Container Deposit Legislation – an independent assessment of the introduction of CDL in NSW

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1 Introduction

The Independent Review of Container Deposit Legislation in NSW (the CDL Review) was commissioned by the NSW Government as part of a review of the NSW Waste Minimisation and Management Act (1995). The primary objective of the CDL Review was to assess container deposit legislation's (CDL's) environmental, financial, and social costs and benefits to the community and industry. The review considered CDL's potential for waste and litter reduction, infrastructure costs, impacts on the beverage industry and on current kerbside recycling, and community willingness to pay. This paper will summarise the assessment of CDL's economic efficiency and impacts on local government. The reader is referred to the full report[1] for details of other aspects of the review.

Container Deposit Legislation 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 under a CDL system, including designated collection centres, point of sale, reverse vending machines, or council run kerbside recycling collection system.

In some countries, there is a voluntary deposit-refund system on containers. These systems are very similar to CDL but are established by industry without legislation that specifically mandates for a deposit. Voluntary deposit-refund systems are usually 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.

Historically the policy objectives commonly related to CDL have been litter reduction, (e.g. South Australian Container Deposit Legislation 1975) and landfill reduction (e.g. German Packaging Ordinance 1991). More recently, however, CDL has been investigated and implemented with broader objectives including increased use of refillable containers, increased recycling rates for containers, and extended producer responsibility, often driven by a life cycle assessment of environmental impacts.

In NSW, Extended Producer Responsibility (EPR) has been adopted as a policy principle in the revised Waste Minimisation and Management Act (2001). The principle of EPR, combined with an enhanced understanding of the environmental benefits of recycling containers, is the main driver behind the investigation of CDL in NSW. Both internationally and in Australia, deposit-refund systems are the only mechanisms that the CDL Review found that are able to achieve consistently high overall container recovery. Many deposit-refund systems achieve return rates on specific containers in excess of 95%, and most achieve overall return rates above 70%[2]. In NSW currently, the recovery rates for containers made from aluminium, glass and PET are 59%, 42% and 61% respectively[3].

[1] Available online at http://www.isf.uts.edu.au/CDL_Report/index.html

[2] See Appendix A of Volume II of the full report of the CDL Review

[3] See Section 2.9 of Volume II of the full report of the CDL Review

2 Approach and Method

The methodology applied by the CDL Review was based on the US Environment Protection Authority's "Guidelines for Economic Analyses" (US EPA, 2000). Accordingly, the cost-benefit analysis (CBA) consisted of two distinct sections: an assessment of impacts on NSW as a whole (economic efficiency), and an assessment of the distributional impacts of the introduction of CDL. The clear separation of efficiency and distributional impacts was important for ensuring that stakeholder perspectives were not confused with the implications for society as a whole. Many previous studies have failed to adequately distinguish between costs and benefits that accrue to society, and those that are merely transfer payments between stakeholders.

A total of twelve scenarios were modelled in the CBA[4]. Three represented reduced or non-existent recycling systems, that is, all waste to landfill, only paper recycled via kerbside collection, and all recycling via collection depots (without a deposit). Two scenarios represented essentially business as usual, one being continuation of current recycling strategies with dependence on kerbside collection, the other being achievement of the 2003 Industry Waste Reduction Plan (IWRP) targets. The remaining seven scenarios represented different CDL configurations. Three were based on the current system in South Australia, with varying deposit rates of 5¢, 10¢, or 20¢ per container. Two were based on the current system in California, in which collection centres must be provided by all retailers with a turnover greater than $2mill p.a. The Californian style system was modelled with 10¢ and 20¢ deposit levels only. Finally, two scenarios based on mandatory point of sale collection of containers were modelled, also with deposits of 5¢ and 10¢. Note that all seven CDL scenarios assume that the current kerbside system continues in parallel with the same collection frequency as at present.

In order to evaluate costs and benefits associated with each scenario, it was first necessary to model container and material flows. The modelling projected the quantity and type of container material could be expected to be consumed, recycled or landfilled under different scenarios. After a preliminary analysis, the modelling of container flows and subsequent evaluation of costs and benefits was restricted to beverage containers.

The categories of beverage products included in the modelling were:

- 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:

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

The non-beverage container packaging, which was excluded from the analysis, incorporates a large range of product categories, including: food, pet food, detergents and cleaning products, shampoos and personal cleaning products, and motor oil.

[4] see Table A1 in the appendix for detailed description of all twelve scenarios.

