Title: Extended producer responsibility for packaging waste in South Africa: Current approaches and lessons learned

Abbreviated Running head: Extended producer responsibility for packaging waste in South Africa

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Abstract

Extended producer responsibility (EPR) is a policy concept aimed at extending producers' responsibility for their products to the post-consumer stage of their products' life cycle. One of the outcomes of an effective EPR programme is to move waste management up the waste hierarchy away from final disposal in favour of recycling, minimisation and avoidance. This paper examines various approaches to implementing EPR for various types of packaging waste in South Africa, focusing in particular on their effectiveness in stimulating the recovery of post-consumer packaging material for recycling. In particular, the approaches adopted in the plastic bag, steel beverage can, glass and polyethylene terephthalate (PET) industries are examined. It is found that voluntary industry initiatives (as in the can, glass and PET industries) are far more effective than mandatory, government-imposed regulations (as in the plastic bag industry) in stimulating recovery. It is suggested that this can be explained by the particular types of market failure affecting recycling markets; namely information failure, technical constraints, search costs, etc; which act as barriers to the development of a viable recycling industry. In such cases, it is in the industry's own best interests to overcome such failures, e.g. through voluntary implementation of EPR.

Keywords

Waste management, recycling, extended producer responsibility, packaging waste, economic instruments, developing countries

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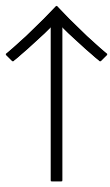
Introduction: EPR and the waste hierarchy

In recent years, waste management strategies in many countries have paid increasing attention to the waste hierarchy, which prioritises options for waste management in terms of their desirability (Table 1).

Table 1: Waste management hierarchy (National Treasury, 2006)

Avoidance	
Minimisation	
Recycling / reuse	
Treatment	
Disposal	**Desirability**

Despite the South African government's recognition of the need to move up the waste management hierarchy, i.e. away from final disposal toward recycling, minimisation, and avoidance of waste (Department of Environmental Affairs and Tourism, 1999), final disposal to landfill continues to be the cheapest, most attractive, and therefore preferred option for waste management in South Africa (Nahman and Godfrey, 2008). This places a significant burden and imposes significant costs on the environment and broader society, in the form of various health and environmental hazards. The external costs associated with disposal to landfill are generally regarded as higher than those associated with options higher up the waste hierarchy (Wilson, 1996).

The reasons for this failure to move up the hierarchy are largely economic and are associated with various types of market failure, whereby prices provide actors in the waste cycle with the incorrect signals, such that incentives are geared toward inappropriate

behaviour. In particular, the external environmental and social costs associated with disposal to landfill are not reflected in the production costs incurred by producers, or in the municipal waste collection and disposal charges faced by consumers, and there is therefore no incentive for either to move up the hierarchy (Wilson, 1996; Stromberg, 2004; Nahman and Godfrey, 2008). In addition, there are various failures in recycling markets in South Africa, which fail to provide incentives for recycling as a specific alternative to disposal. These include the costs and inconvenience associated with separation, collection, and processing; low prices paid for the return and collection of recyclables; price volatility in the prices of recycled materials; and low costs of manufacture using virgin as opposed to recyclable materials; which act as barriers to the creation of a sustainable recycling industry (Stromberg, 2004; Nahman and Godfrey, 2008).

One way of overcoming these failures in recycling markets and moving waste management up the hierarchy that has attracted increasing attention in recent years, including in SA (Republic of South Africa, 1998; Department of Environmental Affairs and Tourism, 1999; Republic of South Africa, 2003a), is extended producer responsibility (EPR). EPR can be defined as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of the product's life cycle, including its final disposal" (OECD, 2001, in Widmer et al., 2005:446). In line with the polluter pays principle, EPR shifts the physical and financial responsibility for the environmental impacts (waste) associated with products throughout their lifecycle from society as a whole (and municipalities in particular) toward the generators of waste, namely the producers (broadly defined to include manufacturers, importers, distributors and retailers) and consumers of the product in question. EPR aims to ensure that the external costs associated with products throughout their lifecycle (including final disposal) are internalised in the costs faced by waste generators (e.g. in the market price of the product), and therefore to provide

incentives to both producers and consumers to change their behaviour in ways that shift waste management up the waste hierarchy.

EPR is a policy concept, rather than a policy instrument; and can be implemented through a variety of regulatory, economic, and informative policy instruments that fall under the EPR umbrella (Table 2) (Walls, 2006; Nnorom and Osibanjo, 2008). Furthermore, EPR can be implemented in a variety of ways, ranging from voluntary industry initiatives to mandatory regulations imposed by government (Widmer et al., 2005; Walls, 2006; Nnorom and Osibanjo, 2008).

Table 2: Policy instruments under the EPR umbrella

Category	**Examples**
Regulatory instruments	Take-back programs (mandatory or voluntary), including the provision of infrastructure; reuse and recycling targets; minimum product standards; prohibitions of certain hazardous materials or products; disposal bans; mandated recovery/recycling obligations
Economic instruments	Product taxes, input/material levies, virgin material taxes, collection fees, disposal fees, deposit-refund schemes, subsidies, tax/subsidy combinations
Information instruments	Environmental reports; environmental labelling; information provision to consumers, collectors, recyclers, etc through education and awareness-raising campaigns

Source: adapted from (Widmer et al., 2005; Nnorom and Osibanjo, 2008).

This paper focuses on economic instruments under the EPR umbrella that are specifically geared toward overcoming failures in recycling markets so as to promote recycling. It reviews the types of instruments available and their use in other countries, before focusing on their use in four packaging waste streams in South Africa, namely plastic bags, steel

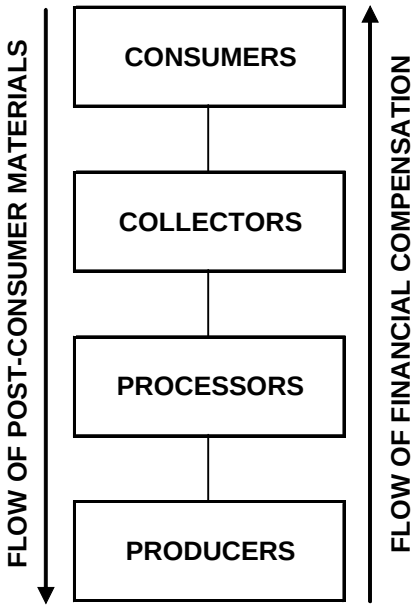
beverage cans, glass and polyethylene terephthalate (PET). Particular attention is paid to the considerably higher levels of success achieved by voluntary as opposed to mandatory approaches to EPR in the packaging industries in South Africa.

