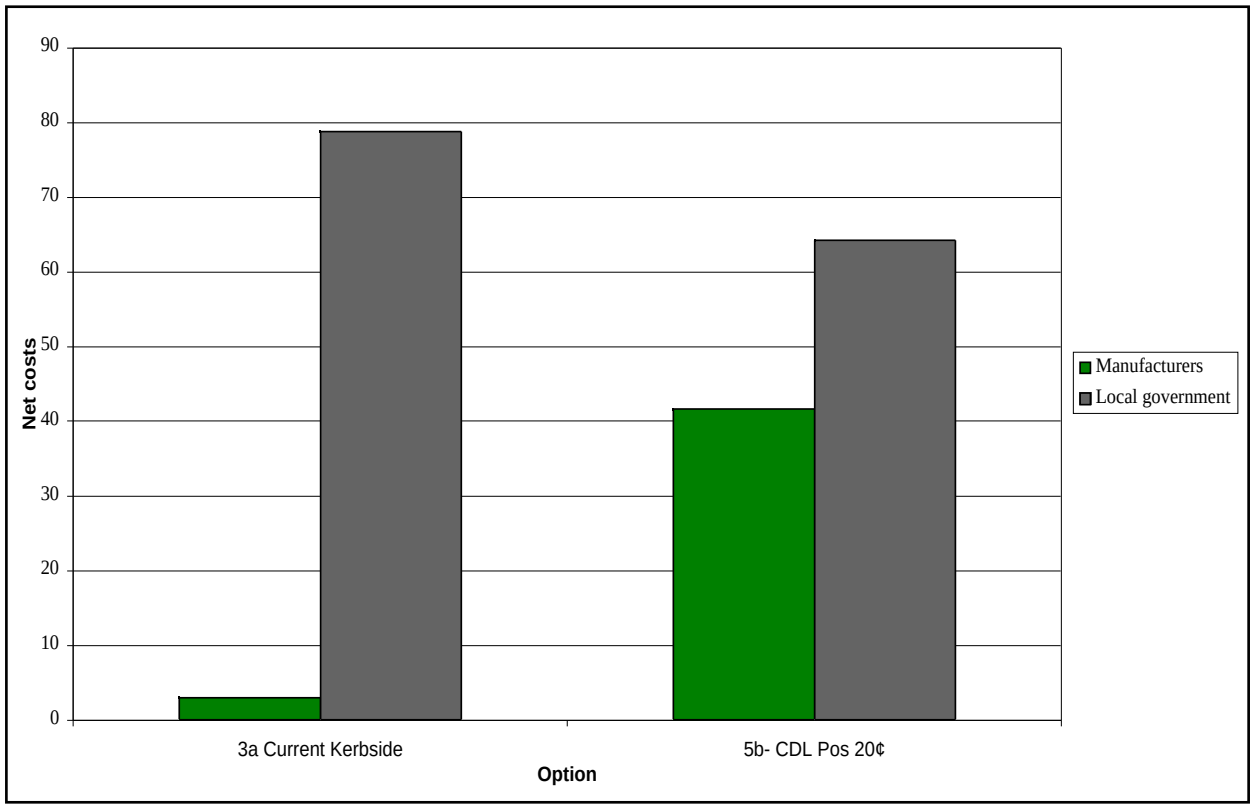


Figure 3.6-5: The change in product responsibility from local government and ratepayers to manufacturers and consumers based on the current system of recovery, compared to Option 5b.

The benefits that accrue to suppliers and manufacturers include those that apply to the rest of the community in terms of environmental and litter benefits. As the investment community takes on the principles of socially responsible investment and corporations see themselves as stakeholder organizations they will pursue further opportunities to reduce the externality costs of aspects of their business. In that case, the reduction in externalities that is described in *Section 3.4* and for which estimates are provided, will prove valuable for such corporations. Some of these reductions in externality costs may be realised as financial benefits if they are incorporated in markets. For example, the reduction in greenhouse gas emissions that would result from the introduction of CDL, approximately 182,000 tonnes per annum, would be worth $1.8 million per annum if tradable credits were introduced at a value of $10/tonne.

3.6.3 Retailers

Retailers are a highly diverse stakeholder group that includes:

- food outlets;
- supermarkets;
- hotels;
- bottle shops;
- confectionery and soft drink stores; and
- grocers (& local corner stores).

The following pie graph indicates the breakdown of retail outlet categories in NSW.

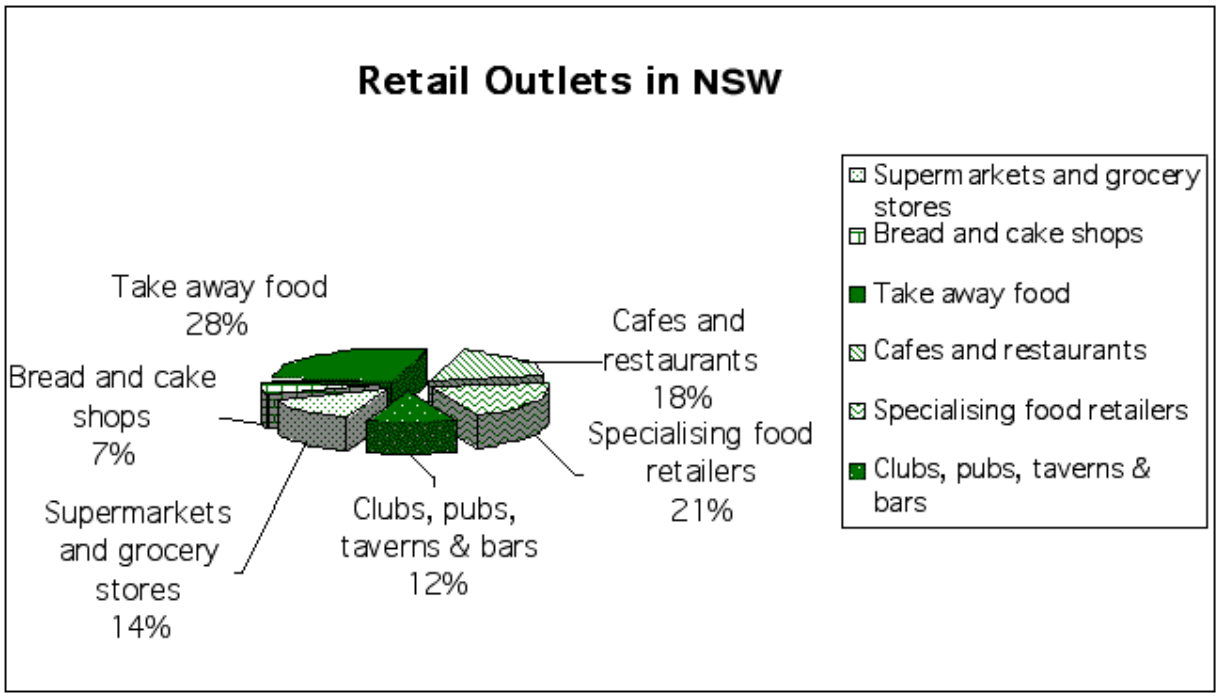


Figure 3.6-6: Proportion of retail outlet categories in NSW.

Source: AC Neilsen, (2000) ***The Grocery Report,*** Retail World:Sydney

Trends over the past few decades indicate a decrease in grocery stores and a subsequent increase in centralisation of retail outlets, namely towards supermarket chain outlets. This trend is indicated in *Figure 3.6-7*.

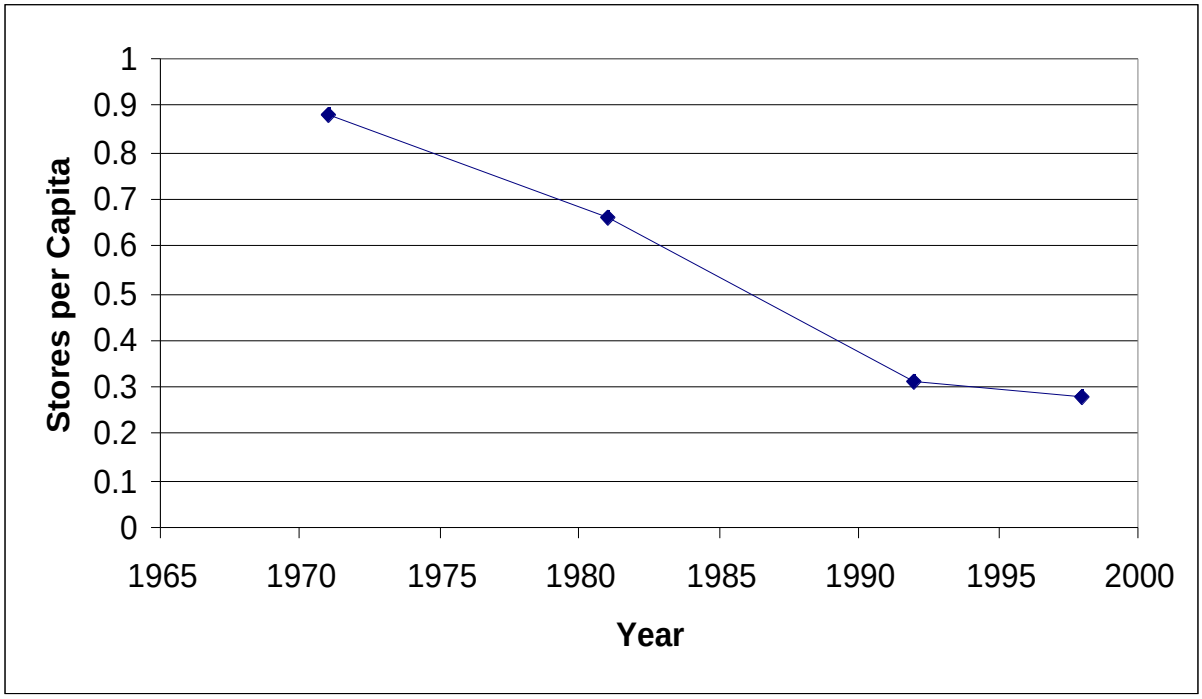


Figure 3.6-7: Trends in number of grocery stores in Australia.

Currently, 81 percent of the market share in retail outlets is held by Coles, Woolworths, and Franklins (AC Nielsen, 2000,p9). The diversity of retailers as a group and the implications of variations in size and profitability are discussed later in this section.

3.6.3.1 Retailers and the CDL System

Retailers may experience various costs and benefits if CDL is introduced in NSW. The impacts will vary under the different scenarios, namely, traditional depot CDL system, Zones of Convenience, or POS system. It is anticipated that the greatest impact will be felt under the 'return to retailer' (POS) system whereby retailers are required to collect, handle and store used beverage containers and issue the appropriate level of refund to the consumer.

3.6.3.2 International Experience

Other jurisdictions that incorporate a point of sale system as part of their deposit-refund systems include British Columbia, Michigan, New York, California, Israel and most northern European countries such as Denmark, Sweden and Norway. Most of the European countries with a deposit-refund system collect proportionally more of their used beverage containers via return to retailer (POS) than return to depots. In turn, most of the retailers participating in the POS system utilise RVMs. Some deposit states in the US use RVMs (such as Michigan, New York and California) while other states rely on manual labour for the collection, storage and handling of used beverage containers.

3.6.3.3 Traditional Depot Scenario

Under the traditional depot system, retailers would be impacted upon to a minimal extent, if at all. Potential loss of sales is one financial impact retailers may feel under a traditional depot scenario.

3.6.3.4 Zones of Convenience Scenario

The zones of convenience model in Scenario 4, is based on the California situation, in which retail outlets over a certain turnover level must establish local collection centres, or be required to establish point of sale return. All retailers within a certain radius of a collection centre would be exempt from participating in a return to retailer scheme. It is likely that those retail outlets exempt from the responsibility of functioning under a POS would bear minimal costs, similar to those retailers under the Traditional Depot Scenario discussed above. Only those retailers with no other collection centre in the same zone must function as a collection and redemption point for consumers. It is likely that participating retail outlets will be supermarkets and other large outlets.

3.6.3.5 POS Scenario

Under a POS system, all retail outlets must function as a collection centre and refund deposits. The retailer has two choices regarding these responsibilities: either undertake them manually, or invest in reverse vending machine (RVM) which automatically delivers a refund when a deposit bearing container is fed into the machine (See *Appendix J* for further details on RVM's). The machine can also store the containers until emptying is required. The economic viability of manual labour versus the use of RVMs will depend on a number of factors, including the profit margins of the retail outlet, the available floor space and storage space, and the anticipated number of used beverage containers to be returned.

3.6.3.6 Results of Cost-Benefit Analysis

It is important to note that the costs incurred by the retailer if a CDL system is introduced would most likely be compensated through the handling fee or passed on to the consumer. Hence it is anticipated that the net financial impact on retailers will be zero, except for a reduction in profit margin on product sales should there be a reduction in demand. The marginal costs and benefits included in the CBA are discussed here.

Loss of Sales

It is anticipated that the loss of profit to retailers due to reduced sales may be in the order of $2.3 to $5.0m per annum across NSW, assuming that this is not passed on by retailers to consumers, and that the demand elasticity for all beverages is -0.5. A ten percent retailer profit margin has been assumed.

Cost of Convenience Centres

For Options 4d and 4e (collection centres established at zones of convenience) the total cost of implementing such centres as $84 million per annum. This cost includes a significant proportion of land cost based on the value of car parking spaces (assumed to be at or near supermarket car parks), buildings, bins, baling equipment, security fencing, and labour costs. Depending on the method of implementation, retailers could be responsible for establishing these collection centres, as is the case in California, or required to implement point of sale return. On the analysis undertaken for this Review, there would be a lower annualised cost, and a much lower capital cost, for a retailer to establish a point of sale return system.

Cost of POS System

For scenario 5 (POS 'return to retailer') the total cost of implementing such a system $53-$59 million per annum. This cost includes collection, handling and storage costs based on increased labour costs, the cost of storage space, bins or other receptacles, cleaning costs, and pest control.

Handling Fees

The results of the CBA indicate retailers would require a handling fee and/or share of unredeemed deposits equivalent to 1.7¢ to 2.9¢/container redeemed in order to be cost neutral. This is in line with the actual handling fees paid in operating CDL systems around the world (see *Section 2.1:CDL – International Experience*). Handling fees are discussed further in *Section 4.6 Handling Fees*.

Option label	Option short description	Cost per container with 10% profit markup (¢/container)	Cost to retailer (level of handling fee) (¢/container)
4a	CDL intermediate 5¢	1.4	-
4b	CDL intermediate 10¢	1.4	-
4c	CDL intermediate 20¢	1.3	-
4d	CDL convenient 10¢	2.9	2.9
4e	CDL convenient 20¢	2.8	2.8
5a	CDL POS 10¢	2.2	1.7
5b	CDL POS 20¢	2.3	1.9

Table 3.6-7: Appropriate handling fees for modelled options.

Pest Control

The need for additional cleaning and pest control has been included in the costs to retailers. The estimate of the cost of additional cleaning and pest control is based on a typical cost for retail premises on a square metre basis.

Storage Space

According to NAGRA, storage space is very costly at $1,500 per square metre since it must also include actual container space plus separation from other food items. Retailers are designed to sell food not take back containers.

In the CBA modelling the assumed value of leased space was determined from a range of current retail outlets in Sydney and regional Australia, with a value of approximately $260/m2/a in Sydney and $170/m2/a in the rural areas. This is expected to be a low value, as recyclables would be stored alongside garbage in most retail outlets.

3.6.3.7 Issues Not Included in CBA

While some costs and benefits to retailers that CDL would bring about are quantifiable, others are qualitative and are thus not included in the CBA. It should be noted that the exclusion of several qualitative issues from the CBA does not necessarily indicate they are less important, rather that they are more difficult to associate with an economic value. Such issues are discussed in this section.

Health & Hygiene Issues

If a POS system is implemented there are several health and hygiene issues that should be addressed in relation to the collection, handling, and storage of used beverage containers where food is being sold. This may be particularly relevant when stores are not set up to effectively separate the used containers. The storage of used beverage containers may potentially attract more vermin (W.D. Scott & Company, 1983). The cost of pest control has been included in the CBA (see *Section 3.6.3.6 Pest Control* above).

The Australian Retailers Association (ARA) has expressed concern that the handling and storage of used (and therefore contaminated) beverage containers will increase the risk of injury to staff and customers, especially through the handling of glass. The submission by the ARA also addresses public health concerns such as cross contamination via the handling of used beverage containers prior to food handling, or the storage of used beverage containers attracting vermin.

The storage and handling of used beverage containers in a POS system would require retailers to comply with the standards of the Australian and New Zealand Food Authority. Division 2 of the Standard (*Standard 3.2.3 Food Premises and Equipment: Storage of garbage and recyclable matter*) requires that:

Food premises must have facilities for the storage of garbage and recyclable matter that:

- adequately contain the volume and type of garbage and recyclable matter on the food premises;
- enclose the garbage or recyclable matter, if this is necessary to keep pests and animals away from it; and
- are designed and constructed so that they may be easily and effectively cleaned.

Administration

Other issues raised by NARGA include administrative responsibilities for retailers which would result from the introduction of a POS CDL system. GST is evidence of the accounting burden on smaller businesses and NARGA believe administration of CDL would only add to this burden.

Refillables

If the use of refillables were to increase under a CDL system, it is likely that retailers would be the stakeholder group feeling the greatest financial impact (Golding, 1999). However it is not anticipated that the costs associated with sale and return of refillables would be any greater than for single use containers.

Payment Lag

The lag time in payment of handling fees is a further cost to retailers. Under the proposed CDL system, upon collection the distributors would pay retailers the handling fee. This means that there is a lag time between collection when retailers are not reimbursed for their processing and handling. This will be more critical or problematic for retailers with lower profit margins.

3.6.3.8 Discussion and Retailer Attitudes

It is evident from CDL submissions by the retail industry that these peak bodies are opposed to the introduction of a CDL system in NSW. The ARA submission states that "*CDL is likely to have unknown and adverse impacts on the retail industry, and therefore its introduction would be opposed*". However, some existing literature indicates there are some benefits to retailers under a CDL system. This section discusses further the attitudes of retailers towards CDL, including both perceived costs and benefits.

Low-income Collectors

An impact on retailers dealing with a more contentious issue is redeeming deposits from non-customers, such as the homeless under a mandatory point of sale redemption/deposit system. Some international experience has shown conflicts may arise from homeless or other non-customers redeeming containers in bulk, which becomes more time consuming for the retailer if manual sorting and handling is required.

In addition to the increased labour requirement which may detract from labour devoted to sales, retailers have often felt (rightly or wrongly) that the presence of homeless makes their customers feel uncomfortable. Thus, retailers may discriminate against non-customer bulk redeemers such as homeless because they do not want to deal with them (Morris, 1996).

Differential Effects on Large and Small Retailers

In its submission to the CDL Review the peak industry association for small grocery retailers in Australia (National Association of Retail Grocers of Australia - NARGA) claims that *"CDL has a disproportionate impact on small and medium businesses"*. The reasons for this claim are not stated, but the CDL Review assumes that it is related to the difference in profit margins between small and large retailers.

Small grocers operate with very low profit margins, as low as three percent, currently in NSW and may not have the capacity to absorb the implementation and ongoing costs arising from CDL. Segal (1981) notes that food retailing is characterised by high turnover and very low margins (particularly supermarkets), where as small grocers often 'operate at very low turnovers and are only marginally viable'. Morris (1996) notes that the profit margins that different retailers hold on beverages is likely to influence willingness to process and handle used beverage containers under a mandatory point of sale (POS) CDL system. Thus small retailers can be expected to be less willing or able to bear any costs that may be associated with the introduction of CDL in NSW.