Steel is the one container material for non-beverage packaging comprises a significant proportion of total container consumption. The CDL Review found that beverage containers, mainly for fruit and vegetable juices, comprise only around 4% of total steel can production.

Based on the projected material flows, costs and benefits were calculated for each of the twelve scenarios. Costs and benefits were calculated in three categories: financial, environmental and social. As far as possible, dollar values were assigned to the environmental and social impacts. This triple bottom line approach allowed comparison of scenarios in terms of overall economic efficiency. Table A2 in the Apendix lists the costs and benefits included in each of the three categories.

3 Results

3.1 Whole of Society Analysis

The introduction of container deposit legislation in NSW would approximately double the number of used containers recovered for recycling, from a current level of approximately 1.6 billion to between 2.8 and 3.4 billion depending on the particular system introduced. The main increase in container return rates under any CDL scenario, compared with the current kerbside system, would come from products that are consumed away from home. The range of improvement associated with CDL depends on the implementation scenario. Those that have higher level of deposit and increased convenience of collection points have significantly higher expected return rates compared to the more basic options.

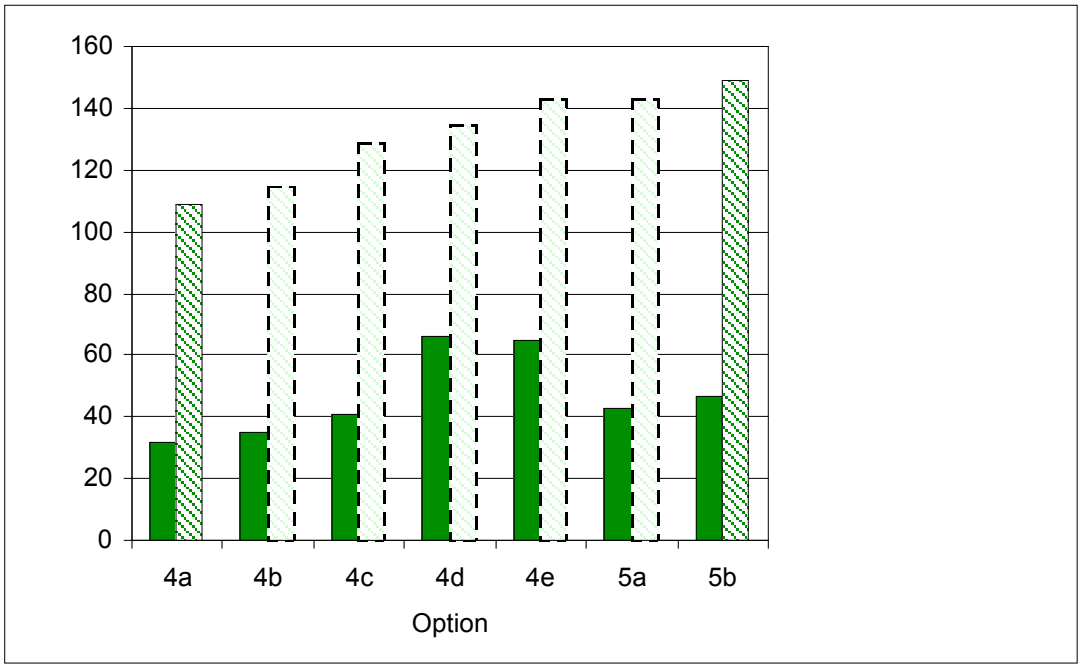
The estimated additional financial cost of the options for implementing CDL in combination with kerbside recycling ranges from $32m/a to $66m/a, relative to the current kerbside recycling system. The current kerbside recycling system has a financial cost of approximately $100m/a in NSW relative to a 'landfill only' baseline. Again the range of costs associated with CDL depends on the implementation scenario. The major financial cost of implementing CDL would be provision of collection centres, thus those scenarios with the highest density of depots have the highest financial cost. This increase is somewhat offset by the decrease in transport costs and consumers time associated with increased convenience. However, the most convenient option is point of sale return, which does not require construction of many collection centres. The cost per container of point of sale return (which has the highest expected return rate) is similar to that of a depot system similar to that in South Australia. Both have lower per unit costs than a Californian style system where depots are provided by all large retailers.

The additional environmental benefit of implementing CDL is estimated to be $100m/a to $150m/a depending on the implementation scenario. The unit net environmental benefit from recovering and recycling used containers averages approximately 8-9¢ per container. Expressed differently, this means that the environmental externality, or the societal cost, of throwing a container in the rubbish, rather than recycling it, is 8-9¢[5]. There is therefore a net benefit to society if the container can be recovered and recycled for less than 8-9¢. The unit net cost of CDL in combination with kerbside recycling programs is in the range 2-3¢/container, based on a comparison with kerbside collection of paper only.