1. The economics of waste, recycling and environmental policy

1.1. Market failures in recycling

Recycling as a waste management option has clear benefits over disposal and production using virgin materials. It saves natural resources and energy; reduces production costs; reduces the costs of waste management; reduces environmental impacts, demand for landfill airspace and other costs associated with landfilling; and generates income and job creation opportunities for the poor and unemployed (e.g. Batool et al., 2008; Gregory and Kirchain, 2008). However, a sustainable recycling industry requires an established market for recyclable waste materials and for the recycled products. Indeed, the lack of such markets is the main reason why many types of recyclable materials are not recycled (Brink, 2007). In turn, a market requires both sufficient demand for and supply of the product in question. In South Africa, there are problems related to both the supply of and the demand for both packaging waste and recycled materials.

Figure 1: The recycling value chain



Assume a simple model (Figure 1) with four actors: consumers, who have a choice between separating recyclables and making them available to collectors for recycling, or putting them out with the trash to be collected for final disposal to landfill; collectors, who collect recyclables, either at source from consumers or from landfills, and make them available to processors; processors, who process recyclable materials into a form that can be used in manufacturing and make the processed (recycled) materials available to producers; and producers, who have a choice between using virgin materials or recycled materials (obtained from processors) in the manufacturing process. Given a particular level of consumption, and thus waste generation, the overall level of recycling depends on the supply of recyclables from consumers and collectors, processors' supply of recycled materials, and producers' demand for recycled materials. The factors affecting the level of supply and demand in these markets are described below.

Consumers' supply of recyclables

$S_{consumer} = f (P_{recyclables}, C_{supply}, C_{disposal})$

Where

$S_{consumer}$	=	Consumers' supply of recyclables
$P_{recyclables}$	=	Price (financial compensation) received by consumers for supplying recyclables, if any
C_{supply}	=	Costs incurred by consumers in supplying recyclables
$C_{disposal}$	=	Costs incurred by consumers in having waste collected for disposal

Given a particular level of consumption, and thus waste generation, the quantity of recyclables supplied by consumers increases with any financial compensation received from collectors and with the costs of having waste collected for disposal through normal waste collection services; and is negatively related to the costs of separating recyclables and making them available to collectors, which depends on the effort expended in doing so (Stromberg, 2004). In general, South African consumers receive no financial compensation for supplying recyclables. Furthermore, given the lack of efficient and effective separation and collection infrastructure in SA, and the lack of information regarding the existence and whereabouts of such infrastructure where it does exist, there are costs (actual or perceived costs related to transport, time, inconvenience, etc) involved in separating recyclables and making them available to collectors. Finally, low, flat-rate fees for municipal waste collection imply that the costs of leaving waste to be collected for disposal are negligible, and are in fact zero at the margin (Nahman and Godfrey, 2008). All of these factors imply that the quantity of recyclables supplied by consumers will be too low.

Collectors' supply of recyclables

$S_{collector} = f (P_{recyclables}, C_{supply})$

Where

$S_{collector}$	=	Collectors' supply of recyclables
$P_{recyclables}$	=	Price received by collectors for supplying recyclables
C_{supply}	=	Costs incurred by collectors in supplying recyclables

Given a particular level of supply of recyclables from consumers, the quantity of recyclables supplied by collectors increases with the prices received from processors for collected recyclable materials; and is negatively related to the costs they incur in collecting recyclables (Stromberg, 2004). In South Africa, the prices received by collectors for collected materials are often too low (and/or too unstable). Furthermore, given the lack of collection infrastructure, and therefore the fact that supply from consumers is low, the majority of recyclables are collected from landfills or door-to-door from consumers, rather than from central collection points, implying that collectors must expend significant effort (and therefore incur significant costs) in collecting recyclables. Both factors imply that the quantity of recyclables supplied by collectors will be too low.

Processors' supply of recycled materials

$S_{processor} = f (P_{recycled\ materials}, C_{supply})$

Where

$S_{processor}$ = Processors' supply of recycled materials

$P_{recycled\ materials}$ = Price received by processors for supplying recycled materials

C_{supply} = Costs incurred by processors in supplying recycled materials

Given a particular level of supply of recyclables from collectors, the quantity of recycled materials supplied by processors increases with the prices received from manufacturers for processed materials; and is negatively related to the costs incurred in processing, which in turn depends on the quality of the material (e.g. the way in which the product is designed and the extent to which it is contaminated with other materials), and on technology (Stromberg, 2004). In South Africa, products are not generally designed for recyclability, and a large proportion of recyclables are recovered from landfills. Thus, the materials received by processors are often of a low quality, i.e., they are often contaminated with other types of materials. Thus, the operational costs of processing are high (Brink, 2007). Furthermore, price volatility in the market for recycled materials creates uncertainty regarding future prices, which discourages investment in sorting and processing equipment (Ackerman and Gallagher, 2002; Stromberg, 2004), further increasing processing costs. These factors imply that the quantity of recycled materials supplied by processors' will be too low.

Producers' demand for recycled materials

$D_{producer} = f\ (P_{recycled\ materials}, P_{virgin\ materials}, Q, T, S)$

Where

$D_{producer}$ = Producers' demand for recycled materials

$P_{recycled\ materials}$	=	Price of recycled materials
$P_{virgin\ materials}$	=	Price of virgin materials
Q	=	Quality of recycled materials, which determines the range of potential applications (end uses) for the recycled materials
T	=	Technology, which determines the range of potential applications (end uses) for the recycled materials
S	=	Product standards specifying the minimum required content of recycled materials in new products, resulting from either legislation or voluntary agreements

Producers' demand for recycled materials is negatively related to the price they have to pay for these materials; and increases with the price of virgin materials, with the quality of recycled materials and the state of technology, which both influence the range and profitability of potential applications (end-uses) of recycled materials, and with the minimum recycled content requirement of their products. Because of high processing costs (referred to above), the costs of purchasing recycled materials is often high. Furthermore, the cost of virgin materials generally fails to reflect the negative external costs associated with their use, such as resource depletion and the environmental and social costs associated with disposal to landfill; and is therefore too low. In some cases, virgin materials may even be subsidised, furthering lowering their price (Stromberg, 2004). Furthermore, in some waste streams, e.g. plastic bags and PET in SA, the low quality of recycled materials, or inadequate technology, limits the potential end-uses of such products (Brink, 2007), while in other cases there is no legislation or voluntary agreement specifying the minimum required content of recycled material in a product's make-up. All of these factors imply that the quantity of recycled materials demanded by producers is too low.