In order to avoid adverse impacts on small retailers, it is recommended that if a POS CDL system were implemented, it should be designed in a way that can ensure the handling fee paid to retailers includes an approximately ten percent profit margin. In this way, container collection would become a potential source of revenue for small retailers, rather than an additional cost.

Exemptions

Due to differential financial impacts on small and large retailers some states and countries have provided exemptions for smaller retailers defined in various ways. In New York, the major review of the State's Bottle Bill (The Moreland Report) recommended that retailers within a specified 'zone of convenience' be exempt from participating in the mandatory POS system. In other countries, such as Israel, retail outlets with floor space less than 28 m^2 are exempt from compliance. Other countries place restrictions in terms of number of containers that can be returned per capita per day. For example, British Columbia allows no more than 24 containers per day per person to be returned, while Michigan allows no more than US$25 (or 250 containers) per person per day.

In the review of New York's Returnable Container Act, The Moreland Act Commission into the New York Bottle Bill recommended that the Bill be changed to exempt small retailers from mandatory collection/redemption if there was a collection centre within half a mile of their premises. The Commission found that smaller retailers had been burdened by the bottle bill and should be relieved of their obligation where possible.

National Packaging Covenant

Many submissions from industry groups including those representing retailers believe the introduction of CDL in NSW would undermine the National Packaging Covenant. NARGA (the representative body for smaller retailers) expressed concern that the major companies they represented have all indicated they will sign the Covenant in 2001 and that introducing CDL after five years of negotiation may be seen as a "breach of faith".

Perceived Benefits to Retailers

While the CDL submissions by the retail industry indicate retailers as a whole are not in favour of the introduction of CDL in NSW, literature indicates some retailers may be willing to participate in a POS system. This willingness may result from the known potential for increased customer loyalty under a CDL system. Especially with customer benefits such as coupons and vouchers, a customer may be more likely to return to the same retail outlet (TOMRA, 2000; CDL Televote survey, 2001 – see *Volume III: Section VIII: Social Research – Televote and Citizens Jury*). A retailer may also be willing to participate in a POS system because of a feeling of environmental responsibility. According to qualitative surveys of retailers conducted by McGregor (1994a), 75 percent of food retailers surveyed agreed that their business should take an active role in preserving the district from litter. Further, the survey also showed that 60 percent of retailers said they would support CDL on cans and bottles. However, it was not obvious whether the retailers were provided with a clear understanding of the responsibilities they might be given under a container deposit system.

According to the McGregor survey, cost was a prominent factor in packaging and litter control decision-making. One response among those retailers interviewed was *"…in the end, it means we will be environmentally friendly wherever we can, provided there's no substantial trade-off in cost."* (McGregor, 1994a,p8).

Some European studies have shown the use of RVMs under a mandatory POS deposit system can become a source of revenue within several years of operation, depending on beverage containers collected and other such variables (TOMRA, 2000).

3.6.4 Impacts on Consumers

The ultimate success of any recycling or waste minimisation system relies on consumers' involvement and acceptance, so consideration of how they will be affected is crucial. This section examines the impacts of the different CDL scenarios from the perspective of the consumers (or users) of containers.

CDL is a user-pays system, so the degree to which consumers are financially impacted by CDL will depend on how much they consume, and their behaviour with respect to the disposal and recycling of used containers. This section initially describes the results of an analysis of the potential financial impact of CDL in NSW on households[15], identifying the different financial costs and benefits that may arise from the implementation of CDL.

The contribution of potential consumer unpaid time and labour to CDL is calculated[16]. Although this remains unpaid in reality, and is therefore not included in the formal cost-benefit analysis[17], a dollar figure is placed on this labour to gain insight into the total contribution likely to be made by consumers to CDL in NSW. Exactly which member of the household might actually end up performing these extra tasks and who actually receives the deposit is discussed.

By offering a financial incentive, CDL will also have a differential impact depending on consumers' motivations to recycle. However, international experience and local research has shown that financial incentives alone do not secure high return rates by consumers. The relative cost of inconvenience brought about by CDL depends on other issues including access to transport and collection centres, and the amount of storage space (Moreland Act Commission, 1990, p18).

Different strategies such as CDL which are available to policy-makers, are discussed in terms of the various techniques devised to influence consumer behaviour. Finally, an outline of the perception of, and attitudes towards, the costs and benefits of CDL by consumers and other stakeholders is considered.

These core issues have been drawn from studies of other CDL recycling systems, studies of current consumption and waste systems, from submissions to the Review by stakeholders and by issues raised by the Citizens Forum and CDL Televote Survey respondents. Where possible, impacts on consumers are quantified, and qualitative descriptions are also provided. The methodology employed is described in each relevant subsection.

3.6.4.1 Financial Impacts on Consumers

This section provides estimates of the costs and benefits to consumers that may arise from the implementation of CDL. These costs come from a wide range of sources, including, the following financial costs:

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[15] The household is defined as a person or group of people who usually live in the same dwelling and make common provision for food and other essentials of living. The household is adopted as the basic unit of analysis because it is assumed that sharing of the use of goods and services occurs at this level. (ABS: 6535.0 Household Expenditure Survey, Australia: Detailed Expenditure Items 27/09/2000

http://www.abs.gov.au/Ausstats/abs%40.nsf/b06660592430724fca2568b5007b8619/eaaaa3983ef780b7ca256966007c91a6!OpenDocument

[16] Porter calls this the 'loss of consumer convenience'. And states that "chief among these is clearly the expense of time – and possibly bother – incurred in returning the empty containers" (Porter, 1983: 365-366)

[17] Previous reviews of the costs and benefits of recovering used packaging materials have not included unpaid labour, including most analyses of kerbside recycling such as Nolan- ITU/SMK (2001). Porter (1983) is one of the few studies that have considered this formally, and it is considered in this study in terms of the distributional impact.

- **An increase in retail prices.** Prices of beverages in containers to which CDL applies may rise due to the cost of establishment and operation of the CDL system, assuming that these costs are passed on to consumers and not absorbed in reduced profit margins by suppliers. These costs are summarised in *Section 3.3.6.*

- **The opportunity cost of the deposit.** This cost arises from the fact that the refund is reclaimed at a later date than when the deposit was paid. Consumers face some opportunity cost of not having access to this money due to the time lag involved. It has been assumed that the turnaround time for containers is four weeks, and the interest rate is seven percent per annum.

- **Transport costs** incurred by consumers in taking back used containers and re-claiming deposits will depend on the convenience of the collection points. The intermediate spaced collection depots (Options 4a, 4b and 4c) are estimated to require the largest net increase in consumer travel (90-170 m/capita/wk), and 5a and 5b which are the point of sale options, requiring minimal additional travel (6-7 m/capita/wk). Additional travel estimates assume consumers make trips to redeem containers on average once per month. The costs of this additional travel are based on the fuel required, assuming 10 litres/100km vehicle fuel efficiency and $1/litre fuel cost, plus depreciation on vehicle usage of $5/100km. Transport costs are included in the whole of society costs and are described in *Section 3.3.7: Transport Costs*.

Additionally, some of these costs are offset by the following financial *benefits*:

- **Reduction in local government rates**. As described in *Section 2*, the implementation of CDL will reduce the cost of collecting recyclable material from kerbside and sorting recyclables at materials recovery facilities, reduce landfill charges and litter collection costs for councils, and council will recover the value of deposits on containers placed in kerbside recycling. The net impact of these measures is estimated to vary between $10 and $20 per household per annum, with the largest savings being for Options 4a, 4b and 4c.

There is another class of costs that are borne by those consumers who do not redeem the container and collect the deposit themselves, and this cost is treated separately because it is an avoidable cost, or a transfer payment between different groups of consumers or other stakeholders. These costs include all circumstances in which there is a potential loss to the consumer if he or she fails to redeem the deposit, i.e. in instances where:

- containers are placed in the kerbside recycling service. This is estimated to be between two percent and 20 percent of the total containers recovered, depending on the details of the system implemented (see *Section 3.6.1: Impact on Kerbside Recycling and Local Government*);

- containers are donated to charities. This is estimated to be some eight percent of the total containers recovered (See *Section 3.6.6: Impacts on Non-Profit Organisations/Charities*);

- containers are picked up by litter collectors/ pilferers. This is estimated to be some two percent of the total containers recovered (see *Section 3.6.7: Impacts on Low-income Groups*);

- containers are either disposed of to landfill via public or household garbage services or remain as litter. This is estimated to be between 4 percent and 20 percent of the total containers produced (see *Section 2.5: Impacts on Litter, Section 3.3.3: Impacts on Landfill*).

3.6.4.2 Estimate of Financial Impact on Consumers

Table 3.6-8 shows a summary of the main financial impacts on consumers, as described above. This shows only the unavoidable financial costs, and not the cost of unpaid labour or the costs incurred in unclaimed deposits. These are shown separately in *Table 3.6-10* and *Table 3.6-11*.

Scenario label	Scenario short description	Increase in retail prices	Opportunity cost of capital for deposit outlay	Consumer transport costs	Reduced rates	Net financial costs
4a	Depots intermediate 5¢	$7.05	$0.10	$2.02	-$5.85	$3.32
4b	Depots intermediate 10¢	$7.05	$0.23	$2.89	-$7.55	$2.62
4c	Depots intermediate 20¢	$7.05	$0.53	$3.76	-$7.25	$4.08
4d	Convenience centres 10¢	$14.07	$0.26	$1.01	-$7.15	$8.19
4e	Convenience centres 20¢	$14.07	$0.56	$1.07	-$7.23	$8.47
5a	Point of sale 10¢	$11.30	$0.29	$0.15	-$3.39	$8.35
5b	Point of sale 20¢	$11.99	$0.60	$0.16	-$3.91	$8.84

Table 3.6-8: Estimated annual per capita financial costs and benefits to consumers for different CDL options in NSW.

Table 3.6-9 below shows the cost to consumers who choose to forgo their deposit by donating to a charity, leaving it for low-income collectors, for example in public areas, littering, disposing to garbage or placing it in kerbside collection. These costs represent a transfer payment between groups of consumers, in the case of donations, low-income collection or charities. Where containers are placed in kerbside recycling the deposit value will be obtained by council or a recycling contractor, and therefore represents a transfer payment to local government which may be passed on in reduced rates. The unredeemed deposits that accrue from containers disposed to landfill and never redeemed represent a transfer payment to whichever organisation collected the deposit in the first place, and this depends on the system that is in place. In South Australia and British Columbia, the beverage fillers collect the deposit and therefore receive the unclaimed deposits, or escheats. In other places, such as Michigan and New York, the deposits are paid into a state fund and used for environmental protection purposes.

Scenario label	Scenario short description	Deposits to landfill	Deposits to kerbside	Deposits to charities	Deposits to low-income collectors	Deposits not redeemed by purchaser (total)
4a	Depots intermediate 5¢	$5.42	$3.78	$1.43	$0.36	$10.99
4b	Depots intermediate 10¢	$9.70	$5.39	$3.15	$0.79	$19.02
4c	Depots intermediate 20¢	$13.07	$5.45	$7.23	$1.81	$27.56
4d	Convenience centres 10¢	$5.45	$5.23	$3.50	$0.88	$15.05
4e	Convenience centres 20¢	$7.59	$5.42	$7.64	$1.91	$22.56
5a	Point of sale 10¢	$3.38	$1.63	$3.96	$0.99	$9.96
5b	Point of sale 20¢	$4.58	$2.18	$8.17	$2.04	$16.97

Table 3.6-9: Estimated annual per capita costs foregone by consumers in unredeemed, foregone or donated deposits for different CDL options in NSW.

3.6.4.3 Contribution of Household Time and Labour to CDL

One of the major ways in which consumers contribute to CDL (and indeed any post-consumer recycling system) is through their own unpaid time and labour. Porter writes that the 'real' social cost (of CDL – 'Bottle Bills' in the U.S.) lies in:

> "… the time, effort and/or bother incurred by the necessity to keep, organise, and transport empty containers and then to check them in during a shopping trip" (Porter, 1983 p 366).

The Australian Bureau of Statistics defines unpaid work as a type of 'work' because:

> *"….it is an activity that combines labour with raw materials to produce goods and services with enhanced economic value"* (ABS, 1995,p1).

Such 'domestic duties' as shopping, separating waste, taking waste containers for collection and potentially for reclaiming a deposit are usually unpaid. The relevant tasks are estimated on a per person basis for each of the five main CDL options and for the two current kerbside and IWRP target kerbside options. These results are shown in *Table 3.6-10*.

Scenario label	Scenario short description	Rinsing	Sorting and moving at household	Transport	Transaction	Total	Economic value of unpaid labour ($m/a)
3a	Current Kerbside	0.16	3.30	0.00	0.00	3.46	285
3b	2003 Likely	0.18	3.30	0.00	0.00	3.48	287
4a	Depots intermediate 5¢	0.36	3.30	0.12	0.76	4.54	374
4b	Depots intermediate 10¢	0.37	3.30	0.17	0.76	4.60	379
4c	Depots intermediate 20¢	0.40	3.30	0.22	0.76	4.68	385
4d	Convenience centres 10¢	0.41	3.30	0.06	0.76	4.53	373
4e	Convenience centres 20¢	0.42	3.30	0.06	0.76	4.55	374
5a	Point of sale 10¢	0.43	3.30	0.01	0.30	4.03	332
5b	Point of sale 20¢	0.43	3.30	0.01	0.33	4.07	335

Table 3.6-10: Estimated unpaid labour for time associated with the current recycling system and the CDL options, in hours per person per year.

These results are clearly only estimates, and could be in error by a factor of two or more.

Scenario label	Scenario short description	Value of unpaid labour for all options ($/cap/a)	Value of unpaid labour for all options relative to current ($/cap/a)
3a	Current Kerbside	$42.82	$0.00
3b	2003 Likely	$43.08	$0.26
4a	CDL intermediate 5¢	$56.19	$13.37
4b	CDL intermediate 10¢	$56.95	$14.13
4c	CDL intermediate 20¢	$57.89	$15.07
4d	CDL convenient 10¢	$56.04	$13.22
4e	CDL convenient 20¢	$56.23	$13.42
5a	CDL POS 10¢	$49.91	$7.09
5b	CDL POS 20¢	$50.39	$7.57

Table 3.6-11: Estimated value of unpaid labour for time associated with the current recycling system and the CDL options, expressed as dollars per person per year.

These results are based on the award rate for cleaning services of $12.37 per hour.

The unit (per container) cost of unpaid labour represents approximately 15¢ per container recovered for the current kerbside system, decreasing to 10¢/container for the CDL POS options.

Who does the Unpaid Work?

According to an EcoRecycle Survey of 1998, the individual in Victorian households most likely to contribute to recycling is female (58 percent of respondents stated that recycling work is mainly done by either "a wife, mother or female head of household" (EcoRecycle, 1998).

Although the numbers of women working full-time as 'home workers' has declined in Australia in the past 20-30 years, it has been shown that women still spend twice as much time on housework as men do, and three times as much time on children (ABS, 1997a). Women also spend more time on average on tasks such as shopping and cleaning (ABS, 1997a). From this it is reasonable to expect that increases in time spent on recycling duties in the home are likely to fall disproportionately to women.

A mediating factor on the potential increase in housework burden for women is the fact that children are likely to be enticed to undertake recycling activities in return for the right to retain all or part of the deposits that they redeem. This may have the added benefit of providing a small source of income to young people, sixteen percent of whom currently earn no income at all (ABS, 1996b).

3.6.4.4 Perceived Benefits to Consumers and Citizens

From the above sections it is clear that consumers will bear a reasonably large share of the cost of implementing CDL, and that the current kerbside recycling system also benefits from a large input of unpaid labour. It is therefore important to determine whether consumers are willing to bear these costs, particularly the cost of unpaid labour, which represents a large component of the costs and would be expected to result in resistance to such a system. Contrary to expectations, CDL retains high support

amongst consumers in South Australia, where surveys indicate over 95 percent support for CDL, where consumers have had many years of experience, and in which recovery rates have been maintained and even increased over time (Hudson 2000), and from surveys of international CDL systems e.g. BC, Canada: (McConnell Weaver, 1998, p6).

The social research undertaken as part of this CDL Review also indicates significant support for CDL to be introduced even after considerable deliberation on the issue (See *Volume III, Section 5* and *Volume III, Section 8*). A survey undertaken for the Australian beverage industry indicated significant (77 percent) support for CDL in the three eastern seaboard cities (BIEC 1997c).

Supporters of CDL argue that it offers consumers a number of both tangible and intangible benefits. Those that are often cited include:

- reduced costs of kerbside that may be passed on to citizens as reduced local government rates;
- increased visual amenity born from the reduction in litter (however consumers' willingness to pay for this reduced litter is difficult to quantify - see Ackerman 1995, Porter 1978, Dewees 1998). For example, the Local Government and Shires Association claim in their submission to the CDL Review that: "Living in an environment devoid of container packaging litter will boost morale within the community and foster a greater appreciation of the natural and built environments. Additionally, CDL creates a positive attitude within individuals for litter avoidance by providing a strong incentive for environmentally responsible behaviour." (LGSA, 2000);
- increased environmental awareness. For example, one community group's submission to the CDL review wrote that: "CDL stimulates waste awareness" (Manly Greens Submission, Nov. 6, 2000);
- the provision of income for the poor and homeless, and for charity groups which then reduces the financial impact on communities who would otherwise support them.

The submissions, CDL Televote Survey results, and Citizens' Forum findings reinforce the view that people in the community support CDL for reasons other than financial costs and benefits. The main reason cited is the environmental benefits (see CDL Televote Survey results in *Volume III*) and the major qualifications that the members of the Citizens' Forum placed on their support for CDL were related to the social and equity impacts. Clearly, when given the opportunity, and particularly in relation to a familiar and widely supported issue such as waste minimisation, recovery and recycling people think like citizens, rather than merely as self-interested consumers.

3.6.5 Impacts on Charities and Non-Profit Organisations

This section examines the relative costs and benefits that CDL might bring to charitable and non-profit organisations. It discusses the different ways in which charities and non-profit organisations may contribute to the overall success of CDL, and which social groups in particular may be the beneficiaries.

3.6.5.1 Significance of Charities and Non-profit Organisations to CDL

Many charities and non-profit organisations would be affected by the introduction of CDL in NSW, though the degree to which they are involved will differ. In South Australia, many different charitable organisations are voluntarily involved in different aspects of the CDL system. Some charitable organisations in South Australia use container collection as a revenue raising activity. The potential market that charities and non-profit organisations might be able to exploit in NSW is quantified in this section.

Different activities in the CDL system that charities and non-profit organisations might contribute to include:

For 'at home' consumption:

- running collection centres as a business activity (e.g. Scouts Recycling in South Australia);
- household collection service (e.g. through 'Bottle Drives');
- kerbside collection service (e.g. five percent of Adelaide's metro kerbside collection of CDL containers is carried out by Scouts Recycling SA);
- placing conveniently located collection bins, and;
- providing a pick up service from other charities, non-profit organisations and businesses.

For 'away from home' consumption:

- operating collection services from commercial outlets (such as restaurants, hotels and clubs) to service container returns;
- collection at or after special events such as large sporting matches or carnivals, and;
- placing permanent secure collection bins in public places (e.g. at parks, beaches etc).