Figure 1 shows the net financial costs and net environmental benefit for a number of combination CDL and kerbside scenarios, relative to the current kerbside system (labelled

[5] Based on results of recent life cycle analysis studies in Denmark (Danish EPA, 1999) and Germany (Plinke, 2000), the benefits would be even greater if the container were refilled.

Option 3a). The net environmental benefits were only modelled for the two CDL scenarios that would have the lowest and highest environmental benefits. Environmental benefits for other CDL scenarios (Options 4b-e & 5a) would be expected to be between those modelled for the two extreme options. The approximate level of net environmental benefit associated with intermediate CDL scenarios (Options 4b-e and Option 5a) is therefore indicated by the values in the dashed columns on Figure 1.



Option 4a - CDL intermediate spacing 5¢	Option 4b - CDL intermediate spacing 10¢	Option 4c - CDL intermediate spacing 20¢	Option 4d - CDL convenient spacing 10¢
Option 4e - CDL convenient spacing 20¢	Option 5a - CDL Point of Sale 10¢	Option 5b - CDL Point of Sale 20¢	

*****Net environmental benefits are shown for Options 4a & 5b, environmental benefits for other Options have been inferred assuming benefits are proportional to increases in mass of container material recycled.

Figure 1: Net financial and environmental costs and benefits for various options for implementation of CDL relative to current kerbside.

Tables 2 & 3 summarise the components of the estimated costs and benefits for the addition of a deposit-refund system relative to the current kerbside scenario. The results presented in Tables 2 & 3 are for the CDL labelled, Option 5a – CDL POS 10¢. Option 5a is the CDL scenario that most closely resembles the preferred model for a CDL system recommended by the Review.

A range of possible values for each cost or benefit are presented along side the single value that was used in the formal cost-benefit analysis (CBA) conducted by the CDL Review. It should be noted that the range of values presented in Tables 2 & 3 is *indicative only*. The ranges have not been obtained by formal sensitivity analysis, but rather are based on an understanding of the issues and assumptions surrounding the values used in the formal CBA.

Cost Category	Method Used	Upper and Lower Limit Value ($m p.a.)	Value Used in CBA ($m p.a.)
Increase in financial cost of non-residential recyclables collection	ISF modelling	5-15	10
Financial costs associated with the infrastructure and labour for a deposit and refund system	Literature review / primary research	50-100	66
Additional financial costs of a deposit and refund system (administration and compliance monitoring, labelling and education)	ISF modelling / literature review	2-12	4
Value of consumer's time spent on tasks associated with container return	ISF modelling / literature review	50-100[6]	Not included

Table 2: Breakdown of costs to society as a whole of implementing CDL in addition to the pre-existing kerbside (using Option 5a – CDL POS 10¢) relative to maintaining the current kerbside system alone.

Benefit Category	Method Used	Upper and Lower Limit Value ($m p.a.)	Value Used in Formal CBA ($m p.a.)
Reductions in financial cost of household garbage collection	WRCM model	0-5	0
Reductions in 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 mobile garbage bin (MGB) collection	5-35	19
Reductions in financial cost of non-residential garbage collection	ISF modelling	0-1.5	0.5
Reductions in financial costs of landfill (marginal costs only)	ISF modelling and estimates, based on Wright (2000a)	10-24	14
Reduced costs of litter collection and disposal (marginal costs only)	Survey of NSW councils	0-10	4.5
Increased visual amenity due to reduction in litter	Average cost attributable to container litter of total spending in NSW on litter management.	0-15[7]	Not included
Net environmental benefits	LCA conducted for this Review by RMIT. Nolan ITU/SKM (2001) results for environmental evaluation and own modelling based on WRCM model	Not assessed. See sensitivity testing in full report.	150

Table 3: Breakdown of benefits to society as a whole of implementing CDL in addition to the pre-existing kerbside (using Option 5a – CDL POS 10¢) relative to maintaining the current kerbside system alone.

[6] Note the absolute upper limit of value of consumers' time to return containers would be $176mill p.a. This is the value of all deposits that householders would forgo if they did not return the containers.
[7] See section *Section 3.3.4: Litter Costs in* the full report of the NSW CDL Review available at http://www.isf.uts.edu.au/CDL_Report/index.html.