1.2. Intervention in the recycling market: Extended producer responsibility

The previous sub-section suggests that, in the absence of some form of intervention, there will be insufficient supply or demand to ensure viable recycling markets in South Africa. In particular, it suggests the need for interventions aimed at increasing and/or stabilising the price consumers, collectors or processors receive for supplying recyclables or recycled materials; at lowering the costs to consumers, collectors or processors of supplying recyclables or recycled materials; at increasing the costs to consumers of leaving their waste to be collected for disposal to landfill; at decreasing the price producers must pay for recycled materials or increasing the price they pay for virgin materials; at increasing the range and profitability of end-uses for recycled materials; and/or at increasing the minimum required recycled content of products, either through legislation or some type of voluntary agreement. Examples of interventions under the EPR umbrella which could potentially achieve these changes in the recycling market are described in Table 3.

Table 3: Examples of EPR instruments that address market failures in recycling

Category	Examples of instruments	Mechanism
Financial incentives for returning, collecting or recycling	refunds to consumers (as part of a deposit-refund scheme, for example), payments to collectors per item/ton	Increase or stabilise the price paid to consumers, collectors and/or processors for supplying recyclables / recycled materials, thereby increasing supply
Provision of subsidies, infrastructure, or information	Subsidies to establish collection/recycling programmes or processing facilities, drop-off bins / banks / centres, buy-back centres, kerbside collection, education & awareness programs, advertising campaigns	Lower the costs (or perceived costs) to consumers, collectors and/or processors of supplying recyclables / recycled materials, thereby increasing supply

Collection and/or disposal fees [a]	Municipal waste collection fees that increase proportionally based on the quantity of waste collected	Increase costs to consumer of leaving waste to be collected for disposal to landfill, thereby increasing supply of recyclables
Incentives to use recycled materials	Subsidies to create demand for use of recycled materials	Lower the price producers pay for using recycled materials, thereby increasing demand
Disincentives against the use of virgin materials	Virgin material levies	Increase the price producers pay for using virgin materials; thereby increasing demand for recycled materials
Revenue-raising instruments	Producer responsibility organisation fees, input / material levies	Raise funds for the provision of incentives, subsidies, infrastructure and/or information; so as to increase the price or lower the costs to consumers, collectors or processors of supplying reyclables or recycled materials, thereby increasing supply
Minimum product standards (legislation or voluntary agreements)	Minimum recyclable or recycled content of products	Minimum *recyclable* content standards lower processors' costs and thus increase their supply of recycled materials; and increase the range and profitability of potential end uses of the recycled products; thus increasing producers' demand for recycled materials. Minimum *recycled* content standards increase producers' demand for recycled materials

Source: adapted from Widmer et al. (2005) and Nnorom and Osibanjo (2008)

[a] These instruments are not discussed here since the focus is on instruments implemented at the industry level, rather than at the municipal level; but see Nahman and Godfrey (2008) for an analysis of these instruments in the South African context.

1.3. International Practice with EPR in the recycling market

The concept of extended producer responsibility was originally conceived and applied to the management of packaging waste in countries such as Sweden, Taiwan and Germany (the 1991 German Packaging Ordinance) in the late 1980s and early 1990s (Wilson, 1996; Walls, 2006). It has since been extended to the management of waste electrical and electronic equipment (WEEE) in the EU (through the 2002 EU WEEE directive), North America and East Asia; and to a range of other waste streams, such as used oil in Western Canada and vehicles in Japan (Widmer et al., 2005; Walls, 2006; Nnorom and Osibanjo, 2008).

EPR is traditionally implemented through either mandatory or voluntary product take-back schemes. Mandatory take-back obligations require that manufacturers, importers, distributors and/or retailers take products back at the end of their useful life, usually in combination with a recovery or recycling target, as in Germany, Austria and Taiwan. Alternatively, EPR schemes can be implemented voluntarily by industry, often to meet targets agreed with government, as in the Netherlands, Victoria (Australia) and the UK (Wilson, 1996; Walls, 2006). In the latter case, government may set a framework within which industry must act, but producers are given the financial and physical responsibility to ensure that they fulfil their obligations, and the freedom to find the most cost-effective way of doing so (Wilson, 1996). Voluntary approaches are often created by agreements arising out a memorandum of understanding between the industry and government, often stemming from a desire by the industry to avoid the imposition of potentially harmful regulations (Widmer et al., 2005).

In either case, Producer Responsibility Organisations (PROs) are often established as cooperative industry initiatives to collectively handle collection and arrange for recycling on behalf of the industry, so as to ensure that member companies are able to meet their EPR obligations (Widmer et al., 2005; Walls, 2006; Nnorom and Osibanjo, 2008). The extent of PRO involvement can vary, however, from acting merely as a clearing house between producers and municipalities (as in the management of WEEE in Germany); to management of the entire chain (from collection to recycling), as in Sweden (Widmer et al., 2005).

PROs are usually financed through fees paid by member companies. In the case of packaging, such fees can be paid by the manufacturers of packaging products, through a levy on purchases of the material used in manufacturing the product (e.g. plastic resin used in producing plastic bottles); or by the companies who use the packaging for their products; through a levy on purchases of the packaging product (e.g. glass or plastic bottles). Such fees can be assessed on either a weight basis (e.g. per ton of glass or plastic), or a per unit basis (e.g. per bottle) (Walls, 2006). For example, in Germany, the PRO which was established to meet mandatory product take-back obligations on behalf of the packaging industry charges its members licensing fees for purchases of glass (€0.076/kg / $0.093/lb), paper (€0.18/kg / $0.22/lb) and plastic (€1.35/kg / $0.75/lb) (Walls, 2006). The purpose of PRO fees is to provide funding for the provision of incentives, subsidies, infrastructure and/or information to consumers, collectors and/or processors so as to increase the price or lower the costs of supplying recyclables and/or recycled materials, thereby increasing supply. Furthermore, the fees could encourage producers to reduce material use or packaging volumes, which would lead to a reduction in waste generation. Such fees are often passed on to consumers in the form of higher product prices, which should lead to a decline in demand from consumers, also leading to a decline in waste generation.

Germany's mandatory take-back scheme is often seen as a success story, with packaging volumes declining 4 percent between 1990 and 1999 (Walls, 2006). By contrast, during the same period in the Netherlands, which relied on a purely voluntary program, packaging volumes increased 15 to 20 percent (Walls, 2006). However, in general, mandatory schemes are often seen as "overly prescriptive; having the government choose the system ex ante eliminates the possibility for firms to uncover cost savings in collection and processing… In general, if the government is going to impose take-back, it is best if obligated firms have options to come up with innovative take-back strategies on their own, since their incentives to minimize costs will help reduce the overall costs of the system" (Walls, 2006:7).