By encouraging charities and non-profit organisations to provide some of these services, consumers are encouraged to submit their deposits to the organisations in order to support them. This money may not have otherwise been donated or collected. Litter collecting groups such as 'Clean Up Australia' may use the recovery of deposit bearing container litter to supplement their other fund raising activities.

Apart from benefiting charities directly, the contribution made by Charities and Non-Profit Organisations to CDL contributes to its overall success and acceptability within society. Charities and non-profit organisations may also assist members of society who are either unable or unwilling (for various reasons) to reclaim their deposits directly from a collection point. By providing collection services of different kinds, these groups play an important role in the collection of many containers that would otherwise be left to landfill or litter.

3.6.5.2 Revenue from Donated Deposit Bearing Containers

The types of charitable and non-profit organisations who might be affected by CDL were identified through literature reviews and discussions with organisations currently involved with CDL in South Australia. In this section we have only estimated the potential financial benefits to charities gained from redemption of deposits on used containers that have been 'donated' by consumers. Other potential sources of revenue such as running collection centres (e.g. Scouts Recyclers in SA) and public place recycling bins will depend on the degree to which charities become involved in this aspect of the CDL system in NSW and are not considered here.

The calculation of the potential overall contribution to the recovery of used containers by charities was made by using the results from the CDL Televote Survey (see *Vol. III, Section 7*). In the question on "Behaviour under a CDL system", Televote Survey respondents were asked where they would dispose of used deposit bearing containers under a CDL system that had both collection centres and point of sale (POS) return. The question was asked in regard to both 'at home' and 'away from home' consumption (see *Volume III, Section 7*). For both at home and away from home consumption, ten percent of respondents said that they would donate deposit-bearing containers to charities.

Both the financial value of these donations and the propensity of consumers to donate will vary with the level of deposit placed on containers. Analysis of responses to the CDL Televote Survey suggests that if the deposit is 10¢, then consumers would be ten percent less likely to donate the deposit than at 5¢.

It has been estimated that the potential revenue for charities and non-profit organisations under CDL would be in the range of $20-50 million per annum, depending on the level of deposit and type of system. Some of the revenue may be used by charities to cover the costs of the collection activity. Costs may include equipment and infrastructure (e.g. of buying and installing collection bins and protective clothing); rent; transport and labour. These costs will vary with the degree to which they are donated – for example through voluntary labour, the use of vehicles, rental subsidies etc.

Additionally, some costs may be offset by the fact that many charitable and non-profit organisations in NSW are already involved in recycling and re-use systems. For example, charitable organisations such as St Vincent De Paul already collect, distribute and re-sell second hand furniture and clothes via a system of drop–off points (bins and shops) and pick-up services. EcoRecycle Victoria record that already 93 percent of households surveyed reported making use of charity shops or clothing collection bins to pass on items for re-use (EcoRecycle, 1998,p46).

3.6.5.3 Operating Collection Centres

Apart from collecting containers as donations, charities and non-government organisations also have the opportunity to manage collection centres, (i.e. Depots) using the profits from this activity (generated mainly through handling fees) to generate revenue for their organisations. This activity is used by Scouts Recyclers of South Australia who handle some ten percent of the total deposit bearing containers in South Australia. The seven depots run by Scouts Recyclers generate $5.5 million revenue per year, approximately 50 percent of which is profit. This profit is then donated to the Scouts Association of South Australia, and accounts for some 50 percent of the Scouts Association's funding. For a cost analysis of collection centres see *Section 3.3.4: Infrastructure Costs*.

3.6.6 Low-income Groups

Concern about the potential impact of CDL on people who are disadvantaged or economically vulnerable was highlighted by the CDL Citizen's Forum (See *Volume III: Section 8.3.1*) In their report, the Citizen's Forum panellists stated:

> *"Any price increases should not adversely affect low-income earners (Citizen Panel Report, p 4), especially concerning the initial price of the product – relative to their income."*

Social inequality and disadvantage are relative concepts yet are typically associated with low-income, groups with a high level of dependence on social security (such as the unemployed), a low level of educational attainment, and inability to speak English (ABS, 2000c,p16). Levels of disadvantage also directly relate to *access* and *location*: access to goods and services and the number of viable industries in the area (which provide employment opportunities).

Experience in South Australia and overseas shows that disadvantaged groups may be affected by CDL in three key ways:

- through potential changes in prices for products affected by CDL (relative to their income and cost of living);

- through the value of used containers relative to their current income, or their 'value of time'. Collection of used containers originally purchased by other consumers can provide a minor source of income for poor people, and;
- through their relative access to goods and services connected to CDL, such as collection centres or depots. For instance, an ABS social trends survey indicated that while most people in disadvantaged areas live in major urban centres, they tend to be over-represented in smaller towns and in geographically isolated locations (ABS, 2000c, p16).

Different sub-groups will be affected by each of these three factors to different extents. For example a poor rural family that purchases containerised beverages but has little access to a point of collection for deposit bearing containers may suffer a net financial disbenefit through the introduction of a CDL system. Whereas a homeless teenager living on the streets of Sydney and having easy access to points of collection may gain significant financial benefit from collecting and redeeming deposits on containers that have been left in the litter or garbage streams.

Indeed, youth in general are an important sub-group on whom the impact of CDL should be considered. Youth actively participate in CDL systems by collecting waste containers from streets and by returning their own household's or school's waste containers. In many cases, children are able to supplement their 'income' or pocket money with deposits collected. This means that for individual family members the financial costs and benefits of CDL may differ and a small redistribution of income will occur. This redistribution may be considered a positive impact given that Australian Bureau of Statistics data shows that currently in NSW sixteen percent of young people reported receiving no income at all (ABS, 1996b)

People who currently collect aluminium cans are another group that would be affected by the introduction of CDL, through expansion of what is able to be collected, increased value of the containers, and possibly increased competition from other collectors.

Box: Current Aluminium Can Scavenging in NSW

It is difficult to ascertain any general behavioural characteristics of low-income earners who collect aluminium cans. From the information provided by metal recyclers[21], it seems there is variation in scavenging behaviour among individuals and among recycling operations. There is variation with respect to frequency of visits and also in the amounts collected. One operator stated that individuals may visit a metal recycler once a month and then not return until many months later. Another operator estimated that up to a twenty percent of their regular (individual) customers visit once a week.

The amount of material brought in also differs, but generally only a small proportion is from aluminium cans, between one percent - ten percent, while the rest is scrap metal. Modes of transport differ: some travel on foot, but generally it seems collectors own their own vehicle. One regional operator commented that some collectors travel by train. Low-income collectors tend to be male. Many of the operators had never seen a female doing this type of work, but one operator observed that many of their customers were "mums and dads".

The amounts that collectors receive in a single visit varies between operations. At the lower end collectors made $10 to $12 per visit while at the regional operation on average collectors earned between $50 and $60.

All the operators that discussed the issue remarked that there had been a definite decline in aluminium can collection by individual, low-income collectors over the years. One operator thought this was the result of increased kerbside collection, while others suggested the decline might be due to increasing amounts of other recyclable material such as glass and plastic.

3.6.6.1 Scavenging – Positive Implications

For the purposes of this report, scavenging refers to the collection of waste containers, primarily those left as litter or in street bins by away from home consumers, by poor or homeless people. Scavenging is a common feature of CDL systems. A review of the New York CDL system has this to say of scavenging:

> *"A completely unintended consequence of the Act has been the opportunity it has provided for the poor, the homeless, and the indigent. By making it possible to scavenge for and return containers, it has created a means for them to contribute to their own livelihood and, as a result, to increase their self-respect. In doing so they have made the streets and sidewalks of metropolitan areas infinitely cleaner and contributed immeasurably to the success of the Act in New York City" (Moreland Act Commission, 1990, p35-36).*

Another report from the US describes a certain level of organisation associated with low-income and otherwise disadvantaged groups making the most of the deposit value:

> *"Guy Polhemus, a soup kitchen volunteer, started a non-profit organization, WE CAN, to redeem the cans and hired some of his earliest "customers" to help staff the fledgling business. Industrious collectors earn $25 to $30 a day by helping clean up the city's litter and reducing the garbage going into landfills. Some people have told Polhemus that scavenging cans was too degrading. Obviously, the homeless, who voluntarily participate, disagree. They choose to create what wealth they can" (Morris, 1996).*

In order to understand the financial implications of scavenging, the CDL Review has attempted to estimate the total potential financial gain it could bring to low-income groups. The estimate has been based on the number of containers potentially available for scavenging from each of the following sources:

- Litter collection;
- Pilfering from kerbside;
- Collecting from public bins;
- Collecting as donations from neighbours, restaurants etc.

Very little empirical data is available to suggest the potential size of each of these streams. However, the CDL Televote Survey provides some information about the way NSW residents may behave. Televote respondents were asked what their likely behaviour would be in relation to disposal and the fate of their used containers, including making them available to charity groups or leaving them for others to collect and redeem. Responses to this question were used to estimate the proportion of deposit bearing cans that would be available for scavenging. The potential income for low-income collectors has then been calculated assuming one hundred percent collection of available deposit bearing containers and a ten cent deposit. This outcome is a potential $30million per annum transfer of income to low-income collectors (see *Table 3.6-13*).

Location of consumption	Proportion of recovered containers diverted to low-income collectors	Transfer of value ($m/a)
At home (own and others consumption and pilfering from kerbside)	2%	6
Away from home (street garbage bins, litter)	8%	24
Total	10%	30

Table 6.3-13: Potential sources of income to low- income earners resulting from CDL.

3.6.6.2 Scavenging – Negative implications

While the transference of income to extremely disadvantaged groups is generally considered a positive outcome of the introduction of CDL systems, there are negative impacts that need to be mitigated against.

Retailers who are obliged to collect containers under mandatory point of sale return systems are the stakeholders that can experience the largest problems with scavenging behaviour. Retailers sometimes resent redeeming deposits to non-customers, such as the homeless. Some international experience has shown conflicts may arise from homeless or other non-customers redeeming containers in bulk, which becomes more time consuming for the retailer if manual sorting and handling is required. In addition to the increase in labour requirement, which may detract from labour devoted to sales, retailers have often felt (rightly or wrongly) that the presence of homeless makes their customers feel uncomfortable. Thus, retailers may discriminate against non-customer bulk redeemers such as homeless because they do not want to deal with them (Morris, 1996). Some states in America have mitigated this problem by imposing a limit on the number of containers that may be returned to a retailer by an individual in one day. This issue is discussed further in *Section 3.5.3: Impacts on Retailers*.

An important philosophical concern with regard to scavenging is that the CDL system as a whole should not rely on the free labour provided by low-income earners in order to service others' poor waste habits. Although some individuals do benefit in such a situation, it is the Moreland Commission's opinion that:

> *"it should be made incumbent on everyone to take responsibility for addressing the problem…. reliance on poor individuals to 'pick up after us' is a failure of public policy" (Moreland Act Commission, 1990,p36).*

Another more practical concern related to the potential exploitation of low-income collectors is the health and hygiene of the individuals involved, and also of the other stakeholders they necessarily come into contact with.

Further research into the best way of mitigating the above issues in the NSW context would be necessary before any CDL were introduced in NSW. This research should include direct consultation with low-income groups and individuals likely to be affected by CDL.

3.6.7 Impacts on Employment

The impact of CDL on employment is a significant issue for the CDL Review, as it was raised by many of the stakeholders to this review (mentioned in sixteen submissions, stakeholder interviews, the Televote Survey and by the Citizen's Forum). Unemployment consistently rates in surveys of NSW citizens as the most pressing issue for the State Government to pay attention to (NSW EPA, 1997b,p9)

However, the impact of the implementation of CDL on employment is a contested issue. The purpose of this section is to define and approximately quantify the potential net impact of implementing CDL on employment, to illustrate where these impacts might occur and to discuss some of the ramifications of these changes.

It is estimated that in South Australia the CDL system results in the direct employment of approximately 600 people, with some estimates as high as 1,700 people when a multiplier effect is considered (Dept. Environment & Heritage SA, 2000:13; Anderson Muller Consulting, 2000:14; Hudson, 2000:20). Most of these jobs are found in the collection depots and supercollectors (materials co-ordinators) (Hudson, 2000:19). Anderson Muller Consulting in March 2000 wrote that in South Australia, the CDL-related industry is:

> *"a large employer of particularly junior and part time employees in both metropolitan and country areas."*

According to some submissions, positive impacts would include the generation of employment, especially for unskilled labour in regional areas with the establishment of collection depots and sorting facilities.

By contrast, other submissions and literature on CDL argue that it would result in a transfer of jobs rather than an increase in employment. Other submissions argued that a negative impact of the introduction of CDL on employment would be felt by community groups and charities that collect containers for profit. According to Dairy Farmers, *"these revenues would be taken from community groups and given to commercial companies, while the community groups would have to seek funding elsewhere."*

These issues are analysed in this section by looking at the nature of the employment types, the location of the employment opportunities/losses, the relative capital costs to employers per job, and an estimation of the net benefits to the economy related to a reduction in unemployment, with a particular emphasis on long term unemployed.

3.6.7.1 Methods

The impact on employment arises in the following ways:

- increase in employment at depots and collection centres;
- increase in employment due to additional retailer staff time for container return through point of sale;
- decrease in employment due to reduced cost of kerbside recycling and garbage collection;

- increase in employment due to increased collection of recyclables from the non-residential sector;
- decrease in employment in the manufacturing industry resulting from any reduction in sales of products covered by the CDL system;
- increase in employment through administration of the CDL system and compliance monitoring, and administration of the unclaimed deposits fund, should there be one.

The results of the analysis that provides these employment figures are shown in the following section.

3.6.7.2 Estimated Net Impacts On Employment

Table 3.6-14 shows the employment changes expected as a result of implementing CDL in NSW by category and for the various options.

Option	Employment in collection centres	Employment in retail outlets	Kerbside recycling, MRF sorting and garbage collection	Administration and compliance	Suppliers	Net total
Intermediate depots 5¢	978	0	-25	10	-3	960
Intermediate depots 10¢	978	0	-25	10	-2	961
Intermediate depots 20¢	978	0	-25	10	-2	961
Convenience centres 10¢	1,449	0	-25	10	-4	1,430
Convenience centres 20¢	1,449	0	-25	10	-4	1,430
Point of sale 10¢	288	1,025	-24	10	-3	1,295
Point of sale 20¢	288	1,179	-24	10	-4	1,449

Table 3.6-14: The estimated changes in full time employment in NSW by category and by option for implementation of a CDL system.

There are a number of qualifications and issues to note in relation to these results:

- These figures include only those jobs that are ongoing, not jobs that may be created in the construction of depots or collection centres, upgrading of existing depots, or in the design and establishment of such a system, or in initial marketing and education.
- It is assumed, due to limited data, that in the non-residential sector, any increase in employment due to increased collection of recyclables will be matched by decreases in waste collection. This is a conservative assumption in terms of employment gain, since the relative increase in recyclables will be greater than the relative decrease in waste.
- The analysis also assumes due to limited data that any increases in jobs for materials re-processors and recyclers (e.g. Visy Recycling) would be matched by any decrease in jobs for virgin material production – so this is not recorded in the table. This is also a conservative assumption given that the relative increase in recycled material will be much higher than the relative decrease in virgin material for individual firms.

- The number of positions for administration and compliance will depend heavily on the structure of the system that has been established, particularly on the question of who retains the unclaimed deposits. For example, if an unclaimed deposits fund is established by the NSW government to support kerbside recycling, or for other purposes, then the number of positions required to administer this fund will be higher than if the unclaimed deposits are retained by suppliers. The number of positions estimated here is based on an extrapolation from the South Australia situation, plus an additional four positions.
- The job losses in industry are based on reduced sales due to increased retail price of products. This is a worst case based on two important assumptions. Firstly, that the assumed demand elasticity of -0.5 for all affected products applies[18], and secondly, that the suppliers pass through the entire cost of implementing the CDL system in increased prices, rather than in reduced profits. It has also been assumed, based on ABS figures (ABS 8221.1 1998-99:11), that employment costs are ten percent of the turnover in the industry and that this translates into a ten percent reduction in employment costs relative to the reduction in sales. It is worth noting that for the industries concerned, employment levels per volume of beverage produced have undergone a four-fold reduction due to increased capital intensity.

These figures can be compared to the number of people currently employed in NSW in the waste management industry. In 1996-1997, ABS report that some 3,255 people were employed in NSW in the private and public trading sector of the waste services industry. Additionally, 2,044 people are employed in the general government sector of the waste services industry (ABS: 8698.0, 1998:10)

The estimated net employment change represents an 18 to 27 percent increase on the existing employment in this sector.

The soft drink and beer sector (50 percent of sales by volume of total beverages) account for approximately 32 to 50 percent on the employment in this sector.

The sector where the greatest impact in terms of employment will occur is the collection system, whether collection centres, depots, or point-of-sale (retailers). The employment costs associated with the handling of used containers by collection centres are affected by the following trends:

- Tendency towards increasingly automated systems, particularly the use of reverse vending machines.
- Improvements in the quality of used containers as demanded by materials re-processors to reduce contamination. Issues include sorting, cleanliness and crushed/uncrushed materials (e.g. the bulking and baling of used containers at collection centres).

3.6.7.3 Other Results

Nature of the Different Jobs Created/lost due to CDL

The types of work related to the creation of new jobs through CDL, and the appropriate NSW Awards, is summarised in *Table 3.6-15*.

[18] Very little data exists regarding the demand elasticity, and this figure is likely to be an overestimate, as discussed in Section ll.

Type of Job	NSW Awards
Collection of containers	Garbage Collection / Bottle Handlers Award
Customer service (taking back containers and issuing deposits)	Retail Services Awards
Cleaning of collection centres to maintain visual amenity	Cleaning Services Awards
Sorting, cleaning and storing containers (Bottle Handlers)	Federal Glass Industry Bottle Merchants Award
Transport of used containers and recyclate	Transport Workers (NSW) Award
Administration	Clerk Workers Award

Table 3.6-15: Types of jobs created through CDL and related NSW Awards.

As mentioned in the Introduction to this section, the nature of jobs created through CDL has attracted some interest. This interest mainly settles around the creation of jobs using skilled versus unskilled labour. CDL is claimed by some to result in the creation of more unskilled and part-time work. Part of the argument has been that there is a net shift in employment from skilled (e.g. in the beverage industry) to unskilled (e.g. in the waste handling and recycling industry). The results indicate that there is likely to be at most, a very minor reduction in the beverage industry, and the largest reduction will be in other parts of the waste collection and recycling industry, especially runners on recycling trucks and sorting staff at materials recovery facilities. There will be a net increase in employment in this sector.

Assuming that there is no significant transfer of jobs from skilled to unskilled, another perspective is that the increased employment at the unskilled (depot and collection centre staff) and semi-skilled (shop assistants) level is a positive outcome in terms of reducing long-term unemployment, where there is a higher concentration of unskilled and semi-skilled people.

Location of Employment Opportunities

It is important to consider not only the net impact on employment and types of jobs, but also *where* these jobs are located. This is important in that different rural and regional areas are currently facing much higher levels of unemployment than urban areas (ABS, 2001b). The levels of access and actual location of economically disadvantaged groups often contributes directly to their relative disadvantage, not the least through the inaccessibility of employment opportunities (See *Section 3.5.5: Low-Income Groups*). This being said, such groups will most benefit from a positive shift in employment opportunities if these are located nearby.