A range of values has not been included in Table 3 for the net environmental benefits. The complexity of the environmental benefit calculation is such that this type of analysis was not possible within the scope of the CDL Review. Instead, sensitivity testing on the environmental benefits was conducted. The testing suggested that the magnitude of the environmental benefits, and therefore net positive benefit of introducing CDL was relatively robust under all reasonable assumptions. The reader is referred to Table 4.1-4 of the full report of the CDL Review (available at http://www.isf.uts.edu.au/CDL_Report/index.html) for more detail on this issue.

3.2 Implications for Local Government

The CDL Review considered the impact of implementing CDL in combination with kerbside recycling on a number of different stakeholder groups. Stakeholder impacts were assessed in terms of their current attitudes to the introduction of CDL and in quantitative terms as part of the cost-benefit analysis. The social research investigating stakeholder attitudes found highly heterogeneous responses. There was strong support from NSW local government and environment groups, majority support from the community, limited support from the recycling industry, and outright opposition from the beverage, packaging and retail industries.

The findings of the cost-benefit analysis were roughly in-line with the expectations of the stakeholders themselves. Consumers of containerised beverages were found to be the group that would bear the largest cost burden if CDL were introduced in NSW. The beverage 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 costs on to consumers and also on the type of CDL system introduced.

Local government and ratepayers, in contrast, would realise financial benefits from the introduction of CDL. Currently, local government in NSW spends approximately $100m/a on kerbside recycling services, and recovers approximately $20m/a worth of recycled material[8]. Modelling undertaken by the CDL Review suggests that under a CDL system the net cost of kerbside recycling would reduce by between $23m/a and $50m/a depending on the type of system implemented. This saving is mainly due to reduced cost of kerbside collection as a result of the reduction in high volume, low mass containers, and increased revenue from the deposit value of residual deposit-bearing containers placed in recycling bins. These benefits exceed the reduced materials value from containers diverted from kerbside, which amounts to between $8.5m/a and $13m/a. If CDL were implemented, the collection of waste paper at kerbside is likely to become more efficient, with reduced contamination rates and a lower cost per tonne to collect. Paper has a lower value per tonne than other materials, but its high density means that it has a relatively high value (approximately $20) per cubic metre. Volume is the determining factor in the cost of kerbside recycling as it determines the number of truck trips and number of trucks.

4 Conclusion

The CDL Review concluded that NSW would obtain overall benefits from the significant improvements 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 targets. However, it notes that international experience has found deposit-refund systems to be the most effective mechanism for achieving high container recovery rates.

[8]Based on the results presented in Nolan-ITU (1998 p24) and Nolan –ITU/SKM (2001 p36).

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 identified 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 was 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.

References

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Appendix

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-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, current 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 of 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 that accept containers and refund deposits 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 a 'convenient spacing' of collection centres and a 10-cent deposit.
	4e	CDL convenient 20¢	CDL system with a 'convenient 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 (POS) requirements (most shops selling products with container deposits also give refunds upon return of containers) with a 10 cent deposit
	5b	CDL POS 20¢	CDL system with mandatory point of sale (POS) requirements (most shops selling products with container deposits also give refunds upon return of containers) with a 20 cent deposit

Table A1: Scenarios and options used for modelling costs and benefits of container recovery

Cost/ benefit	Method used
Financial cost of household garbage collection	WRCM model
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 mobile garbage bin (MGB) collection
Financial cost of non-residential garbage collection	ISF modelling
Financial cost of non-residential recyclables collection	ISF modelling
Financial costs of landfill (marginal costs only)	ISF modelling and estimates, based on Wright (2000a), *Independent Assessment – Landfill Capacity and Demand*
Financial costs associated with the infrastructure and labour for a deposit and refund system	ISF modelling
Additional financial costs of a deposit and refund system (administration and compliance monitoring, labelling and education)	ISF modelling
Reduced costs of litter collection and disposal	Survey of NSW councils
Environmental cost of transport in trucks and cars (prior to MRF or transfer station)	Life Cycle Assessment (LCA) conducted for this Review by RMIT. Nolan ITU/SKM (2001) results for environmental evaluation and ISF modelling based on WRCM model
Environmental costs of production of virgin container materials	LCA conducted for this Review by RMIT and Nolan ITU/SKM (2001) results for environmental evaluation.
Revenue from sale of recycled material	Calculation based on market values
Revenue from unclaimed deposits in kerbside recycling	Calculation based on modelled results and experience from locations with deposit and refund systems
Landfill fees	Weighted average of Greater Sydney Region values and rural NSW

Table A2: Parameters and Methods used in the CDL Review Cost Benefit Analysis