Both mandatory and voluntary take-back programs have been found to increase recycling, while PRO fees have been found to lower material use and packaging volumes (Walls, 2006). However, other types of policies which fall under the EPR umbrella, but which provide different incentive effects, can yield similar outcomes, often at a lower cost (Walls, 2006). For example, an advance recycling fee (ARF) is a tax assessed on product sales, revenues from which are often used to cover recycling costs (Walls, 2006). ARFs "may be visible to the consumer when he purchases a product – that is, as a separate line item on the bill, similar to sales tax – or they can be assessed upstream on producers and later incorporated into the product price" (Walls, 2006:3).

The incentives provided by an ARF depend largely on what is done with the revenues it generates (Walls, 2006). For example, as with PRO fees, revenues from ARFs can be used to fund financial incentives (payments) to consumers, collectors or processors per unit or on a weight basis of material returned, collected or recycled, which increase the price they

receive for supplying recyclables or recycled materials, and thus increase the quantity supplied. This combined ARF/incentive system is essentially a type of deposit-refund scheme; where the ARF acts as a 'deposit' at the point of sale, while the payment acts as a refund that is paid upon return of the used product for recycling. Collection of fees and payment of incentives can be handled by a dedicated non-profit organisation (Walls, 2006), essentially a PRO. For example, in western Canada, the oil industry devised and runs a program in which sales and imports of oil, oil containers and oil filters are subject to an 'environmental handling charge' collected by dedicated non-profit associations, which then pay collectors, transporters and processors for every container, filter or litre of oil reused or recycled (Walls, 2006). Legislation requires all sellers and importers to join the associations, and allows the associations to set the level of the environmental handling charge and the corresponding payment (Walls, 2006). Furthermore, collectors pass on a proportion of the payment they receive to downstream consumers, thus providing incentives to consumers to return used oil, containers and filters to collectors (Walls, 2006).

Mandatory and voluntary product take-back programmes and combined ARF/incentive systems "have very different incentive effects and ultimately may lead to different environmental outcomes, and the costs of the instruments may differ widely" (Walls, 2006:4). For example, according to Walls (2006), the combined ARF/incentive system may be more cost-effective as compared to a mandatory take-back program. For example, in British Columbia, one of the provinces involved in the western Canada used oil program, the new ARF/incentive program was found to be far more effective than the previous mandatory take-back system, in which retailers were required to simply accept used oil from consumers at their own expense, leading to a lack of compliance by retailers (Walls, 2006).

2. Extended producer responsibility in the packaging industries in SA

2.1. Context

Developing countries have been far slower than developed countries in implementing EPR (Nnorom and Osibanjo, 2008). Some of the difficulties associated with implementing EPR in developing countries are as follows (Widmer et al., 2005; Nahman and Godfrey, 2008; Nnorom and Osibanjo, 2008):

- consumers tend to re-use or dump products rather than recycle
- recycling is undertaken largely by the informal sector, making organised collection difficult to implement and posing risks to the environment and human health.
- consumers are unwilling to return goods for recycling or pay for disposal of their waste
- lack of awareness among consumers and collectors of the environmental and health impacts associated with inappropriate waste handling and disposal, and of the benefits of recycling, including potential financial rewards
- lack of funding to finance recycling or even adequate waste management
- lack of safe and efficient infrastructure for recycling or appropriate waste management
- absence of waste management and recycling legislation/regulations and/or enforcement
- lack of adequate capacity, skills and technology
- lack of reliable data for designing efficient waste management/recycling strategies and for making rational investment decisions

Nevertheless, there has been increasing mention of EPR in recent environmental and waste management legislation and policy documents in South Africa, including the National Environmental Management Act 107 of 1998 (Republic of South Africa, 1998:12), which refers to the principle that "responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;" the National Waste Management Strategy (Department of Environmental Affairs and Tourism, 1999), which mentions EPR and product take-back legislation as priority areas for further investigation with a view to implementation in the near future; and the National Integrated Waste Management Bill (Republic of South Africa, 2003a), which emphasises that waste management in SA must emphasise EPR. Most recently, the Draft national environmental management: Waste management bill (Department of Environmental Affairs and Tourism, 2006) explicitly creates an environment in which EPR can be implemented, by allowing the environment minister to establish national standards for EPR and provide for the implementation of nationwide EPR policy measures, following proper consultation; while provincial authorities responsible for waste management may similarly implement EPR policy measures at a provincial level.

Other legislation and policy documents provide for operationalisation of the polluter pays principle (PPP) through the implementation of economic instruments (EIs), which often form an important component of EPR programs (e.g. in the form of PRO fees, ARF/incentive combinations, etc, which can be seen as types of EI). For example, the National Waste Management Strategy (Department of Environmental Affairs and Tourism, 1999) explicitly emphasises the relevance of the PPP for ensuring funding for waste management, and highlights EIs as an important way of implementing this principle. More recently, the National Treasury's 'Framework for considering market-based instruments to support environmental fiscal reform in South Africa' (National Treasury, 2006) provides

guidelines for the use of EIs in various areas of environmental management, including waste management, while Section 24(1) of the Environmental Conservation Amendment Act 50 of 2003 provides for "the imposition of compulsory charging, deposits or related financial measures on waste types or specified items in waste types with the concurrence of the Minister of Finance" (Republic of South Africa, 2004:4).

Government has targeted packaging waste as a priority waste stream for which EPR should be implemented. This had led in some cases to the promulgation of legislation (as in the case of plastic shopping bags); and, in other cases, to the signing of memorandums of understanding with industry (e.g. glass and polyethylene terephthalate (PET), a type of plastic), and subsequently to the establishment of joint industry initiatives for dealing with EPR in these industries. In another case (steel beverage cans), an industry initiative was established in 1993, long before any mention was made of EPR in South African policy documents or legislation. This section compares these different initiatives, focussing in particular on the effectiveness of voluntary schemes (e.g. cans, glass and PET) relative to mandatory legislation (e.g. plastic bags) in stimulating the recovery of post-consumer packaging materials for recycling.

2.2. Mandatory regulations: The case of plastic bags

By the late 1990s, plastic shopping bag litter had become so ubiquitous in SA that such bags became known as the 'new national flower.' Besides being unsightly, the bags are non-biodegradable and therefore persist in the environment. Even when they are disposed of properly, they are easily dispersed by wind during waste transport or at landfill sites, which are often uncovered, particularly in developing countries. On the other hand, they cause air pollution when incinerated (Republic of South Africa, 2002b). Furthermore,

producing plastic bags from virgin materials is relatively resource and energy-intensive (Fridge, 2001), implying that there are significant advantages to recycling plastic bags, both in terms of reducing the impact of post-consumer plastic bag waste and reducing resource and energy use in production.