One submission put this issue in a historical perspective:

> *"The advent of very large beverage plants resulted in the closure of most regional, locally owned plants, adding to the loss of employment in such centres. If containers were to be returned, then local plants might be encouraged to re-establish as transport costs for them would be less" (J.L.O Tedder, North Coast Environment Centre, Lismore).*

The CDL Review does not consider an increase in the number of regional beverage bottling and production facilities to be a likely outcome if CDL were introduced in NSW. However, CDL would be expected to increase the employment opportunities wherever beverages are consumed and disposed of, and consumption of beverages will remain as dispersed as the population that consumes them.

Effects of Employment Changes

"If a policy creates a job, this has the net benefit to society to the extent that the person employed would have otherwise not have been employed. In other words, the benefits of employment are equal to the social costs of the unemployment avoided as a result of the policy" (RPA, 1999,p35). This depends on the period of employment and the level of state support offered during the period of unemployment.

In Australia, it was estimated that in 1992 the direct budget costs of unemployment were at least $20 billion per year and probably more (a year in which unemployment was at 10.7 percent). A large proportion of these costs fall on the public sector. They include direct payments in unemployment pensions and job placement programs (together accounting for $9 billion), and associated items (such as extra police and community welfare services, health care, education, and forgone income taxes) accounting for $11 billion (Langmore & Quiggin, 1994:29-30). This means that a reduction in employment has the potential to save the community $20,000 in direct costs (not including social costs) per net job created. For the net increase in employment generated by the options considered this would translate to between $20m and $30m benefit, mostly to the Commonwealth government.

The other shift to note is that the more unpaid labour consumers directly contribute to CDL (through sorting, counting, cleaning, and storing used containers) the less paid employment will be needed. This is especially true for collection centres where anecdotal evidence suggests a correlation between the amount of time employees take to serve a customer (in processing their used containers), and the state in which the containers have arrived in (i.e. if cleaned, sorted and counted)[19]. It would be expected that, if CDL were implemented, as consumers become more aware of how the system works and their own obligations, collection centres will see an improved quality of the used containers and thus might need to employ less staff over time. In effect, this movement suggests an (albeit small) transfer of paid to un-paid labour.

3.6.7.4 Summary of Results

In summary, CDL will create a net increase of between 960 and 1,430 jobs, depending on the option, with the potential to reduce the costs of unemployment by approximately $20m to $30m per year. It is unlikely that this will result in a significant shift from skilled to unskilled work.

[19] Personal Communication: J.Lester, Scouts Recyclers SA, 20 February 2001.

Section 4: IMPLEMENTATION ISSUES

4.1 Introduction

Container Deposit Legislation (CDL) could be implemented in a number of ways. As illustrated by both the international and South Australian experience, and through the results of the Cost Benefit Analysis (CBA) of the various CDL scenarios, different outcomes can be reached depending on how a system is designed and implemented.

This section examines some of the issues surrounding implementation in more detail, considering the advantages and disadvantages of different systems in relation to how they might apply in NSW.

Firstly, the core legislative and regulatory impacts of CDL for NSW (and Australia) are discussed; this includes topics such as impacts on the National Packaging Covenant.

Other implementation issues discussed in this section include the ways in which the CDL system is actually administered (whether a government or 'producer responsibility' organisation administers unclaimed deposits, handling fees, auditing, and accountability for the system as a whole). The actual levels of deposits and handling fees are dependent on a number of factors ranging from system operating costs to consumer preferences. This chapter also discusses cross border issues that may arise if NSW introduces CDL without its neighbouring states introducing similar systems. Finally, the issue of access and convenience under the different scenarios of collection centres and point of sale (POS) systems are discussed in addition to the requirements of education and awareness in implementing a new system.

4.2 Legislative and Policy Considerations

This section briefly discusses legal and policy issues concerning the introduction of CDL into NSW. An investigation of the legislative and regulatory feasibility of the introduction of a container deposit law in NSW was not one of the terms of reference for the CDL Review, and the information presented in this section represents preliminary research into the issues, and not formal legal advice.

The two legal aspects discussed in this section are whether CDL in NSW would constitute an excise duty (which is something that only the Commonwealth can impose) and whether CDL would be likely to be deemed as restricting interstate trade and commerce contrary to the Commonwealth Constitution. The research conducted as part of the CDL Review[1] found that neither issue could be resolved as part of this Review and concluded that the NSW government should conduct a thorough investigation of the legal issues associated with CDL before attempting to introduce such legislation.

An additional potential legal obstacle for any container deposit law introduced in NSW is the mutual recognition requirements between the States. This issue was not researched by the CDL Review.

4.2.1 CDL as a State Tax or Excise

If CDL is a duty of excise it could not validly be imposed by New South Wales. This is because under the Commonwealth Constitution the Commonwealth has the exclusive power to impose excise duties.

The broad definition of an excise has now been accepted, first by a majority in *Capital Duplicators Pty Ltd* v *Australian Capital Territory (No 2)* (1993) 178 CLR 561 and more recently in *Ha* v *New South Wales* (1997) (1997) 189 CLR 465 which found that an excise duty is "an inland tax on a step in production, manufacture, sale or distribution of goods" (at p.490). Depending upon the basis on which it was imposed, a state-mandated container deposit (i.e. CDL) could fall under the accepted definition of an excise.

[1] Research conducted by Karen Bubna-Litic of the Faculty of Law, University of Technology, Sydney.

A necessary element of an excise is that it is a tax. To be a tax it would have to be a compulsory payment, that is raised for government purposes and that is not a pecuniary penalty or a fee for services rendered – see *MacCormick* v *FCT* (1983-1984) 158 CLR 622. A state-mandated container deposit (CDL) may not meet either of these criteria. The fact that consumers can redeem their deposits if they choose may indicate they are not a compulsory payment.

4.2.2 CDL and Restriction of Interstate Trade and Commerce

The question addressed by the preliminary research was whether CDL restricts interstate trade and commerce in a manner that is contrary to s92 of the Constitution. One of the relevant cases to be considered in relation to this question is *Castlemaine Tooheys Ltd & Ors* v *South Australia* (1990) 169 CLR 436. Although the outcome in the case depended very much on the particular facts, the Court made some relevant comments regarding the validity of legislation which does discriminate against interstate trade.

The Court said that this legislation might be valid if the burdens imposed are "a necessary means for achieving the conservation of the natural resource or other public object that the legislation seeks to protect or promote." (p.468). But the means adopted by the State needs to be in proportion to the purpose of the legislation.

> *"The fact that a law imposes a burden upon interstate trade and commerce that is not incidental or that is disproportionate to the attainment of the legitimate object of the law may show that the true purpose of the law is not to attain that object but to impose the impermissible burden." (p472)*

4.2.3 Implications of CDL for the National Packaging Covenant

Under the terms of the National Packaging Covenant, there are different views of what has been agreed. On the one hand, are the views such as those of the packaging and soft drink industries.

Gavin Williams, the Chief Executive officer of the Packaging Council of Australia, stated in a submission to the Review that the introduction of CDL would:

> *"have serious adverse, and perhaps fatal, consequences for the National Packaging Covenant. It would be widely regarded by industry as a breach of faith. … Ministers, in approving the National Packaging Covenant and the association (sic) National Environment Protection Measure for used packaging materials stated that 'the Covenant and Measure will form the key measurements for managing consumer packaging waste over the next five years subject to significant Covenant uptake'. The Communiqué released by ANZECC Ministers on July 2, 1999, went even further stating that 'The Covenant/NEPM package is intended to be the sole instrument for managing consumer packaging waste in particular jurisdictions over the next five years subject to a significant uptake of participants in the Covenant'. The introduction of CDL in NSW would render null and void these two commitments" (Packaging Council of Australia, 2000: 3,4).*

In support of the Packaging Council of Australia comments, the Australasian Soft Drink Association Ltd stated in their submission to the CDL Review that the Review:

> *"is at odds with the agreements negotiated between the state and federal governments and the beverage industry under the National Packaging Covenant. The Joint Action Plan, agreed to and now being implemented, has been developed on the basis that CDL will not be introduced. The NSW government was an intrinsic player in these negotiations."*

An alternative view is that state governments that have signed the Covenant still retain the rights to establish and increase mandatory waste reduction/recycling targets to accomplish specific objectives, including achieving recovery and recycling rates that provide net economic and environmental benefits to society. In this view, the Covenant was essentially a mechanism to allow industry to address packaging issues over five years. If for any reason they fail in this, then governments have a right and duty to act. For example, any industry not complying with the Covenant would fall under the NEPM or alternatively some other arrangement that might be a mandatory target or a different industry waste reduction measure.

There are at least two issues of importance to state governments. Not achieving the targets in the Covenant could be regarded as a breach of faith by industry. Secondly, the Covenant Council and state governments will need to review the appropriateness of the targets set in relation to the objectives to be achieved, including the use of new information on environmental costs and benefits which becomes available from the *Independent Assessment of Kerbside Recycling* (Nolan ITU 2001) or the CDL Review. Such reviews could result in increasing or decreasing the targets.

It was noted that several industry submissions to this review made clear that container deposit legislation would not be their preference. However, a reading of the Covenant itself reveals consistency of CDL with the objective to: *"establish a collaborative approach to ensure that the management of packaging and paper throughout its lifecycle and the implementation of collection systems including kerbside recycling schemes, produces real and sustainable environmental benefits in a cost effective manner" (ANZECC, 1999 p1).*

While kerbside recycling is specifically mentioned, alternative or complementary collection systems to achieve improved lifecycle management and environmental benefits are not precluded by the Covenant. This interpretation is also consistent with South Australia's clearly stated intention to retain container deposits as a collection system. A container deposit system also works on the principle of shared responsibility for the lifecycle management of containers. Under a CDL system, consumers, retailers and producers are required to take responsibility for the containers produced and/or purchased. Consumers, for example, are required to take responsibility by paying a deposit on each container that they purchase.

CDL is also recognised in the National Environment Protection Measure through exemptions from obligations provided if "arrangements exist for the industry or industry sector that produce equivalent outcomes to those achieved through the Covenant" (National Environment Protection Council, 1999b p8).

While retaining an existing program is covered, starting a new state CDL program in Australia is not precluded by the Covenant. However, the Covenant is voluntary and there is no guarantee that it would continue, if CDL were implemented by any of its signatory governments. For example, as early as 1997, South Australia communicated the possibility of an extension to CDL if industry (in particular the milk and juice industry) could not reduce their litter component by a set target over two years. The NSW Waste Minimisation Act 1995 also provides for the possibility of CDL being implemented in NSW to achieve targeted outcomes. Section 39 (6) of the Act states that:

> *If the container/packaging industry has failed to achieve a waste reduction target that has been set up by an IWRP, SWAC may advise the Minister of the need to introduce container deposit legislation.*

Existing legislation was not rendered null and void by the signing of the Covenant. The CDL Review has demonstrated that implementing a combination of CDL plus kerbside recycling can:

- achieve significantly higher recovery and recycling rates for used container materials;
- increase the overall economic benefits;

- lower the unit cost of recovering containers (expressed as a cost per container, or tonne) compared to kerbside recycling alone.

Therefore, it may be appropriate for the NSW government to recommend an increase in the recovery targets to the levels shown here to be cost effective, that is, in excess of 90 percent.

A CDL program is not the first approach usually recommended by packaging and drink industry associations to achieve prescribed targets. However, in other jurisdictions it is not uncommon for industry to choose to implement its own version of a container deposit program and establish a system it prefers rather than have one developed by government. For example, in British Columbia, a deposit and refund system was implemented by industry in response to elevated government targets.

4.3 Administration of the CDL System

4.3.1 Responsibilities

Administration and enforcement of a deposit-refund system can be managed by a government body, or the responsibility can be shared in part with private industry. While the state or national government will always be responsible for enforcement of any associated legislation, a private industry body may take responsibility for some or all of the following administrative tasks: (Segal, 1981; Moreland Act Commission, 1990):

- Management and distribution of the unclaimed deposits;
- Management and distribution of handling fees;
- Ensuring correct labelling of deposit bearing containers;
- Managing auditing;
- Licensing of collection centres; and
- Ensuring retailers provide refunds on deposit bearing containers they sell (if a POS system is implemented).

4.3.2 Administration by Government versus by Producer Responsibility Organisation (PRO)

A deposit system can either be administered by a government body (as is the case in South Australia and US Bottle Bill States) or by a private body, often known as a *Producer Responsibility Organisation* (PRO) as in some European countries (OECD, 1998c) and in British Columbia (Canada) (Morawski, 1999b), or both. Most systems operate with the tasks shared between government and the PRO to varying degrees.

4.3.2.1 Administration by State: Examples of South Australia and US

In South Australia (currently the only Australian state with a deposit system), the State government administers the legislation (Segal, 1981). In 1981, three people were employed full time to manage this task. Representatives from the beverage industry (known as super-collectors) are responsible for administering the deposit system, including the collection of used beverage containers and payment of the handling fee to depots.

Bottle Bill Acts in US States, administered by government bodies include New York, where the Department for Environmental Conservation (DEC) is responsible for enforcing the Act. However, due to

lack of resources and inadequate penalties, it was recommended by the Moreland Act Commission (1990) that the responsibility to enforce the Act be transferred to other government agencies, including the Department of Sanitation and the Department of Agriculture and Markets.

4.3.2.2 Administration Shared by State and PRO: Example of British Columbia, Canada

British Columbia's deposit-refund system is an example of shared responsibility between a government agency and two PROs. The sharing occurs because the BC government owns one of the stewardship agencies, the Liquor Distribution Branch (LDB), which is involved in implementation of the deposit-refund system for alcoholic beverage containers. The LDB acts as a brand owner on behalf of 220 companies that sell wine and spirits as well as a few companies that sell coolers, cider, and beer. The LDB also operates the in-store portion of the deposit-return system for the Brewers Distribution Limited, a second stewardship agency or PRO, which acts on behalf of fifteen of the major brand owners of coolers, ciders, and beer. Finally, it contracts out management of 42 large-volume redemption centres (Morawski, 1999b).

The BDL itself recovers containers from over 450 stores, licensed establishments, and depots (Morawski, 1999b).

A third stewardship agency is Encorp, a PRO group representing the non-alcoholic beverage sector, which is responsible for managing and administering the deposit and refund system, and paying the handling fees to retailers, while minimising the impact on consumer shelf prices (Morawski, 1999b).

Except for the government ownership of one stewardship agency, the British Columbia system functions much like that of a system administered by PROs (See next section). If CDL were to be introduced in NSW with the intention that a PRO partakes in administering the Act, it can be said that the Australian Beverage Industry Environment Council (BIEC) already exists as a form of PRO. BIEC represents the beverage and packaging industry and funds several environmental education and research initiatives, such as the Keep Australia Beautiful Council, Tidy Towns, Garbage Bin and Recycling Audits. BIEC could potentially assume a PRO role in implementation of CDL.

4.3.2.3 Administration by PRO: Example of Europe

In European countries such as Austria, Belgium and Germany, the beverage and packaging industry have *total* responsibility for packaging waste management, as opposed to *shared* responsibility (Andrews, 1998). In the German system (described further in *Section 2.1: The Current Situation*) the Dual System Germany Inc. (DSD) is the PRO, responsible for making contracts with the disposal branch, book keeping of the whole collection, sorting and recycling process, and responsible for payment of collection costs. This administrative body is comprised of members of the beverage industry, packaging industry, retailers and waste disposal/recycling industry.

It has been argued by some (Ackerman, 1995) that PRO schemes in EPR legislation may create monopolies in waste collection, such as that in the German DSD. Critics of the DSD argue the system has created profitable waste management for both private and municipal waste managers at the expense of consumers (OECD, 1998c).

4.4 Unclaimed Deposits

Unclaimed deposits (also called escheats) are the pool of money, retained by the administrative authority, resulting when consumers do not redeem the deposit from their used deposit-bearing container. The

amount of money involved was estimated to be in the range of $30-90 million per annum for NSW, depending on the CDL scenario implemented.

The ownership and use of the unclaimed deposits varies among different systems around the world. These differences are summarised in *Table 4.4-1* for some of the key systems.

Country	State	Fate of unclaimed deposits
Australia	South Australia	Retained by the beverage fillers.
USA	Michigan	25% to retailers as handling fee, 75% to State Government funds.
	California	Program administration; grants to nonprofits, recycling and education programs; and reimbursement to municipal governments for the containers they collect.
	Oregon	Retained by distributors and bottlers.
	New York	Retained by the Department of Environmental Conservation.
Canada	Alberta	Retained by distributor/bottler.
	British Columbia	Retained by distributor/bottler for non-alcohol and domestic beer. Retained by vendor for alcohol.
Europe	Germany	While it is not a deposit system, the Producer Responsibility Organisation (PRO) DSD retains funds to subsidise system expenses.
	Sweden	Retained by the beverage fillers to fund system.
Israel	-	Unclaimed deposits transferred from manufacturers and fillers to a Maintenance of Cleanliness Fund.

Table 4.4-1: Fate of unclaimed deposits in various deposit systems around the world

The unclaimed deposits are managed by the administration authority. As discussed above in *Section 4.3.2* the administrative authority can either be a government body, a PRO, or both. The money from the unclaimed deposits can be used for a number of purposes. Some examples are to:

- offset industry's costs of complying with CDL. The packaging and beverage industry often claim their expenses associated with CDL are greater than the handling fee.
- subsidise collection centres.
- subsidise Councils' kerbside collection programs. If there is a negative economic impact on Councils' kerbside collection of recyclables, they can be reimbursed by some of the unclaimed deposits.
- support education about the Act.
- support enforcement and administration of the Act.
- support waste management projects including recycling programs.

If the unclaimed deposits in NSW were to be managed by the government if CDL were introduced, it is important to ensure the constitutional issues are first addressed and understood to avoid potential conflicts.

4.5 Auditing Efficiency

The introduction of a CDL requires several parts of the system to be monitored and audited. The extent of auditing efficiency will depend on the type of system implemented. This section briefly discusses the issues of efficiency in relation to auditing brand owners and kerbside collections.

4.5.1 Brand Owners

Some existing deposit systems are seen to be more efficient than others. For example, systems such as the Californian legislation which do not require sorting and counting of used containers by brand names are deemed more efficient in terms of record keeping. A single collector can simply gather containers from all the various redemption points and only sort by material before they are transported to the reprocessors (Ackerman, 1995). In contrast, both Massachusetts and South Australian systems require recovered containers to be sorted by brand names, in addition to container counts. This is necessary, as bottlers are responsible for the particular containers they sell. Each bottler (or a representative) must collect containers from the various redemption centres. This type of system adds significant inefficiencies to the record keeping and auditing process.

In South Australia there are three 'supercollectors' (representatives of the brand owners responsible for the collection of materials). Previously, each of the three supercollectors collected only those used beverage containers from certain brand owners. This led to inefficiencies. Statewide Recyclers (SWR) is the largest supercollector in SA and handles over 60 percent of the recovered containers. Currently, SWR has the license to recover PET bottles from both Coca Cola Amatil (CCA) and Cadbury-Schweppes (CS) and the split is handled via an audit. This is more efficient than the previous method. However, the same system has not been applied to glass collection and sorting, where nine splits are needed, three for different brands and three for different glass colours.

4.5.2 Kerbside

To achieve maximum benefits in NSW, a kerbside program should complement a CDL program. When CDL exists in conjunction with a kerbside recycling program, auditing is also required to account for the deposit bearing containers collected in the kerbside systems and to refund deposits to each kerbside operator. In California, this is achieved relatively efficiently by determining a statewide average of deposit bearing containers in kerbside. This is achieved by conducting audits at periodic intervals of state-wide kerbside commingled collection to calculate the proportion of deposit bearing materials to non-deposit bearing materials. The associated refund amount is then distributed evenly between operators. However, if an individual kerbside operator believes he is entitled to a greater refund rate than the state-wide average, that operator can receive an individual rate (based on auditing of that individual kerbside collection). This method is highly efficient and avoids the need for extra record keeping of all individual kerbside operators and thus higher costs associated with the system (Hill, 1997a; California Beverage Container Recycling and Litter Reduction Act, 1987).