According to Fridge (2001), supply of post-consumer re-processed polymer from plastic bags depends on the price of re-processed polymer; and on supply costs, which in turn depends on collection infrastructure and the weight of the material, which determines the cost-effectiveness of collection, and on the extent to which the material is contaminated, e.g. with printing, which affects processing costs. On the other hand, demand for re-processed polymer is determined by the price and availability of both virgin and re-processed polymer, and the market demand for products that can be manufactured from re-processed polymers, which in turn depends on technology and on the quality (including the thickness) of the re-processed polymer. In the late 1990s in South Africa, there was a lack of central collection points, while plastic bags were light in weight and highly contaminated with printing, and composed of thin plastic film, leading to high collection and processing costs, and limiting the range of potential end-uses. Recycling was therefore not viable or cost-effective, while the thin plastic film of which the bags were made had little commercial value as a raw material. Recycling rates of plastic bags were therefore less than 1% (Fridge, 2001).

The government's response was to impose legislation in 2003 (Republic of South Africa, 2003b) with respect to the thickness of and printing on plastic bags manufactured and imported (imposing a minimum thickness of 30 microns, and a limit to the amount of

printing allowed). At the same time, a mandatory levy (essentially an advance recycling fee) of 3c[1] per bag was imposed on plastic bag manufacturers and importers.

The legislation has a number of intended purposes. Firstly, the regulations on bag thickness (which in turn impacts on weight) and printing increase the range of potential end uses of plastic bags and lower collection and processing costs, increasing the viability and cost-effectiveness of plastic bag recycling, thereby increasing both the supply of and demand for re-processed polymer from plastic bags. The memorandum of agreement between government and the plastic bag industry (Republic of South Africa, 2002a), which gave rise to the legislation, also recognises the need for a minimum percentage reprocessed polymer content in potential end-products, such as garbage bags and bin liners, which should stimulate demand for re-processed polymer.

Secondly, the levy on plastic bags manufactured or imported increases the cost of manufacturing or importing plastic bags. This levy, essentially an advance recycling fee, is passed on to consumers through a voluntary agreement to charge them for plastic shopping bags at the point of purchase in the form of a plastic bag tax. This tax, which appears as a separate line item on the bill, aims to decrease consumers' demand for plastic bags and encourages re-use among consumers, reducing material use and the generation of plastic bag waste. Since there is now a price attached to the bags, consumers are less likely to either dump or dispose of them.

The third aim of the legislation is to stimulate a plastic bag recycling industry by promoting the return and collection of used plastic bags, and to create employment, through the establishment of a 'Section 21' (non-profit) company, Buyisa-e-bag, which is a joint

[1] 100c = 1 South African Rand (R); $1= R9.77; €1= R13.69

venture between government, labour and the private sector that is funded by the plastic bag levy. The aim of this company is to increase the convenience of, and thereby to reduce the costs associated with, the return and collection of used plastic bags, thereby increasing supply from consumers and collectors. For example, the company aims to establish strategically located Multi Recycling Buy-Back Centres to increase the convenience of returning used bags. Furthermore, collectors are able to sell used plastic bags to these centres, thereby increasing their supply (Buyisa-e-bag, 2008).

However, while the legislation has arguably been effective in reducing plastic bag production and waste, with sales at one stage reduced to 20-30% of pre-2003 levels (Packaging Council of South Africa, 2006), it has been far less successful in terms of creating a viable plastic bag recycling industry and associated employment. According to one media report in 2006, "consumers [had] forked out more than R100-million to the government from the compulsory plastic bag tax… but to date not a single bag [had] been recycled from this lucrative fund" (Gosling, 2006). Nor had any recycling depots been established or jobs created in the recycling industry. Indeed, with the decline in demand for plastic bags and therefore job losses in the plastic bag manufacturing industry, the net effect may have been a *decline* in overall employment (Gosling, 2006; Packaging Council of South Africa, 2006).

According to the Packaging Council of South Africa (PCSA) and various reports in the media, a plastic bag recycling industry has not developed because insufficient funds from the plastic bag levy are distributed to Buyisa-e-Bag, with the bulk of the revenues ending up in government coffers (Gosling, 2006; Packaging Council of South Africa, 2006). The plastic bag levy is paid to the South African Revenue Service; thereafter funds are transferred via the Department of Environmental Affairs and Tourism (DEAT) to Buyisa

based on the submission of an annual business plan (highlighting recycling and awareness-raising projects and programs to be carried out over the next three years, and their associated budget) to DEAT. Based on these business plans, DEAT requests funding for Buyisa from the National Treasury (Buyisa-e-bag, 2008).

For the year ending February 2006, R90 million was collected in levies (3,000 million bags * 3c per bag); of which only R20 million (22%) was allocated to DEAT, of which only R12 million (13% of revenues collected) was paid to Buyisa, of which R5.4 million had to be paid to the South African Bureau of Standards for enforcing the plastic bag minimum thickness regulations, leaving only R6.6 million (7% of revenues collected) for Buyisa's activities (Packaging Council of South Africa, 2006). According to the PCSA (2006:3), "this level of earmarking is unacceptably low and a substantially higher proportion – in excess of 35% - should be allocated to Buyisa-e-Bag for their activities."

However, the National Treasury does not allow tax revenues to be 'ring-fenced' for a specific purpose, since this reduces transparency and increases the scope for special interest groups to capture revenue (Nahman and Godfrey, 2008). It is for this reason that DEAT has to apply to Treasury for recycling funds on behalf of Buyisa. Although this is in line with international best practice regarding sound fiscal management, the result is that Buyisa receives insufficient funds for recycling and job creation. However, according to the Treasury (Morden, 2007), the problem is not that the funds are not earmarked, but that Treasury simply hasn't received requests from DEAT to release the funds; presumably because the business plans submitted to DEAT by Buyisa have not been adequate.

Furthermore, the decline in plastic bag sales as a result of the plastic bag tax is itself a reason why the legislation has failed to stimulate recycling and employment. At one point,

when consumers were paying 46c per bag, sales seemed to have fallen to such an extent (to 10% of previous levels) that there were no longer enough plastic bags in circulation to ensure a viable recycling industry, threatening the creation of jobs in the industry (Packaging Council of South Africa, 2006). Furthermore, such a decline in sales implies a decline in tax revenues, such that less money is available for Buyisa-e-Bag to undertake its activities. Although the price consumers pay for bags has since declined to 21c per bag, this is still much higher than the 3c levy paid by manufacturers; and at one stage sales has stabilized at only 20 – 30% of pre-2003 levels (Packaging Council of South Africa, 2006), which is arguably still too low for a viable recycling industry.

Thus, according to the PCSA (2006), it is retailers, Treasury and DEAT who benefit from the government-imposed legislation; at the expense of employees, consumers, the plastic industry and the environment. By contrast, "an industry driven environmental solution – as per a number of initiatives between [other] sectors of the packaging industry and DEAT – is a far more efficient and effective method of dealing with the issue of packaging in the waste stream" (Packaging Council of South Africa, 2006:3). Let us now turn to some examples of these industry-driven initiatives in the packaging industry.

2.3. Voluntary industry initiatives: Cans, glass, and PET

2.3.1. Collect-a-Can

In contrast to the government-initiated plastic bag recycling model, initiatives in other packaging waste steams "attest to the benefits of industry-based intervention to encourage recycling" (Brink, 2007:112). For example, Collect-a-Can was established in 1993 as a joint venture between ArcelorMittal South Africa (Africa's major producer of steel and

tinplate, used to manufacture food and beverage cans) and Nampak (Africa's major producer of beverage cans and other packaging) (Brink, 2007; Collect-a-Can, 2008a). It is a non-profit initiative that operates exclusively from funding provided by the two founding companies, with ArcelorMittal owning a 60% stake. Its long term sustainability is ensured by this funding and by a cost-effective operational model whereby its operations and cost structures are managed at optimum levels (Collect-a-Can, 2008a; Córdoba, 2008). During its 15 years of operation, it has increased the recovery rate of steel beverage cans from 18% to 67.5% (Córdoba, 2008), as compared to paper (50%), glass (26%) and PET (17%) (Collect-a-Can, 2008a). This rate is higher than that reported in many developed countries, placing South Africa in the top six countries in the world in terms of beverage can recovery rates (Dhliwayo, 2003; Córdoba, 2008).

Steel recovered from used cans is 100% recyclable and can be used many times over to produce new steel products, with no pre-treatment costs incurred (Collect-a-Can, 2008a). Collect-a-Can is essentially a producer responsibility organisation that "supports the collection of metal cans, the separation of tin from steel and the sale of recuperated materials" (Córdoba, 2008). Unlike other such initiatives in South Africa, however, Collect-a-Can doesn't only promote and facilitate recycling, but is involved in the physical recycling process itself (Brink, 2007). It removes the tin from scrap cans through an electrolytic process, and sends the resulting high-grade steel scrap to steel mills and foundries, where the scrap is melted and used to produce new steel (Kock, 2004; Collect-a-Can, 2008a). Its main objective is to ensure extended producer responsibility on behalf of the industry through recovery and recycling of used cans. A secondary objective that has emerged more recently is to avoid harmful legislation of the plastic bag type being imposed on the industry (Kock, 2004).

Before the establishment of Collect-a-Can in 1993, the market for used cans was characterised by both low supply and low demand. Firstly, prior to 1993, neither collectors nor consumers were paid for returning or collecting used cans, implying a low quantity supplied. Now, however, Collect-a-Can buys used cans and pays collectors and consumers above market prices (Collect-a-Can, 2008a). Collect-a-Can therefore effectively subsidises the price paid for used cans (Collect-a-Can, 2008b), increasing the price and therefore increasing the quantity of used cans supplied. In addition, Collect-a-Can tries to keep recovery and recycling costs to a minimum, e.g. through a cost-effective operational structure and encouraging recovery at source, in order to keep the costs incurred by consumers and collectors low, therefore increasing the quantity supplied.

Secondly, prior to 1993, there was no demand from steel mills for used cans because of the tin content (recall that contamination lowers the quality of the recyclable material, and hence lowers demand) (Collect-a-Can, 2008b). However, Collect-a-Can has since established a world-class de-tinning plant in Vanderbijlpark, were the tin is stripped from the steel cans, allowing the separated steel to be recycled more cost-effectively, which has seen demand increase. In addition, ArcelorMittal, the major steel producer, has signed an agreement to accept the cans to mix with other scrap for the production of mild steel as part of its commitment to EPR (Collect-a-Can, 2008b). Indeed, shareholder commitment is crucial to the success of the model. Such commitment is more likely to be secured through a voluntary industry initiative than through government-imposed regulations, highlighting one of the benefits of voluntary industry initiatives.

Collect-a-Can is therefore often cited as “a good example of how the industry can develop a sustainable effort to meet its responsibilities to the environment and in the process, alleviate the plight of the poor” (Collect-a-Can, 2008a) and “a model to which other industries should aspire” (BuaNews, 2003).

2.3.2. The Glass Recycling Company

Although glass is infinitely, 100% recyclable, prior to 2006, glass recovery rates in SA were relatively low (around 20%) compared to other countries due to a lack of industry ownership and responsibility (The Glass Recycling Company, 2007:8). However, government's focus on the packaging industry, which resulted in legislation on plastic bags, for example, motivated the glass industry to coordinate its efforts and embrace the concept of EPR (The Glass Recycling Company, 2007). This led to the establishment of the Glass Recycling Company (GRC) in 2006. This non-profit, joint industry initiative was established through a nationwide partnership between government (Department of Environmental Affairs and Tourism); glass manufacturers; fillers, who use glass to package their products; and recyclers. It is motivated by the desire to avoid punitive legislation of the plastic bag type, and has signed a memorandum of understanding with DEAT to increase the recovery rate of glass (Consol Glass, 2008).

The GRC is a PRO that is "responsible for facilitating the recovery of waste glass for recycling" (Consol Glass, 2008) on behalf of the glass industry. Unlike Collect-a-Can, however, the GRC does not partake in the physical recycling process (The Glass Recycling Company, 2008). Instead, recycling is carried out on-site by South Africa's major glass producers, Consol Glass and Nampak Weigand Glass. The GRC simply facilitates glass recovery by promoting glass recycling, raising awareness regarding its importance, and building capacity (Brink, 2007; The Glass Recycling Company, 2008). It aims to "foster a robust collecting industry" (Brink, 2007:112) by providing collection infrastructure (such as glass banks where consumers can take used glass for recycling) and payments to collectors,

thereby ensuring a reliable supply of waste glass. Through an agreement with glass manufacturers, it also guarantees a demand for waste glass.

Prior to the establishment of the GRC, financial resources for promoting glass recovery and recycling (including marketing and capacity building) were lacking (The Glass Recycling Company, 2007). The GRC has adopted what it calls an advanced repurchase model, whereby provision is made for dealing with waste glass at the end of its useful life at the point of manufacturing (Goldwyer, 2007). This model essentially amounts to a combined advance recycling fee/incentive system. Member companies (fillers) pay a levy at the point of purchase (essentially a PRO fee) per tonne of glass bottles purchased from glass manufacturers Consol and Nampak (Rhodes, 2007; The Glass Recycling Company, 2007).