In South Australia, kerbside operators currently take recovered materials to depots and are reimbursed the appropriate amount via an audit. In NSW, although CDL does not currently exist, a system has been in place where the NSW EPA audited kerbside recovered materials and reimbursed the councils on a per tonnage basis for materials collected.

4.5.3 System Efficiency

It is evident that if CDL were to be implemented in NSW the system efficiency should be maximised to avoid unnecessary costs, based on experience from systems in SA and abroad. In Hudson's (2000) review of CDL in South Australia, a number of strategies for cost reduction were recommended (Hudson, 2000 p46):

- Centralise and simplify the system;
- Reduce the number of industry sectors involved in the system, and;
- Minimise conflict between industry sectors, particularly in relation to handling fees.

4.6 Handling Fees and Charges

Many CDL systems (including South Australia's) use a 'handling fee' or charge distinct from the container deposit to supplement transfer payments within a CDL system to certain stakeholders. This section examines the issue of handling fees in terms of how it may assist the overall implementation of CDL in NSW and how this fee structure might work. Included in this section is a definition of handling fees, a description of who usually pays and receives the fees, the size of the fee in other CDL systems and how much it might be in NSW, should CDL be implemented.

4.6.1 The Need for a Handling Fee

Most of the costs related to CDL are associated with container return and deposit redemption activities. The handling fee is a means of reimbursing the retailers, or actors who receive containers, for their associated costs. Container return and deposit redemption activities involve sorting, counting, record keeping, storing of containers, and refunding deposits to consumers (Ackerman, 1995 p16). Handling fees may be paid using private funds from fillers or through a centralised authority, as in California. See *Section 4.3 Administration of the CDL System* for more detail.

Handling fees differ among various deposit-refund systems. In a few systems no handling fee is paid as handling returned containers is seen as a normal part of beverage sales. Others see the handling of returned containers as an action taken on behalf of the manufacturer who produced the containers and a handling fee is reasonable compensation.

4.6.2 Payment of Handling Fees

The cost of handling fees may be passed from the bottlers or retailers to consumers through the price of a product. The handling fees are an additional cost to the consumer, non-redeemable, and included in the overall cost of a product. The additional cost paid by consumers must be balanced by the environmental benefits of a CDL system.

4.6.3 Recipients of Handling Fees

The recipient of handling fees varies according to the type of deposit-refund system. Under a point of sale system, typical of the US, the bottler pays the handling fee to the retailer. The retailer plays a large part in redemption and thus incurs associated redemption costs (Ackerman, 1995 p16).

In California, the redemption system is more centralised. Retailer and bottler costs are replaced by administrative costs and recycler and processor costs. The State administers the system, keeps the unclaimed deposits, and pays a handling fee to Convenience Zone centres (Ackerman, 1995 p20).

In CDL systems with depots, handling fees are paid to the depot operators for handling and processing. In South Australia, there are both supercollectors (materials coordinators) and recycling depots, who receive a 3¢ handling fee from the fillers.

4.6.4 Monitoring and Administration of the Fees

The administration and implementation of handling fees varies between systems and countries, it may be co-ordinated either by the private or public sector (See *Section 4.3 Administration of the CDL System* for further discussion on CDL administrative bodies).

In California the system is centralised, beverage manufacturers and distributors pay into the Beverage Container Recycling Fund. This fund is administered by the state. After containers are redeemed, the recyclers and processors are reimbursed from the fund. The unclaimed deposits are then used to fund administration of the program, kerbside collection systems, grants for non-profit organisations, recyclers and special projects (Hill, 1997a p4).

In South Australia, 'co-ordinators' (agents of the beverage fillers) pay a 3¢ handling fee to the recycling depots. Recycling depots are reimbursed on a weight basis, although some country recycling depots receive payment on a statutory declaration of units (Anderson Muller Consulting Pty Ltd, 2000 p11).

In European countries, the payment of handling fees is not as straightforward because it relates to container type, size, the presence of a deposit, and to whom it is paid: either the retailer or beverage filler. In Sweden, the handling fee for aluminium cans for example, depends on whether the containers have been counted by the retailer or brewery. The handling fees are first paid to the breweries, which then transfer the money to the retailers. Retailers receive 2.7¢[2] per aluminium can, when the filler comes to pick up the empty cans. The filler receives a 1.4¢ handling fee from Returpak, the licensed authority to administer CDL in Sweden. Separate Returpak corporations exist for the different container material types, such as PET and aluminium. (Vanthournout, 1998, p47).

In Switzerland there is no deposit on containers, the whole recycling system is financed with advanced recycling fees funded by the fillers. Fillers and importers pay 6.7¢ per can or PET bottle to a recycling fund (Vanthournout, 1998 p59). Collectors receive $1.71 AUD per kilogram of cans. To avoid mandatory deposits and take back responsibilities, retailers and industry were motivated to cooperate in making the system work. In the case of PET, retailers are provided with collection bags and containers (Vanthournout, 1998 p68).

Like Sweden, in Germany the costs of collection and sorting are covered by pre-paid licence fees, paid by manufacturers, producers, fillers, and importers. The licence fees do not cover recycling costs. The licence fee system is differentiated for different materials (Vanthournout, 1998 p15).

[2] Amounts were only available in US dollars, conversion to Australian dollars undertaken using the exchange rate in February 2001.

4.6.5 Handling Fees in other Deposit-Refund Systems

Table 4.6-1 summarises the different handling fees charged in CDL systems around the world. It provides the amount in local currency and converted into Australian dollars. Due to the different ways in which these CDL systems are configured and implemented (i.e. some are point of sale, some depot only, some have PROs, some government authorities, etc.) the handling fees given in *Table 4.6-1* are not described relative to the overall costs to administer the system.

Country	State	Handling fee charged in original currency	In Australian cents (@ 23rd March 2001)
Australia	South Australia	AUS 3¢	3¢
Canada[3]	British Columbia	CA 3.8¢ per container average (differentiated by product type)	6¢
	Alberta	<500ml: CA 3¢ > 500ml: CA 5¢ >imported beer: CA 3.55¢	4.7¢ 7.9¢ 5.6¢
	New Brunswick	CA 3¢ Refillable beer: CA 2¢	4.7¢ 3.1¢
	Ontario	None	
USA[4]	California		1.7[5]¢
	Connecticut	Beer: US 1.5¢ Soft Drinks: US 2¢	2.9 ¢ 3.9 ¢
	Delaware	US 1¢ (20% of (5¢) deposit)	1.9 ¢
	Massachusetts	US: 2.25¢ (originally 1¢)	4.3¢
	Michigan	None (25% of unredeemed deposits go to retailers)	-

Table 4.6-1: A comparison of international and South Australian CDL handling fees. Source: Canada: www.container-recycling.org/page19.htm U.S: Container Recycling Institute, 2000 p 43

4.6.6 Handling Fees in NSW

Estimated handling fees for NSW based on the cost of establishing and running a deposit and refund system will vary between the different CDL options. This section briefly addresses appropriate levels of handling fees based on system costs of a CDL system, and consumers' willingness to pay for such handling costs.

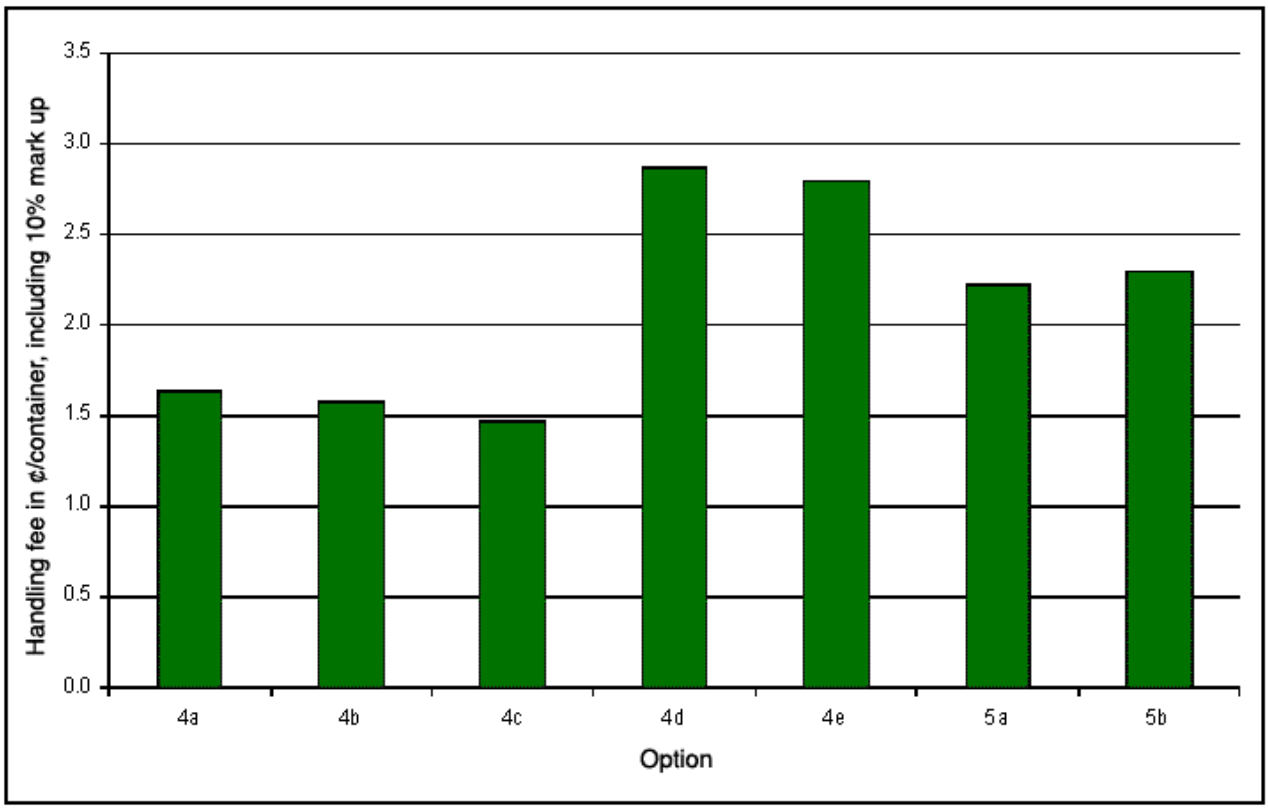
[3] Conversion in AU ¢ in March 2001 from http://www.xe.com

[4] Conversion in AU ¢ February 2001.

[5] The Department of Conservation pays handling fees to qualifying recycling centres, to a maximum of $2,000 per month (Hill, 1997 p4).

System Costs per Container

Figure 4.6-1 illustrates the appropriate handling fees for different CDL options[6] based on the total costs of establishing and operating the CDL system. The levels of the handling fee were determined on a cents/container basis. The figure indicates an appropriate level of handling fee based on such a method would be between 1.5 – 3¢ per container.



Option 4a - CDL intermediate 5c	Option 4b - CDL intermediate 10c	Option 4c - CDL intermediate 20c	Option 4d - CDL convenient 10c
Option 4e - CDL convenient 20c	Option 5a - CDL POS 10c	Option 5b - CDL POS 20c	

Figure 4.6-1: Handling fee required for various CDL options.

Consumers' Willingness to Pay for Additional Costs of CDL

To gain an indication of consumer attitudes and willingness to pay for handling fees in a CDL system, the CDL Televote Respondents were asked two questions regarding their willingness to pay *additional* costs which may (or may not) result if CDL was introduced in NSW. These results indicate the willingness of consumers to pay an extra handling fee in order to maintain a CDL system. It was explained to respondents that:

[6] For a full description of the options modelled by the CDL Review see *Section 3.2: Scenario Description and Container Material Flows.*

> "*Some container deposit systems cost money to set up and run. These costs may mean that the price of some products could increase. Consumers of these products may have to pay to fund the running of the system in addition to paying for a refundable deposit.*
>
> "*For a typical product in a container (costing around $2.00) how much extra would you be prepared to pay to maintain this system?*"

The responses were given without prompting and exact responses were recorded and subsequently coded into appropriate categories. *Figure 4.6-2* illustrates the responses.

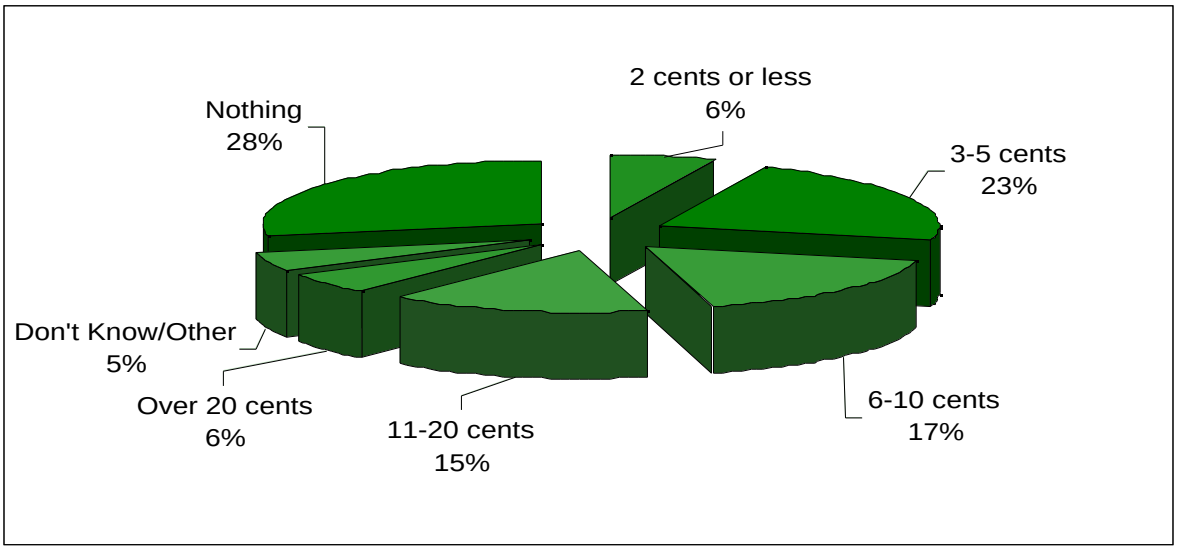


Figure 4.6-2: Respondent willingness to pay for maintaining a container deposit system in addition to the deposit amount.

The majority (67 percent) of respondents indicated that they are willing to pay some amount above the deposit cost for maintaining a container deposit system. Approximately 28 percent of the respondents indicated they would not be willing to pay any extra amount on a container to cover costs associated with running a CDL System in NSW. Those respondents who said that they would be willing to pay 'nothing extra' (i.e. the 28 percent) also did not support the introduction of CDL in NSW (asked in an earlier Televote Survey Question).

From these results we can infer that the majority of consumers would be willing to pay the handling fees which may be required if CDL were implemented in NSW. For a full description of the CDL Televote Survey results see *Volume III: Appendix E.*

4.7 Level of Deposit

The size of the deposit placed on containers is an important parameter in the design of a CDL system. The level of deposit affects both the overall return rates achieved under the system as well as the size and distribution of the financial impacts across different stakeholder groups. In determining the appropriate level of deposit the following considerations need to be weighed:

- The desired recovery rate of deposit bearing containers: higher deposit levels will achieve higher rates of recovery.
- The financial burden placed on consumers who are unwilling or unable to redeem their deposits.

- The financial benefits to charities and other people who redeem deposits by collecting and returning other peoples' containers.
- The financial burden placed on collection centres or retailers due to the lag between when they pay deposits to members of the public and when they receive payment for the deposits from downstream recycling collectors.
- The incentive for fraudulent redemption of containers for which a deposit was not paid on purchase (e.g. container purchased in other states) and the cost of preventing such fraudulent redemptions.

This section of the report addresses the issue of the appropriate level of deposit on beverage containers under a CDL system with reference to international examples, consumer preferences and potential recovery rates achievable with various deposit levels.

4.7.1 Interstate and International Experience

Table 4.7-1 summarises the level of deposit in several other states and countries that have a deposit-refund system in place. In order to compare the level of deposits between countries, the deposit has been represented as a fraction of the cost of a can of *Coca-Cola*.

Country	State	Deposit level in US$, with the exception of Canada	In Australian cents (@ February 2001) for equivalent volumes	Cost of proportion of the can of cola in a supermarket in that country
Australia	South Australia		0.05	13%[7]
Canada[8]	British Columbia	0.05 <30 ¢	0.095	13%
	Alberta	< 1L 0.20 > 1L	0.10 0.38	13%
Sweden		0.7 cans 0.14 – 0.24 one way PET 0.56 refillable PET	1.33 0.27 – 0.46 1.06	7%
Switzerland		0.04 can 0.4 refillable & one –way PET, 0.16 refillable glass <0.6 L 0.40 refillable glass >0.6L	0.08 0.76 0.30 0.76	28%
Germany		0.3 < 1.5 L 0.6> 1.5 L	0.57 1.14	34%
USA[9]	California	0.025 < 24 oz 0.05 > 24 oz	0.05 0.10	8%
	Connecticut	Minimum 0.05	0.10	15%
	Delaware	0.05	0.10	15%
	Massachusetts	0.05	0.10	15%
	Michigan	0.10	0.19	30%

Table 4.7-1: A Comparison of deposit levels in various International and South Australian deposit-refund systems. Source: see Appendix K.

Table 4.7-1 indicates that there is a roughly four-fold variation in the relative magnitude of the deposit under different CDL systems, with deposits commonly around 7.5%, 15% or 30% of the price of a standard beverage. These fractions translated into Australian deposits would be approximately 6¢, 12¢, and 24¢ respectively. This range is reflected in the deposit levels modelled by the CDL Review of 5¢, 10¢, and 20¢. The most common level is 13-15 percent of the cost of a standard beverage. This corresponds to 12¢ Australian, which is close to the 10¢ deposit recommended for a potential CDL system in NSW at the end of this section.

[7] This is the fraction that the 5¢ deposit represented when it was introduced in 1978. Conversion based on CPI changes from 1978 (ABS, 2001c).

[8] Conversion in AU ¢ in March 2001 from http://www.xe.com

[9] Conversion in AU ¢ February 2001. This earlier conversion date is used because of the recent decline of the AU$ to the US$.

4.7.2 Deposit Level and Recovery Rates

The deposit level influences the recovery rates of the materials because a higher deposit increases the incentive to return used deposit-bearing containers. The relationship of deposit level to return rate was examined by the CDL Review in order to predict the returns rates that could be expected under the different options modelled. The analysis is presented in *Section 3.2: Scenario description and container/material flows*.

The relationship between recovery rates and level of deposit is logarithmic with recovery rate increasing sharply with increasing deposit at relatively low levels of deposit and levelling off as the deposit rises and return rates approach 100 percent. The result is that a deposit of around 5¢ would potentially be sufficient to achieve a recovery rate of 80 percent, whereas the deposit would need to increase to around 10¢ or 20¢ if recovery rates of 90 percent or 98 percent respectively were desired.

In a review of New York's Bottle Bill, The Moreland Act Commission (1990 p19) considered that changing the level of deposit in order to increase return rates may be flawed because the reasons cited by consumers for not returning containers are not primarily financial. Consumers related lack of participation to a lack of storage space, lack of commitment to recycling, and the inconvenience of the current collection centres (Moreland Commission, 1990, p 19).