The levy is used to cover costs as well as to raise funds for the provision of information (in the form of education, marketing and awareness campaigns), basic collection infrastructure (e.g. glass banks) and financial incentives (in the form of payments to collectors); in order to ensure a reliable supply of used glass from both consumers and collectors. Firstly, by providing glass banks at strategic locations around the country (The Glass Recycling Company, 2008), the GRC lowers the cost to consumers of returning waste glass, thereby increasing their supply. Furthermore, consumers can get cash for glass if they take their glass to scrap dealers, entrepreneurs or buy-back centres (established by glass manufacturers such as Consol), rather than GRC glass banks (Consol Glass, 2008), increasing the price they receive, thus increasing the quantity supplied.

Secondly, prior to the establishment of the GRC, there was a perception among potential collectors that the prices paid for waste glass were too low, or a lack of awareness that waste glass had a monetary value at all (The Glass Recycling Company, 2007; 2008). The

quantity supplied by collectors was therefore low. The GRC aims to increase this supply by setting up entrepreneurs who pay collectors for the waste glass that they collect (The Glass Recycling Company, 2008). In turn, entrepreneurs sell the waste glass to manufacturers, who have signed an agreement to pay prices equivalent to that of virgin batch material (Brink, 2007). This guarantees a stable price for collected glass that is not subject to market fluctuations (The Glass Recycling Company, 2008), ensuring a reliable supply from collectors and entrepreneurs. This agreement also guarantees a reliable demand for used glass[2].

The GRC relies entirely on levy payments as its only source of income. Thus, as with Collect-a-Can, shareholder commitment is crucial to the success of the model. The GRC's shareholders include the major manufacturers and 90% of fillers, making it "a more comprehensive industry-wide initiative than Collect-a-Can" (Brink, 2007:112). Furthermore, the GRC benefits from 100% levy compliance (The Glass Recycling Company, 2007:12). This level of commitment from industry has resulted in substantial increases in collection, recycling and re-use rates of used glass (The Glass Recycling Company, 2007). In its first year of operation, the recovery rate of waste glass increased from 21% (in 2005/06) to 26% (in 2006/07) of glass containers produced in SA (The Glass Recycling Company, 2007). Like Collect-a-Can, the GRC also contributes to job creation by providing a stable source of income for unemployed collectors, and by allowing for entrepreneurs to be set up (The Glass Recycling Company, 2008). Once again, this case highlights the benefits of a voluntary industry initiative as opposed to punitive government legislation.

[2] Indeed, Consol Glass have shown their commitment to continue purchasing waste glass into the foreseeable future by investing in sorting and recycling technology to the extent that "the company now has a sustainable model that is already revealing a reduction in the overall cost of glass recycling as volumes start to increase" (Goldwyer, 2007).

2.3.3. PETCO

Like steel and glass, polyethylene terephthalate (PET), a type of plastic resin commonly used for beverage and food containers, such as cool drink and mineral water bottles, is 100% recyclable. The recovered polymer can be used in a wide variety of applications. However, a number of potential end-uses, such as 'bottle-to-bottle' recycling, which would 'close the loop' in terms of the PET life-cycle completely, require both fairly advanced technology and recycled PET of an extremely high quality. Prior to 2000, only 2% of PET bottles used in South Africa were collected for recycling, all from landfill sites and therefore severely contaminated; pushing up the operational costs of producing recycled products of sufficient quality for food contact purposes and limiting the potential end-uses of recycled PET (Brink, 2007). Thus, PET collected for recycling was both of insufficient quantity and quality for a viable PET recycling industry. However, given that PET is 100% recyclable and amenable to numerous end-uses, the PET industry realised that it could exploit this latent demand if it could ensure a cost-effective supply of PET of a sufficient quantity and quality, and therefore that it could benefit from an industry-regulated and coordinated recycling initiative (Brink, 2007)

In addition, like the can and glass industries, the PET industry wished to avoid punitive government legislation of the type imposed on the plastic bag industry (PETCO, 2006). Manufacturers and downstream industries came to the conclusion that collectively addressing their responsibilities with respect to post-consumer PET packaging in the waste stream through an industry-driven and financed national recycling initiative based on the concept of EPR would be more effective and efficient than government-imposed regulation (PETCO, 2006; Brink, 2007). Thus, following a 1999 meeting of representatives from the

PET industry (including Coca-Cola, resin producers, converters and bottlers) and the formation of the PET committee, the South African Polyester Recyclers was established in 2000 as an industry-run recycling operation. This was followed by the establishment of PETCO at the end of 2004 as a not-for-profit, joint industry initiative to capitalise on the expected growth in the market for recycled PET and to act as the vehicle through which the PET industry would self-regulate and coordinate its recycling activities (Brink, 2007).

Like the GRC, PETCO is not involved in the physical recycling process itself (Brink, 2007). Instead, it acts as a PRO that undertakes activities related to EPR, such as promoting and advancing the collection and recycling of post-consumer PET, on behalf of its shareholders in the PET industry, namely brand-owners (such as Coca-Cola), resin producers, converters (who manufacture bottles from PET resin) and bottlers (fillers) (PETCO, 2006). It has signed a memorandum of understanding with the Department of Environmental Affairs and Tourism whereby the latter agrees not to promulgate legislation relating to PET recycling (as it has in the plastic bag case) provided that the industry, through PETCO, takes responsibility for its post-consumer waste (PET collection and recycling) "according to mutually agreed upon targets, evaluation and monitoring processes" (PETCO, 2008a).

The market price of PET fluctuates as a result of fluctuations in oil prices, exchange rates, demand from large countries such as China, and other factors (Brink, 2007). In addition, the market for scrap plastics, particularly for a non-traditional waste stream such as PET, is immature and vulnerable to numerous information-related and technical imperfections and failures. Prices in this market are therefore particularly volatile (Stromberg, 2004). Despite this, and despite the fact that neither the technology for nor the quality of recycled PET are currently sufficient to allow for bottle-to-bottle recycling or other food-contact applications,

the multitude of other end-use applications implies that demand for recycled PET is already sufficiently high. However, before the establishment of PETCO, supply of used and recycled PET was not able to keep pace with this demand, and was highly unstable as a result of volatile prices (Brink, 2007).

Like the GRC, PETCO has adopted a business model which essentially amounts to a combined advance recycling fee/incentive system, which aims to stabilise prices, and therefore supply. A key component of the model is a voluntary levy (essentially a PRO fee) paid by converters (who manufacture PET bottles from polyester resin) and bottlers (who fill PET bottles) per ton of PET resin purchased (currently set at R200/ton) from resin producers. The levy is also paid by PET importers; while resin producers (who collect the levies on behalf of PETCO) and brand owners (such as Coca Cola) contribute in the form of annual grants. The revenue from these levies and grants is used to finance operational costs (PETCO, 2005), and to ensure a constant supply of used and recycled PET through adverse economic conditions (PETCO, 2008a).