The findings of the Moreland Commission in relation to consumer motivations for recycling is consistent with the findings of other studies into this issue (see *Section 2.6 Recycling Behaviour and Motivations)*. However, the conclusion that these motivations will mean that return rates will not increase with increasing level of deposit is not supported either by the empirical comparison of international return rates, or by the experience in Sweden. After three and a half years of having a deposit on aluminium beverage cans in Sweden, the size of the deposit was doubled from 0.25SEK to 0.5SEK (3.5 percent to 7 percent of the price of a can of cola). The increase in deposit was a deliberate and successful attempt to improve return rates, which posted a steady increase from roughly 70 percent to over 90 percent over the following five years (Vanthournout, 1998 p54).

The inconsistency between the apparent determinants of consumer participation in CDL systems and the observed effects on return rate may partly be due to the fact that consumers are not the sole group on whom the overall return rate depends. The level of scavenging and the level of participation by commercial stakeholders such as bars and restaurants are also important determinants of the overall return rate achieved. No literature on the effect of the level of deposit on these groups was found.

4.7.3 Deposit Level: Stakeholders Views

A desire for a higher deposit level to yield higher recover rates must be balanced with stakeholder preferences for often lower deposit levels. The main stakeholder group affected by deposit levels are consumers. This section discusses preferences of potential consumers of deposit bearing containers in NSW as revealed by the CDL Televote Survey and the CDL Citizens' Forum.

4.7.3.1 Evidence from the CDL Televote Survey

All respondents to the Televote Survey, regardless of their position on CDL, were asked questions related to deposit levels on what they would do if a Container Deposit System were introduced in NSW. They were asked the following questions on deposit levels:

"What do you think is an appropriate amount of money to be refunded on containers?"

> *"What level of deposit would encourage you personally to return containers to either a shop or a collection depot?"*

The questions were open-ended and did not provide a range of amounts from which the respondent could choose. The interviewers prompted only if necessary with the words "5, 10, 20, 50 cents or more?". For the full results of this question, see *Volume III: Appendix E*.

A large proportion of respondents (42 percent) suggested an amount between 1 to five cents as an appropriate level for a container refund. A further 27 percent felt that this level should be between six to ten cents and twelve percent felt that an appropriate level was between eleven to twenty cents. A small proportion (9 percent) of respondents felt that no amount would be appropriate. The majority of the latter respondents also thought that CDL should not be introduced in NSW. It is difficult to judge from these results the degree to which the responses to this question were influenced by the familiarity of NSW residents with the 5c deposit in South Australia. It is also difficult to predict the level of dissatisfaction that respondents would feel if a deposit was set at a level outside their preferred range.

When asked what level of deposit would encourage the respondent personally to return containers to a shop or collection depot, approximately 20 percent felt that no amount would influence them. It is assumed that respondents would be influenced to use the system with a deposit level equal to or greater than the amount they mentioned. This means that a majority (69 percent) would be influenced to return containers to a shop or depot if the deposit level was greater than 21 cents. If the deposit level were between eleven to twenty cents, then approximately 56 percent would be expected to use the system, and this drops to 24 percent of respondents feeling they would be motivated to return containers if the deposit is five cents or lower.

Those respondents indicating a higher level of deposit required for them personally to be motivated to return containers were more likely to suggest a higher level of appropriate refund.

Based on the responses to all three questions on this topic posed in the CDL Televote Survey, a deposit of 10¢ would seem an appropriate compromise between participation in the system and community support.

4.7.3.2 Consumer Preferences: Citizens' Forum

The Citizens' Forum discussed at length the issues of deposit levels. As a result they specifically recommend the following action:

> ***"****It was unanimously agreed that the deposit be in the range of 5-10 cents.*
>
> *As a group we all agree that a 10¢ deposit would be more of an incentive (than 5¢) to make this scheme work. However, some members of the panel have concerns that a 10¢ deposit would make the transition more difficult.*
>
> *The discussion covered the socio-economic effects of a 5¢ deposit and the extra incentive to increase return that a 10¢ deposit would provide.*
>
> *All members agreed that the amount of the deposit would affect the success of the scheme. The group was divided in their opinions on whether a higher deposit would provide an extra incentive to return containers, as opposed to a lower deposit providing a smoother transition and less adverse impact on lower income earners.*
>
> *The impact on lower income groups was discussed because the group felt sure that the consumer would feel some impact and they had concerns for this potentially impacted group****."***
>
> (*Volume III: Section 8: Citizen Jury, Recommendation 5: Level of Deposit*)

4.7.4 Differential Deposits

Differential deposits are applied to different container types and container sizes in many CDL systems around the world (e.g. Sweden, California & Maine in USA, Alberta & British Columbia in Canada). The different deposits are intended to reflect the value of the container return, larger containers and more valuable materials being given a higher deposit.

In a review of New York's Bottle Bill, The Moreland Act Commission (1990, p17) cites proposals that recommend the introduction of a tiered approach to refund values: 25¢ for 1 litre and one way containers; 5¢ or 15¢ for reusable containers; or a 5¢ deposit in some areas and 10¢ in other areas with low return rates.

The Moreland Commission report also recommended that refund values should be increased from 5 to 6¢ for containers redeemed at 'redemption centres'. This was recommended in order to increase consumer incentive to redeem containers at redemption centres rather than to other collection points such as smaller retailers (who would only refund 5¢) (Moreland Commission, 1990, p 16).

Due to the increased complexity that differential deposits add to a CDL system, it is recommended that they would not be appropriate during the initial phase of a CDL system.

4.7.5 Conclusion

An undifferentiated deposit of 10¢ would be the most appropriate initial deposit level if CDL was introduced in NSW. An increased deposit or differentiated deposits could be appropriate for introduction at a later stage when the system was more established.

4.8 Cross Border Issues

4.8.1 Introduction

Cross border issues relate to the fraudulent redemption of containers in a deposit state, other than the state where they were originally purchased. In NSW, the main areas of concern are Albury on the Victorian border and Tweed Heads on the Queensland border.

Fraudulent redemption may add significant costs through loss of deposits in the CDL system and by increasing operational costs for the retailers and distributors.

4.8.2 Economics of Fraudulent Redemptions

This section discusses the economics of border crossing from a non-deposit state to a deposit state to fraudulently redeem deposit bearing containers.

There are reports in the literature regarding fraudulent redemption from neighbouring states representing a cost to deposit states. For example, Michigan, which has a high use of reverse vending machines, and reasonable proximity to other non-deposit states, reports a high instance of fraudulent redemption.[10] This report attempts to quantify the costs and benefits of fraudulent redemptions. While it estimates the costs

[10] Stutz, J & Gilbert, C (2000) "Michigan Bottle Bill - A Final Report to: Michigan Great Lakes Protection Fund", p11

to be in the order of US$14 million, the benefits were estimated at US$1.2 million (Stutz and Gilbert, 2000).

Although the population density of NSW and surrounding states is significantly lower than in Michigan, it was found that fraudulent redemption may be a significant issue if CDL is introduced in NSW. Modelling undertaken as part of the CDL Review showed that the fraudulent redemption of aluminium, PET and glass containers with a five cent or ten cent deposit value across the NSW border with Victoria and Queensland would be cost-effective relative to freight costs (See *Appendix K* for further details). Aluminium cans were found to have the highest value followed by glass and PET. The following *Figures 4.8-1,2,3* demonstrate the potential break even points for trucking containers from the border between NSW and non-deposit states (such as Queensland) to the nearest potential collection centre.

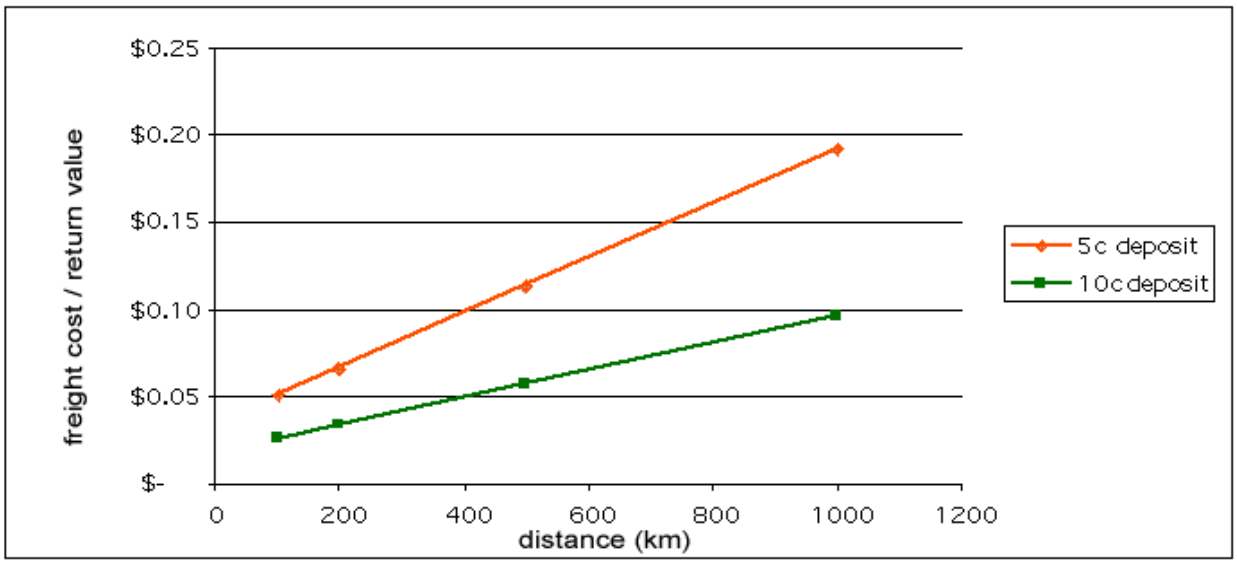


Figure 4.8-1: Cost effectiveness of fraudulently redeeming aluminium cans across the border

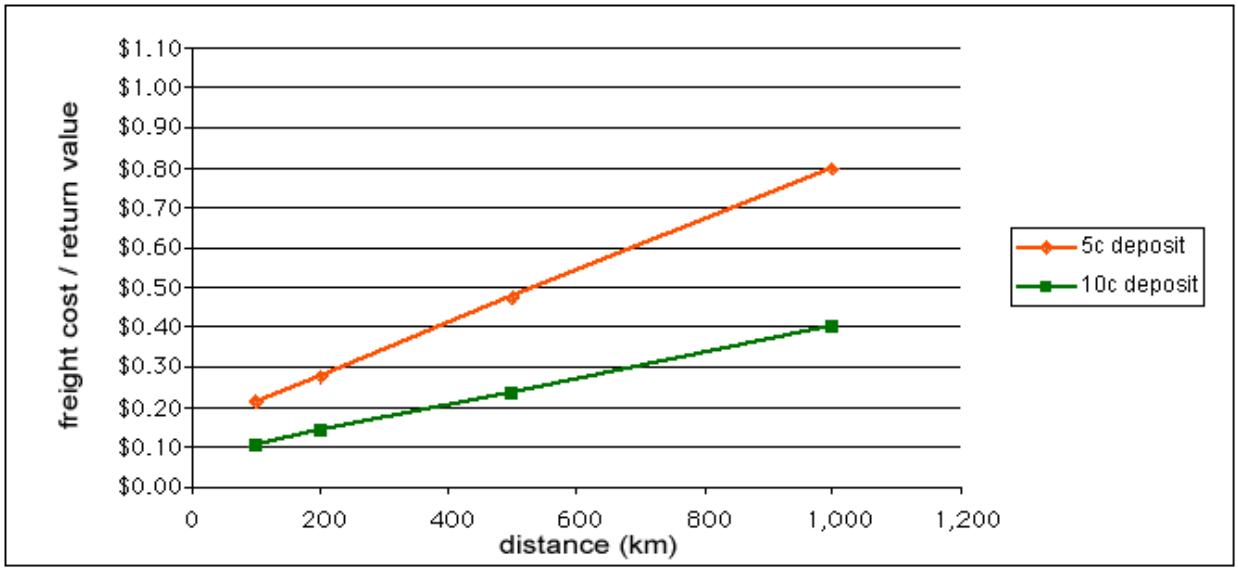


Figure 4.8-2: Cost effectiveness of fraudulently redeeming PET bottles across the border.

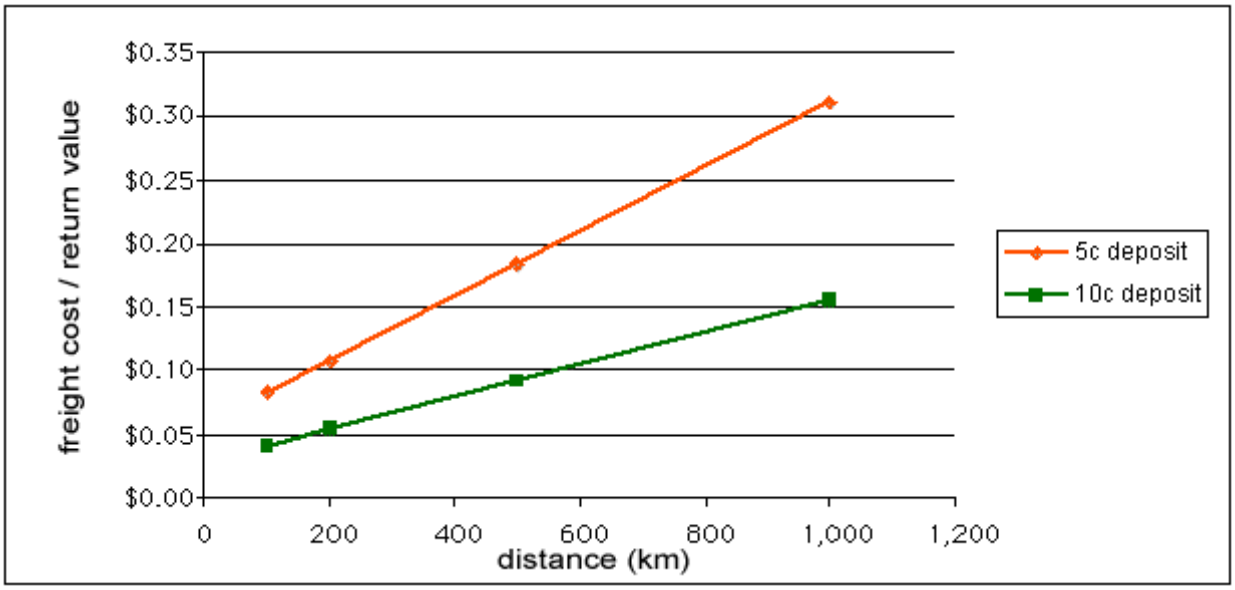


Figure 4.8-3: Cost effectiveness of fraudulently redeeming glass bottles across the border.

The modelling is based on the use of three tonne trucks with 18m^3 capacity to transport uncompacted containers from 100km to 1000km into NSW. The results show that for uncompacted aluminium, PET and glass, it is cost-effective to transport 5c or 10c cent deposit-bearing containers in a three tonne rental truck from Melbourne and Brisbane across the NSW border to Albury and Tweed Heads respectively (See *Figure 4.8-1,2,3*).

4.8.3 Controlling Fraudulent Redemptions

According to the above analysis, it is cost effective to fraudulently redeem deposit bearing containers across the border. The cost of fraudulent redemptions may be significant and thus warrants some form of control. Options for reducing the incidence of fraudulent redemption include:

- separate labelling of containers sold in NSW;
- licensing of contractors and depot operators who are allowed to redeem compacted containers, with extra scrutiny and compliance monitoring at depots near the state border;
- substantial fines for people caught deliberately redeeming out of state containers, as is done in Maine;
- setting an upper bound on numbers of containers/person/day that can be redeemed, or;
- introduction of a comparable form of deposit and refund system in neighbouring states.

4.9 Access and Convenience

The interface between stakeholders and the CDL system is of crucial importance to the acceptability and ultimate success of any recycling or waste management system. This interface can be designed to facilitate high return rates for recycling, and key to this are issues of accessibility and convenience [11].

The CDL Citizens' Forum was especially concerned that convenience, accessibility, and equity be considered in the event of the introduction of CDL. In their 'Citizens' Forum Report', they expressly recommend that:

> *"Access to redemption venues for containers be easily accessible to all members of the community. Considerations must include:*
>
> - *provision for urban collection depots to be within a five km distance of all residents;*
> - *elderly, disabled, non-ambulatory, non-car owners and housebound groups are catered for; and*
> - *consideration be taken of the needs of all the rural population."*
>
> (Citizens' Forum Report, Page 3, See *Volume III: Appendix G*)

Additionally, respondents who were not in favour of CDL[12] in the Televote Survey stated that the key reason why CDL should not be introduced was "inconvenience". Up to 57 percent of respondents mentioning reasons such as it would be a "hassle", "inconvenience", "people too lazy" (*Volume III: Appendix E, p 18*).

Though the most convenient system will undoubtedly encourage consumer participation, this needs to be balanced with consideration to both the whole system costs and distributional costs of providing this convenience in order to implement an optimal CDL system.

Different stakeholders have different requirements for access, convenience and education, even within their stakeholder groupings. For instance, the issues listed by the Citizens' Forum above will affect consumers differently, depending on their location, mode of transport available, lifestyles, and motivations. For example, for the fourteen percent (ABS, 1998c) of the NSW households who do not own a car, dropping off containers to collection centres that are not in either walking distance or easily accessible by public transport will be a major barrier to accessing a deposit return system. However, if a point of sale (POS) system is introduced, consumers are much more able to access a collection point at the same time as doing their shopping. As a result, the different access and convenience issues are discussed for the various CDL scenarios and options. After examining these issues, they must be weighed against the different costs identified with these options as discussed in *Section 3.3* (including infrastructure, environmental, and transport costs), and how these costs can be minimised and shared between the different stakeholders.

[11] This list of issues is drawn from Thomas Linqdvist, 2000 p103; Rush Social Research, 1999 p10.

[12] The percentage of respondents not in favour of CDL in Survey 1 was 21%, and Survey 2 was 33%, see *Volume III: Appendix E: Televote Survey Results*

4.9.1 Access and Convenience Issues

Access to the infrastructure of CDL is a fundamental component of the whole system. Good access enables high participation of stakeholders. However, the convenience of the different CDL options is dictated by issues relating to urban form, such as transport infrastructure and population density. Engwicht writes:

> "In many cities, the physical arrangement of roads and facilities is such that only those who own cars have access" (Engwicht, 1992, p109).

4.9.1.1 Distance to Collection Centres

As recommended by the CDL Citizen Panel, the actual distance to collection centres for collectors *and* consumers is of concern – not only in relation to transport costs (both financial and environmental), but also associated with social issues such as equity and the relative impact of CDL on different citizens.

The least costly infrastructure of the CDL options was shown in *Section 3.5* to be Options 4a (CDL Intermediate 5¢), 4b (CDL Intermediate 10¢) and 4c (CDL Intermediate 20¢). However, to non-car owners or those who live a long way from collection centres, travelling to the centre may end up costing them more than foregoing the deposit. This could result in less containers recovered and an inequitable system. In effect, reduced infrastructure costs are a result of increased cost to consumers (in both their transport costs, loss of deposits, time, and labour – see *Section 3.6.4 Consumers*). Because of different socio-demographic circumstances including location disadvantages and lack of access to transport, some consumers end up paying more for CDL than others.

4.9.1.2 Location of Collection Centres

Apart from the distance travelled to collection centres, the actual location of the collection centre will have different effects on users depending on their own access to transport and timing.

It is here that the main differences between the various CDL options emerge. A POS system relies on current infrastructure, nodal points for interchange (i.e. shopping centres and other retail outlets), transport interchanges etc.

For people with limited access to public transport, private vehicles may be necessary to access collection centres. As has been explored in *Section 3.3.7: Cost of Consumer Transport*, this has various economic and environmental impacts. For those with limited access to cars, there may be some difficulties in accessing collection centres that are not near public transport nodal points (such as shopping centres or schools).

The 'Drive-Thru Recycling Centres' model proposed by the Western Sydney Waste Board (WSWB), must be located in convenient and high profile places to facilitate high use rates. In the proposal for these centres, it is stated the Drive-Thru Recycling Centres must be:

> *"Well designed, well branded, conveniently located facilities, welcoming all members of the community;" and should be "located on main roads with convenient access (in much the same way as service stations and fast food outlets are located) not in out of the way or industrial locations" (WSWB, 2000 p5).*

4.9.1.3 Number of Options for Returning Containers

Maximising the numbers of pathways available by which a consumer can return used beverage containers will increase recovery rates. Providing multiple pathways recognises and caters for the different needs and situations of different consumers, as discussed above. Different collection systems may be optimal for different consumers.

4.9.1.4 Opening Hours of Collection Centres

Maximising the hours when consumers can return containers will increase the usability of the CDL system. Extended hours of operation may increase the convenience of the system to consumers (and others returning containers) at the expense of operators of collection centres or retailers (under a POS system).

4.9.1.5 Cleanliness of Collection Centres

While issues of health and hygiene are discussed in *Section 3.5.3 Retailers*, this subsection refers to the visual and olfactory amenity of collection centres. Consumers may be discouraged from returning their used beverage containers to collection centres which are odorous or visually offensive.

4.9.1.6 Socio-Demographic Effects on Convenience

The different ways in which access and convenience issues of CDL affect selected societal groups are summarised below. Only groups that face particular issues related to access and equity are listed. However, all groups will face some of these issues – perhaps to a lesser degree. The different CDL scenarios and options are discussed where relevant.

- ***Youth***

  CDL represents a potential new stream of income for the young through collecting and returning containers either from at home or away from home consumption. The extent to which this will be realised will depend on their ability to access collection centres and the modes of transport available to them. There are additionally some safety concerns in carrying large numbers of containers long distances, and the safety of the collection centre itself (including opening hours). A point of sale system might encourage further consumption by youths at that retail outlet.

- ***Elderly***

  The extent to which elderly people will utilise a CDL system based on collection centres will depend of their willingness (and ability) to clean, sort, store and transport containers. Elderly people might face some difficulties in accessing collection centres depending on their own personal mobility and access to transport and services. The safety and usability of collection centres is also of crucial importance. A point of sale system will only assist elderly people if they are already actively using shopping centres, have access to transport, and can carry used containers easily.

- ***Women***

  While a kerbside system is undoubtedly convenient for women who are working from or at home, a point of sale system would be the next most convenient option for women (women, by and large, are the household members most likely to undertake food purchasing activities (ABS, 1997a). The safety and amenity of collection centres is especially important for women. Issues include whether the centre is staffed or automatic, the presence of sufficient lighting, cleanliness, location, and opening hours.

- ***Non-English Speaking Backgrounds***

  The accessibility and convenience of CDL mainly affects people with a non-English speaking background in terms of information design and marketing, especially at the actual place of return and during the introduction of the system.

- ***People with Disabilities***

  The access and convenience issues faced by this group will largely depend on the degree of personal mobility the person has. Making collection centres accessible to disabled people will encourage participation, and collection centres with staff will facilitate their participation.

- ***Rural & Remote***

  Only 76 percent of smaller towns currently have a kerbside recycling service, and even fewer remote communities have one. People from rural and remote communities will travel longer distances to collection centres and go less frequently, so opening hours are important to communicate. Any collection centres in such areas should be prepared to take back larger quantities of containers (which have been stored).

4.9.1.7 Discussion

In reality if CDL were implemented, a combination of the options for container redemption may be available, so accessibility issues may be well covered. For example, under a combined system, consumers may still be able to dispose of containers through kerbside pick-ups or donate their containers to charity groups who provide door to door pick-up services (*see Section 3.6.6*). However, in both these cases, the deposit is 'lost' to the consumer (or donated by the consumer) which raises issues of equity of the system as a whole. Often, informal collection systems develop, as has occurred in South Australia where depot operators offer collection services to households without a vehicle.

The CDL Review's own social research found that consumers tend to be more in favour of a point-of - sale system. The CDL Televote Survey found that 70 percent of respondents thought "shops should provide facilities for refunding deposits on containers" (see *Volume III: Section 7: CDL Televote*). This indicates that consumers believe that retail outlets were a convenient location to return deposit-bearing containers.

4.10 Education and Awareness Issues

The adequate design and targeting of information for different groups will be vital in the introduction of any new system – as well as for the maintenance of interest in systems already in operation. Information and education will affect consumer participation and stakeholder participation, their ability to correctly use the different waste systems in place, and will possibly help to reduce the costs of the system as a whole (e.g. via reducing the costs of contamination)[13].

4.10.1 Information and Education Requirements

International programs for EPR and CDL have included using celebrities and television shows (such as '*Home Improvement'* in the US), media events, educational videos for schools, public service announcements, newsletters, and information being placed on product packaging etc (OECD: EPR Guidance, 2000, p121).

An effective education and information campaign about CDL should:

- Offer clear and simple information and instructions at collection points and on labels;
- be understandable by different target groups (e.g. NESB groups, youth, elderly, small business, current waste operators etc);
- be up-to-date in regards to types of containers that have deposits and other materials that can be recycled and where they can be recycled (to reduce contamination);
- offer a standardised information package distributed across collection centres to minimise confusion and reduce costs (Anderson Muller Consulting, 2000 p23);
- design a strong brand and image for the program as a whole, and;
- specify the condition in which containers will be accepted (i.e. cleaned, sorted and counted). This behaviour could be encouraged via incentives such as prizes.

4.10.2 *Responsibility for an Education/Awareness Campaign*

The costs and responsibility for the education campaign will rest on different stakeholders depending on how CDL is implemented and regulated. In most countries or states where CDL has been introduced, this responsibility is shared by some of the key stakeholders. As a good education and information campaign will affect return rates (and thus the size of the unredeemed deposits fund), it is vital that this information and education be adequate. Additionally, some stakeholders can more effectively run an education campaign than others. The following stakeholders are well placed to contribute to the implementation of CDL in NSW.

4.10.2.1 Private Companies

- ***Retailers and Manufacturers****:* have much experience with advertising and promotional campaigns, already have well developed avenues for reaching the consumer and targeting audiences; should provide relevant information on the actual product labels (see *Section 3.3.6: Implementation Costs*)
- ***Producer Responsibility Organisations*** *(PRO's):* could help to standardise information and provide a central information point for the CDL system as a whole (e.g. by maintaining a website with vital information on where to find collection centres etc.). However, if the PRO is also in charge of the

[13] For some regions the costs of contamination are significant.

unredeemed deposits, government may have to require the PRO provide a certain level of education and information to ensure as high return rates as possible.

Additionally, retailers' associations could provide incentives to their stores to redeem – e.g. prizes to stores with best redemption rates. Such prizes could be used by retailers to advertise corporate social responsibility (CSR) and best practice.

4.10.2.2 Public Sector

In setting up the regulatory framework for CDL, some attention should be paid to defining exactly which stakeholders will share responsibility for education and information campaigns relating to CDL. For example the Moreland Commission recommends mandatory source separation (by users) to reduce contamination and costs for collection centres in New York State (Moreland Commission, 1990 p32).

NSW already has a highly developed and established public sector infrastructure dealing with waste related issues (e.g. through the Waste Boards and Local Government initiatives). The introduction of CDL could piggy-back on to some of these campaigns about waste which are already in place – for example, in school recycling programs.

4.10.2.3 Charities and Non-profit Organisations

Non-government organisations and charities also have well-developed pathways for information and education about specific issues, which could be used to promote CDL. For example:

- groups such as Keep Australia Beautiful could promote litter related CDL issues;
- environmental groups such as the Australian Conservation Foundation and Greenpeace could promote the environmental advantages of CDL and EPR;
- the Australian Consumers Association through its magazine *Choice* and its website, could explain the CDL system in terms of issues pertinent to consumers: (price changes, deposit levels convenience, accessibility), and;
- charities such as the Scouts and the Lions Club have well developed community networks which could be used to further educate their own membership as well as the larger community.

Financial assistance for such programs would have to be sourced either through direct revenues gained from CDL itself (see *Section 3.6.5: Charities and Non-profit Organisations*) or through government grants such as the NSW waste grants.

4.11 Responsibilities for Administration

Whether the administration is undertaken by government, PRO, or both, certain responsibilities listed in *Section 4.3.1* above should not be managed by the group administering funds, due to a conflict of interest. For example, if a PRO is the predominant administrative authority, a government agency should still be responsible for enforcing the legislation and potentially also ensuring appropriate targets are set, monitored and audited, and ensuring an appropriate education program is in place. If the administrative authority is a government body that *must* enforce the legislation, it is recommended that industry still play a role in the other tasks.

It is important that targets are set and monitored by the appropriate administrative group. It can be argued that an administrative authority should not be solely responsible for target setting and monitoring as targets set may not be meaningful enough to have an impact.

The same issue applies for education programs in the scenario where the PRO retains the unclaimed deposits. If the PRO is also responsible for educating the public about the deposit-refund system, it may be in their best interest to minimise the effectiveness of the education program, so that recovery rates are kept at a minimum and the number of unclaimed deposits are maximised. The same might occur if a government body both retains unclaimed deposits and manages the education campaign. To avoid this, it is recommended that the group retaining the unclaimed deposits not be given responsibility for education programs.

4.12 Use of International Best Practice in Implementation

The review of international experience has shown that there are many different models of container deposit legislation that exist, and that some have much better recovery rates than others. Based on the research carried out in this Review, it has been concluded that a large part of the differences in recovery rates are related to design elements of the program. Many of these design elements have been discussed in this chapter.

In establishing a CDL system, it would be appropriate to review the experience of various international models and of South Australia. Some of the factors that can provide higher recovery rates include:

- higher handling fees, more redemption centres, more advertising by them;
- higher levels of deposit;
- improved access and convenience, which can come voluntarily from higher handling fees, and/or required participation of major and minor retailers;
- improved education and awareness, which can come from redemption centres if handling fees make participation economically valuable.

4.13 Summary

Several important implementation issues have been addressed in this section:

- Legislative issues;
- Administrative issues;
- Unclaimed deposits;
- Auditing efficiency;
- Handling fees;
- Deposit levels;
- Cross border issues;
- Access and convenience issues, and ;
- Education and awareness.

While the major concerns within each issue have been raised and discussed, detailed recommendations have not been made as this is not within the boundaries of the CDL Review. This section simply highlights further implementation issues that need to be considered in implementing a CDL system.

4.14 Conclusions

On the basis of the information provided in this and other sections of this report, the CDL Review recommends that if CDL is introduced in NSW it have the following features:

- An initial deposit level of ten cents as a compromise between having a reasonable incentive for return and minimising both added cost to consumers and fraudulent redemption.
- Mandatory acceptance of used containers and refund of deposits by retailers of deposit-bearing containers. This should be subject to exemptions and/or qualifications that would prevent an inequitable burden being placed on small retailers when reasonable access for customers is otherwise available.
- A mechanism for ensuring that those parties involved in the acceptance of used containers and refunding of deposits are adequately compensated for those services.
- If a PRO is administering the deposit-return system, the government make provision that if anticipated recovery rates are not achieved, the Minister be able to require that brand owners increase the level of deposit, provide greater education and advertising and/or broaden the number of depot sites, as is the case in British Columbia (Morawski, 1999b).
- Until other means of controlling fraudulent redemptions is arranged, consideration be given, in consultation with industry, to providing for a significant fine for attempting to redeem containers purchased out of state, and that PROs be able to take such cases to court.

Section 5: ALTERNATIVES TO CDL

This section of the report introduces alternative regulatory mechanisms that may be capable of achieving the same recycling and waste minimisation outcomes for containers as would the introduction of CDL. The discussion is general in nature and based on published international literature rather than primary research in the NSW context. This section does not attempt to address in detail the feasibility or relative merit of these alternative mechanisms in the NSW context. Rather, its purpose is to enable the reader to understand that CDL is only one of a broad range of possible regulatory tools.

It is important to point out that the CDL Review considers that a best practice deposit-refund system would be more likely to achieve high container recovery rates in NSW than any of the other mechanisms discussed in this section that do not lead to or accompany a deposit-refund system. This is the case regardless of whether the best practice deposit-refund system is established by legislation (i.e. CDL) or by industry as a means of achieving recovery targets.

5.1 Introduction

This section considers how the objectives that could be achieved by CDL can be achieved to a greater or lesser degree through other means. However, each other policy incentive considered has limitations in achieving the same outcomes as CDL. Policy instruments that may be effective in a waste management strategy include:

- economic instruments (market-based incentives to alter practices);
- self-regulation (based on voluntary agreements), and;
- direct regulation (including enforcement and penalties for non-compliance) (Puplick, 1992).

The first alternatives to CDL discussed in this section are other economic instruments. It can be argued that economic incentives provide the most flexibility to industry (or those affected by the policy measure) whereas direct regulations are more rigid. Beder (1995) argues that while legislation and regulations may ensure firms meet particular targets, they are limited in that once the targets are met there is no incentive to go beyond them. According to Grabosky (1993, in Beder, 1995) economic instruments "*encourage industry to go beyond compliance and engage in continuous innovation and improvement*".

However, it can also be argued that, particularly in a situation where an instrument has significant effects beyond the industry initially affected, a government may prefer to set targets that are capable of being accomplished and let industry establish its own means of accomplishing them. As long as the targets are consistent with those shown to be achievable elsewhere, and there is a means of raising the targets if there is perceived need or value at a future date to "encourage ...continuous innovation and improvement", setting targets may be an appropriate regulatory approach.

There is often a blurred distinction between direct regulations and economic instruments given that for economic instruments to run effectively they usually require legislative or regulatory support. In Australia and overseas, regulations have been used to support the implementation of economic instruments (Environment Australia (1997). In the case of deposit-refund systems, government can implement the economic instrument through CDL, along with appropriate regulations, or provide a target through regulation which is likely to lead to an economic instrument, a deposit-refund system, being created by industry. Both approaches have been used elsewhere. Which approach should be used in NSW is a matter for political consideration. It is the position of this Review that any approach that results in a best-practice deposit-refund system would produce significant net benefits over the current situation.

5.2 Economic Instruments

5.2.1 Role of Economic Instruments

Economists have long promoted the use of economic instruments as environmental policy measures. Their major advantage is considered to be that environmental concerns are incorporated directly into the market economy. Economic instruments can allow for the fulfilment of environmental objectives, at the lowest cost, by triggering actions by both producers and consumers. For example, empirical studies have shown that the use of economic instruments for emission reduction has achieved cost savings compared to uniform emission standards (CRRECCEE, 1998).

The trend in OECD countries is to make use of economic instruments by integrating environmental externalities into the fiscal system. This has be done in two ways:

- Environmental tax revenues replace distortionary tax revenue (mainly taxes on labour).
- By the elimination of tax exemptions and subsidies that can be environmentally harmful.

The effect of the use of the economic instruments discussed in *Section 5.1.1.2* on the refillables market was discussed in more detail in *Section 2.4* and *Appendix C*.

5.2.2 Types of Economic Instruments

According to Puplick and Nicholls (1992) in addition to deposit-refund systems (such as CDL) there are four other generic types of economic instruments, including:

- charges;
- subsidies;
- market creation;
- enforcement incentives.

These market-based instruments are discussed below in further detail in relation to waste management in Australia. Various economic instruments are designed to intervene at different process stages relevant to waste management. This is depicted in *Figure 5.1*.

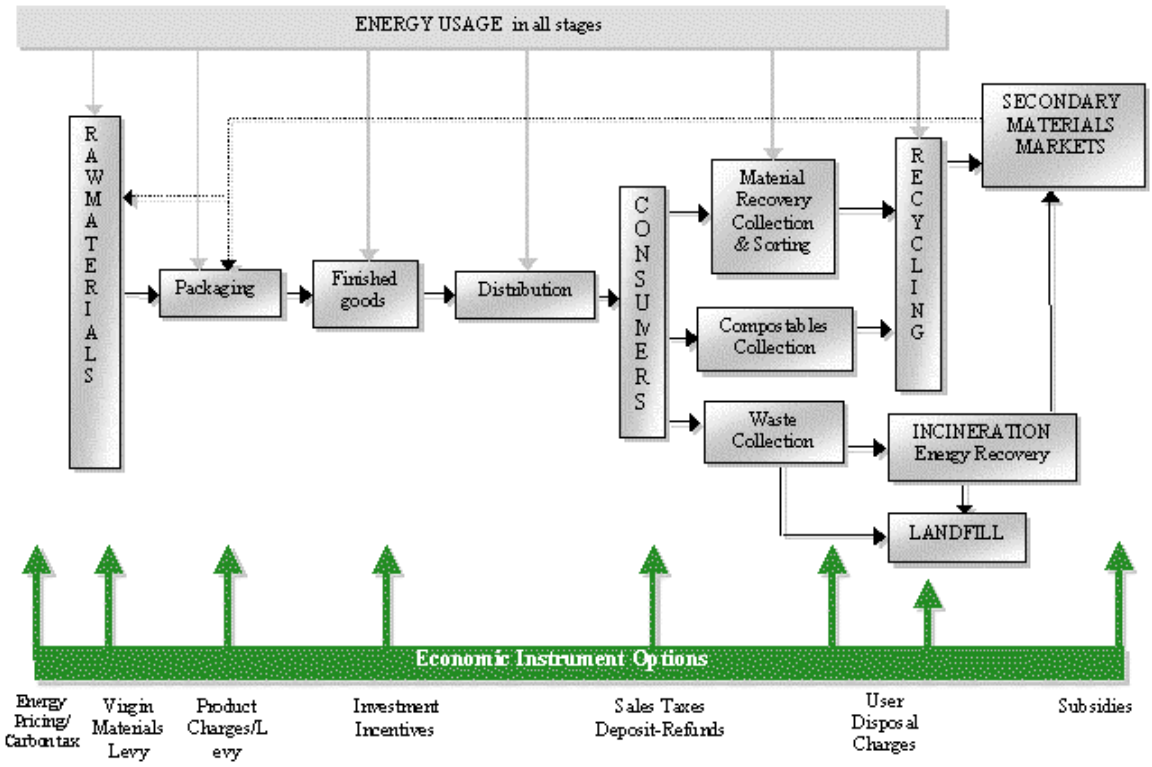


Figure 5.1-1: Economic instrument options for packaging and other waste.

Source: Puplick, C. and Nicholls, B. (1992), Completely Wrapped: Packaging, Waste Management and the Australian Environment, Packaging Environment Foundation of Australia, Sydney

5.2.3 Charges

5.2.3.1 Description

Charges may include such economic tools as:

- advance disposal fee (ADF);
- user charges – waste disposal charges and levies;
- product charges – virgin materials levy, unit packaging levy;
- tax differentials – to discourage environmentally harmful products or processes and encourage more environmentally friendly ones, and;
- administration charges.

An environmental tax (or eco-tax) on products internalises those environmental costs of producing, using and disposing of a particular product not already included in the price of that product. If an environmental tax were to be utilised for beverage containers as an alternative to CDL in NSW, it would be in the order of nine cents per container according to the results of the CBA[1] (see *Section 3.4 Environmental Costs*).

[1] The environmental cost of beverage containers was determined based on diverting the containers to recycling from landfill.

Advance Disposal Fees (ADF) , as implemented in Florida, is a fee per unit of a product based on estimated costs of collection and recycling. In theory, ADF creates an incentive for materials to be recovered by imposing a fee per product. In Florida, the fee is paid by industry on certain cans, bottles, jars, and beverage containers, and then allowing exemptions from the fee for companies that met recycling or recycled content goals (Martin, 1997).

5.2.4 Relevance to Waste Management Objectives

It should be noted that an environmental tax of the same amount as that in a deposit-refund system would not have the same level of effectiveness as CDL because the environmental tax borne by the consumer does not provide an economic incentive to return the container. Simple supply/demand models would indicate that increased cost would result in a reduction in demand, and the recovery rates of beverage containers would remain unchanged. The only benefit of such a tax would be in the reduced consumption of beverages and a reduced supply of containers to landfill.

The use of user charges such as waste disposal charges would only be effective if *a)* they cover the full cost of disposing waste to landfill (including environmental costs) and *b)* if the charge is linked to quantity (by volume or weight) (Puplick and Nicholls, 1992). Though such an economic incentive may act to increase recycling by deterring disposal to landfill, it does not promote extended producer responsibility and polluter pays principles, because councils (not manufacturers) would incur the fee and in turn pass on the increased costs to households and other ratepayers.

However, Advance Disposal Fees would ensure producer responsibility if the fee is imposed on the producers and not the consumers of the product. (OECD, 2000). Advocates of ADF argue that although it is similar in objectives to CDL, it is a more flexible economic instrument because it is based on competition, not on mandates, and because consumers can choose to purchase or avoid products subject to the fee. Exemptions from the fee are possible if manufacturers use more than 50 percent recyclable materials in their products or by diverting the appropriate amount of material from the waste stream and recycling them into other products (Martin, 1997). In this way, manufacturers have the flexibility to choose the most cost effective option (pay the fee or reduce waste/increase recycling to avoid the fee). Criticisms of such an economic tool have been that from a whole systems perspective it is more expensive to operate and administer that CDL.

5.2.5 Subsidies

5.2.5.1 Description

In relation to waste management, subsidies can be described as financial assistance to producers to promote environmentally sound production, consumption and disposal of materials (Danish EPA, 2000).

5.2.6 Relevance to Waste Management Objectives

Subsidies are not revenue raising instruments, rather they require continual funding. If the government is responsible for providing the subsidy, then this economic instrument does not follow the polluter pays principle as the manufacturers are not bearing the cost, they only receive benefits of the subsidies.

5.2.7 Market Creation

Creation of a market for an environmental value or previously unvalued resource can enable market forces to dictate environmental decisions. Tradable permits can relate to resource use or waste discharge are the most common means through which environmental markets are created.

5.2.8 Enforcement Incentives

Enforcement incentives include such measures as non-compliance fees. Such fees are applied when maximum limits of discharge/emissions are exceeded and the fees are proportional to the rate of exceedance (Environment Australia, 1997). It should be noted that fixed fines are not considered economic instruments. Performance bonds are another type of enforcement incentive.

5.3 Self-Regulation

Self-regulation does not appear relevant to NSW at present. The Review is not aware of any deposit-return systems for containers that have achieved high recovery rates and have been voluntarily initiated except in the context of refillable beverage bottles. An example of such a voluntary system is the national deposit-return system in Canada created for refillable glass beer bottles. In some provinces, non-refillable beer containers such as aluminium cans and PET are required to be included also. Unless a decision were to be made that refilling of containers is required in NSW, or desired by industry, in which case industry would want customers to return containers, a deposit-return system is unlikely to be created through self-regulation.

Self-regulation may result in non-deposit-return systems being created. As well as accepting returns of containers bearing deposits, the Changes recycling centres created in British Columbia (Canada) accept containers that are not subject to a deposit, such as those for dairy products from some industries who provide support (See *Section 2l*). Part of the motivation for their establishment is believed to be government consideration of extending the CDL system to include containers of dairy products and dairy product substitutes. However, this return system is really an example of self-regulation in a context where there are expectations of significant recovery rates, and serious likelihood that a CDL system might be mandated. This was also effectively a non-deposit addition to a CDL system already in place. In such a context, understanding the potential recovery rates without a deposit, and issues associated with inclusion of dairy products in a container return system, would be important for industry.

5.4 Direct Regulation

The only form of direct regulation to be discussed is the setting of targets.

5.4.1 Setting of Targets

The setting of targets together with the use of economic instruments has been used in order to achieve increased rates of recovery for recycling.

Legislation in the UK provides an example of this: Valpak is a nation-wide compliance scheme for packaging waste regulations in the UK. The regulations were developed in response to the 1994 European Union Directive on Packaging and Packaging Waste that ensures that member nations recycle 50-60 percent of all packaging waste. In developing the regulation, UK companies were consulted and decided that it would be fairest if all parts of the packaging chain contributed towards meeting the recycling target. This policy approach is a form of 'shared producer responsibility'.

The UK regulation affects most companies that have both an annual turnover of more than £2 million and handle 50 tonnes or more of packaging. If any part of those companies' product packaging ends up in the UK waste stream, they have to recycle or recover a certain percentage of that waste. This is achieved by payments by affected companies into a fund, which is invested into the recycling industry to improve collection systems, increase capacity, create end markets for recycled products, and develop recycling technology. The affected companies must purchase Packaging Recovery Notes (PRNs) that represent a certain tonnage of recycled material. PRNs are issued by the material reprocessors, who actually recycle the packaging waste, to certify that the company's recycling quota has been met.

Valpak's role is to buy the PRNs on behalf of member companies and ensure their money is properly invested into the recycling industry (Valpak, 2001).

Sweden provides an example of target setting specifically regarding recovery of beverage containers (See *Section 2*). Government initially established a minimum recovery rate for aluminium cans of 75 percent. After unsuccessfully trying several other options, industry created a deposit-refund system that worked, and now recovers over 90 percent of aluminium beverage containers.

It should be pointed out that targets by themselves do not always produce an industry-created deposit-refund system. In Germany, for example, recovery targets were set at 72 percent, with provision for a compulsory deposit if the reusable percentage fell below the target. Initially, industry was able to perform satisfactorily, but recovery fell below 72 percent in 1997, triggering a review, with the end result being a compulsory deposit for products not meeting the target. In order to achieve the net benefits to society from container recovery and to avoid having deposits on some beverages such as beer and mineral water and not others such as cola, the government decided to mandate deposits on all ecologically harmful drinks packaging (Germany, Federal Environment Ministry, 2001).

5.4.2 Existing Targets

The Beer and Soft Drink Industry Waste Reduction Plan included recovery targets for glass, aluminium, and PET containers from both the residential and non-residential streams. *Table 5.4-1* provides the recovery targets defined in the Beer and Soft Drink IWRP.

Beer & Soft Drink IWRP	1990	1996	2003
PET away from home recovery rate		11.5%	23%
PET at home recovery rate	11%	48.2%	55%
Glass away from home recovery rate	25.5%	45.8%	45.8%
Glass at home recovery rate	30%	55%	55%
Aluminium recovery rate	62.9%	63.8%	66.5%

Table 5.4-1: Waste recovery targets required under the beer and soft drink IWRP

Source: NSW Environment Protection Authority (1999) NSW Beer and Soft Drink Industry Waste Reduction Plan NSW EPA: Sydney.

The Dairy Industry Waste Reduction Plan required an average milk packaging recycling rate of 47 percent by 31 December 2000.

The National Environment Protection Measure on Used Packaging Materials (NEPM). The requirements under the Used Packaging materials NEPM (for those who are not Covenant signatories and non-complying Covenant signatories) are shown in *Table 5.4-2*.

Material	Required recovery/ utilisation rate
Aluminium cans	65%
Glass	60%
PET	50%
HDPE	50%
LPB	45%
Paper/cardboard packaging	75%
Other materials	50%
Combinations of materials	50%

Table 5.4-2: Requirements under the Used Packaging Materials NEPM.

Note: * or the highest rate applicable to any material in the combination, whichever is the higher rate

5.4.3 Conclusions

If a government wishes to produce most of the net benefits discussed in the CDL Review without itself legislating CDL, the only alternative would appear to be to induce industry to create a best-practice deposit-refund system. One way to do this is through setting recovery targets for industry.

However, based on the experience in Germany, a deposit-refund system may be unlikely to be created by industry if the target recovery levels are set sufficiently low that other recovery methods may reasonably be attempted. Setting targets that are below international best practice and then raising them later is not the most efficient way of achieving maximum net benefits for NSW. The targets should be set at achievable levels that maximise net benefits so industry immediately develops a system that accomplishes the desired end result. Provision could be made that if industry is unable to resolve implementation issues consistent with international best practice, government could introduce CDL.

The recovery targets for containers in the Beer and Soft Drink Industry Waste Reduction Plan and in the Dairy Industry Waste Reduction Plan, and even those in the NEPM, appear very low in comparison to what has been shown in this report to be desirable based on net societal benefits, and to be achievable based on South Australian and international experience.

5.4.4 Recommendation

As an alternative to implementation of Container Deposit Legislation (CDL), the CDL Review recommends the strengthening of industry recycling targets to levels that achieve equivalent recovery outcomes to those that could be expected to result from the introduction of best practice CDL which have been demonstrated to provide economic benefits. These targets should therefore:

- achieve recovery rates for used container materials of ninety percent, and;
- apply as a minimum to beverage containers, with provision for expansion to encompass other container types.

Provision should be made that if within a reasonable time frame, say one year, industry is unable to resolve implementation issues consistent with international best practice deposit-return systems, government would introduce Container Deposit Legislation.

Section 6: CONCLUSIONS & RECOMMENDATIONS

The CDL Review has analysed the costs and benefits of establishing a deposit and refund system for used containers in NSW. It has also determined community attitudes and preferences in relation to the implementation of CDL. Key findings, conclusions and recommendations from the CDL Review are summarised below.

6.1 Key Findings

6.1.1 Whole of Society Analysis

- Currently, the contents of approximately 3.6 billion beverage containers are consumed in NSW every year, resulting in a total of 340,000 tonnes of used container materials (aluminium, glass, plastic, liquid paper board) being produced each year.
- Approximately 45 percent of the container materials used in NSW, or 144,000 tonnes per year, are currently recycled. If the Industry Waste Reduction Plan targets are met in 2003, this will increase to 170,000 tonnes per year.
- Despite the impressive performance of kerbside recycling, especially in NSW, there is clear evidence of declining recycling yields. In particular, glass recycling has reduced due to a combination of reduced recovery from the non-residential sector and increased contamination rates caused by a move towards co-mingled kerbside collection.
- The implementation of a container deposit and refund system (combined with kerbside services) in NSW is expected to increase the recovery and recycling of used container materials from this level to 80 percent-95 percent depending on the system introduced. In 2003 this would result in an increased recovery of used container materials to between 280,000 and 330,000 tonnes per annum.
- Implementing a deposit and refund system in order to increase the recovery and recycling of used container material would provide significant net economic benefits to society.
- The net financial costs to society of recovering containers in NSW for recycling would increase by approximately $32m/a to $66m/a if CDL were introduced, depending on the option implemented. The highest yielding option (point of sale return) would have a net financial cost of approximately $47m/a.
- Conservative estimates of the economic value of the net environmental benefits associated with CDL range from $120m/a to $150m/a. These benefits represent a reduction in externalities and accrue to society as a whole, including outside of NSW. The values should be considered indicative only due to limitations in the environmental valuation data available at the time of the CDL Review.
- The economic benefits associated with the increased recovery of containers for recycling significantly outweigh the increased costs of the combination of kerbside recovery and CDL, even without including the amenity value of reduced litter, and allowing for the value of the increase in consumers' unpaid labour time.
- Sensitivity testing of these results indicate that the overall conclusion of a net benefit to society is unchanged under wide variations in input assumptions, including reduced environmental benefits, increased establishment and operating costs for depots and collection centres, and increased transaction time for container handling at point of sale.

6.1.2 Unit Costs on a Whole of Society Basis

- In terms of unit costs, from a whole of society perspective, the environmental benefits of recovering and recycling used container materials are more than $800/tonne.
- The costs of recovering used container materials through the current kerbside recycling system is approximately $125-$200/tonne, depending on whether industry waste reduction targets are met by 2003. These costs are relative to the cost of collecting paper at kerbside only.
- The costs of recovering used container materials through a combined kerbside recycling and CDL system is in the range $200-$300/tonne depending on the type of CDL system. These costs are relative to the cost of collecting paper at kerbside only.
- The unit net economic benefit (including economic valuation of environmental benefits) associated with recovering and recycling an average container is 8-9¢ per unit under a CDL system, compared to a unit cost of approximately 2-3¢ per unit for the infrastructure and operational costs to collect the container.

6.1.3 Distributional Impacts

- A CDL system will result in a net transfer of the costs of used container recovery from local government and ratepayers, to producers, retailers, and consumers. The social research component of the CDL Review (*Volume III*) indicates that there is significant willingness on the part of citizens and consumers to bear some of the costs of implementing CDL.
- In terms of the distribution of costs and benefits to different stakeholders, a CDL system (operating in conjunction with kerbside recycling) would result in net benefits to Local Government.
- A deposit and refund system will improve the financial performance of kerbside recycling from the perspective of councils by approximately $8.50 to $20 per household per year, depending on the option.
- This net benefit to Local Government under a CDL system is a result of reduced kerbside collection costs, reduced landfill charges, through reduced sorting costs for recyclable materials, and through the collection of unredeemed deposits from containers set out for kerbside collection.
- For all deposit and refund scenarios modelled, the financial benefits under a CDL system outweigh the reduction in the residual value of used container materials that arises from the reduction in used container material in the kerbside system.
- The efficiency and financial performance of kerbside collection of paper would improve if CDL were implemented, due to the higher density of paper and reduced contamination.

6.2 Conclusions

- CDL is consistent with an emerging recognition of the importance of an integrated waste and product policy, as well as with the policy goals of waste minimisation, avoidance, recovery and re-use, and producer responsibility strategies such as EPR (see *Volume I*).
- Best practice deposit-refund systems can achieve recovery rates of over 90 percent for aluminium, glass and plastics (see *Section 2.1 and Section 3.2*).
- There is less international experience regarding the effectiveness of deposit-refund systems in achieving high return rates for liquidpaperboard and steel (see *Section 2.1*). However, the economic and environmental basis for recycling these materials is as valid as for recycling glass (see *Section 3.4*) and inclusion of these materials in a deposit-refund system would avoid inappropriate distortions in the beverage market.
- If a best practice form of CDL were introduced in NSW, a significant net economic benefit (including the economic value of environmental externalities) could be expected (see *Section 3.5*).
- The largest single component of the benefits expected under a CDL system is the reduction in environmental externalities associated with production of new containers from recycled materials rather than from raw materials (see *Section 3.5*).
- The CDL Review therefore concluded that high return rates (above 90 percent) for container materials were found to be both feasible and desirable in NSW.
- International and Australian experience suggests that deposit-refund systems are the most effective means of achieving high return rates (see *Sections 2.1 & 2.2*).
- There may be legal impediments to the introduction of container deposit legislation in NSW. These impediments are less likely to arise if a deposit-refund system were established by industry rather than legislated by the NSW Government (see *Section 4.2*).
- Rather than legislating for CDL, setting significantly higher targets for the recycling rate of used container materials than those currently in place in NSW could allow industry to establish a recovery system to suit their needs while still providing the economic benefits found to result from high recycling rates (see *Section 5*).
- Government implementation of a deposit-refund system through the introduction of CDL allows distributional impacts to be addressed and reduced, and can limit the negative effects that may occur when deposit-refund systems are established by industries that tend towards oligopolies (see *Section 2.1 & 2.2*).
- There is significant community support in NSW for the introduction of CDL (see *Volume III*). The CDL Review's Citizens' Forum qualified their support for CDL with the need to ensure access, convenience and the needs of disadvantaged groups were adequately addressed in the system implementation (see *Volume III*).
- Based on modelling conducted by the CDL Review, the introduction of CDL is not expected to have negative impacts on the financial viability of kerbside recycling and is not expected to decrease the yield of paper recovered from kerbside (see *Section 3.6.3*).
- A system of point of sale return represents the most efficient method for the return of used beverage containers in terms of overall cost to society, due to the reduction in transport burden, the reduced infrastructure costs, the convenience of the increased number of outlets and the high return rates (see *Section 3.5*).

- Evidence from recent international life cycle analysis studies shows that the reuse of containers by refilling (usually glass for beer and PET for soft drink) provides even greater benefits than high recycling rates. The studies also conclude that the setting of quotas for refillables, a situation that exists in many European countries, is also likely to be justified on the grounds of the economic benefits that result (see *Section 2.4*).

6.3 Recommendations

In regard to the implementation of the principles of extended producer responsibility in NSW, the CDL Review recommends that:

- *Policy and legislative frameworks in NSW be amended to incorporate the principles of EPR and to facilitate its effective implementation.*
- *The NSW Government seek agreement at a national level for the adoption of EPR. This would allow a more effective model of EPR to be developed for NSW by addressing constitutional and cross-border issues.*
- *Legal impediments to EPR, specifically those relating to constitutional, mutual recognition and taxation issues, be fully investigated.*
- *Product-specific EPR programs be developed that incorporate mandatory performance targets.*
- *Industry be given the opportunity to determine how they will meet the performance targets specified by product-specific EPR programs, e.g. via the establishment of voluntary schemes that provide appropriate environmental, economic and social benefits, with an understanding that mandatory schemes will be implemented if the voluntary schemes fail to achieve their performance targets.*
- *Products are selected for development of an EPR program based on analysis similar to that conducted for beverage containers in the CDL Review. This would include a comprehensive analysis of the total costs and benefits to society, including externalities, and the use of representative and deliberative processes of public participation.*

Regarding container deposit legislation in NSW, the CDL Review's recommendation is that either:

1. *Container deposit legislation be introduced that establishes a container deposit and return system with the following features:*
   - *Deposit applicable to all beverage containers made from aluminium, glass, PET, HDPE, other plastics, liquid paper board and steel;*
   - *Mandatory acceptance of used containers and refund of deposits by all retailers of deposit bearing containers. This should be subject to exemptions and/or qualifications that would prevent an inequitable burden being placed on small retailers where these exemptions would not compromise consumer access and convenience;*
   - *Should point of sale return not prove possible to implement, a depot or collection centre based CDL system should ensure accessibility, preferably requiring retailers with a threshold turnover level to provide facilities near retail outlets;*

- *A uniform deposit level of ten cents initially with provision to alter the level of deposits on certain container types at the discretion of the Minister for the Environment;*
- *A mechanism for ensuring that those parties involved in the acceptance of used containers and refunding of deposits are adequately compensated for those services, and*
- *A mechanism for expanding the range of containers subject to a deposit.*

Or

2. *The strengthening of industry recycling targets to levels that achieve equivalent outcomes to those that could be expected to result from the introduction of CDL. These targets should therefore:*
   - *Achieve recovery rates for the recycling of used container materials of ninety percent, and;*
   - *Apply as a minimum to beverage containers, with provision for expansion to encompass other container types.*

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