PETCO uses the revenues to support recyclers (particularly during adverse economic cycles, when prices are unfavourable) and recycling projects, as well as to support companies promoting PET recycling and to fund education and awareness raising programs, in order to increase the supply of recycled PET. This support takes the form of subsidies per ton of material recycled, financial support for recycling operations and infrastructure, transport subsidies, and/or a safety net during adverse economic cycles. PETCO keeps the price of recycled PET artificially high when market conditions are unfavourable, ensuring that recyclers are kept in the market despite fluctuations (PETCO, 2005; Brink, 2007). This stabilises the price paid to processors at an attractive level, ensuring a reliable supply of recycled PET. In turn, recyclers pay collectors per ton of used

PET collected, at prices that are based on the prices recyclers themselves receive from PETCO, such that collectors are also kept in the market during adverse cycles (PETCO, 2005; Brink, 2007). Again, this attaches a stable monetary value to each unit of PET collected, therefore increasing the quantity of used PET supplied by collectors.

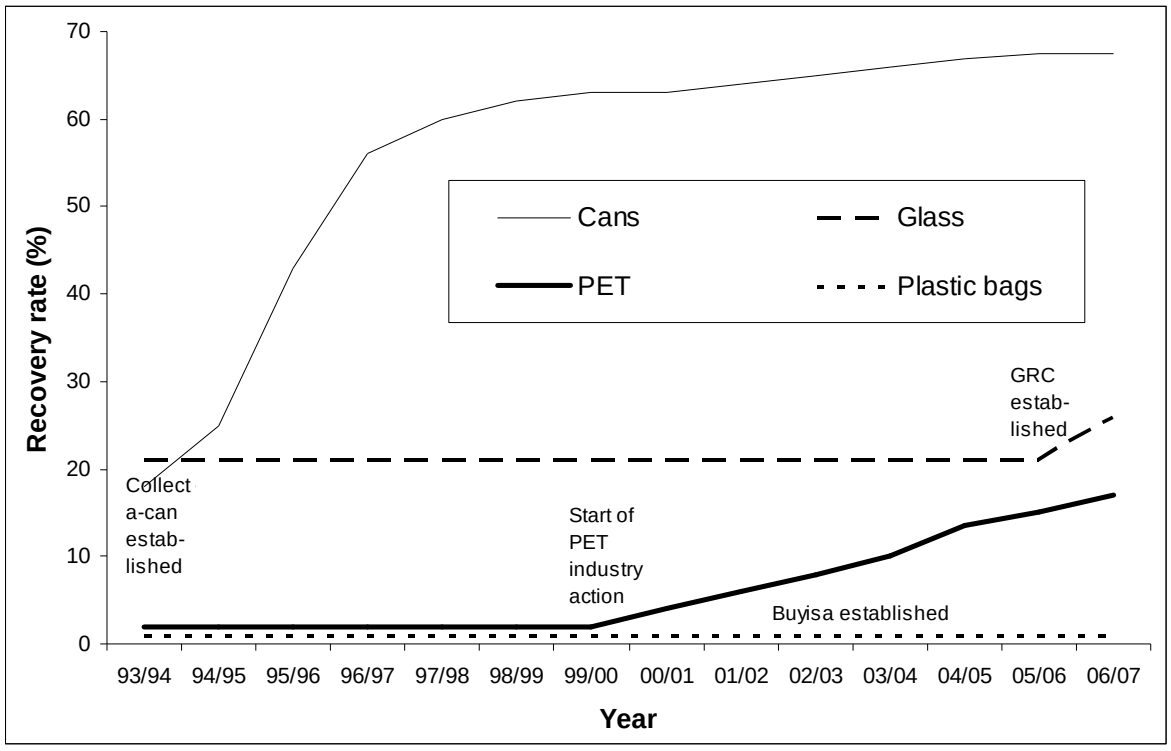
Through the collective actions of the PET industry since 1999, including the establishment of PETCO in 2004, PET recycling in SA has grown from 2% of PET produced in 2000 to 17% of PET produced (including 24% of beverage bottles) in 2007 (PETCO, 2008b). Like Collect-a-Can and the GRC, PETCO also contributes to job creation, by providing support to collectors and recyclers. The PET case thus represents another "successful example of an industry working together to address its post-consumer responsibility by removing a 100%-recyclable product from the national waste stream" (Brink, 2007:110); and, like the can and glass cases, highlights the positive spin-offs for both business and society of voluntary industry initiatives (Brink, 2007).

3. Synthesis and lessons learned

Nnorom and Osibanjo (2008:857) argue that an effective EPR program would be too complex for an industry group to implement and administer alone, and that government action is therefore necessary. However, South Africa's experience with EPR in the packaging industries highlights the relative advantages of industry-led initiatives over government-mandated approaches, particularly in the developing country context, where government intervention aimed at overcoming market failures often does more harm than good; a situation known as government failure. This can be illustrated by showing how recovery rates have increased as a result of the establishment of a producer responsibility

organisation responsible for ensuring that EPR is achieved in each of the respective industries (Figure 2).

Figure 2: Recovery rates over time in SA for cans, glass, PET and plastic bags



This shows that in the case of cans, glass, and PET, recovery rates began to increase significantly in the year or the year after the respective industry initiatives began; whereas in the case of plastic bags, recovery rates remained low even after the regulations were promulgated[3]. This suggests that industry initiatives are more effective than government regulation in stimulating the recovery of packaging waste for recycling. Furthermore, the industry-based initiatives have been able to create viable recycling industries and have therefore contributed to employment creation; whereas in the plastic bag case, this has not

[3] Note, however, that the most recent recovery rates for plastic bags are not available; and that the rate of 1% is an estimate based on various reports that the establishment of Buyisa-e-bag has not resulted in any increase in plastic bag recoveries. Not even Buyisa-e-Bag themselves, the organisation charged with recovery of plastic bags, were able to tell me the recovery rate of plastic bags.

been the case, and the overall effect of the legislation may in fact have been a decline in employment (Gosling, 2006; Packaging Council of South Africa, 2006).

The plastic bag legislation reflects government's "intention to begin forcing behavioural change on business and consumers" (Brink, 2007:110). Under this type of approach, government imposes EPR on an industry, compelling industry to take its post-consumer liability seriously or face some type of penalty (Brink, 2007). However, "whilst plausible, this approach has not yet produced a viable recycling industry for plastic bags [in SA], due to regulatory and institutional incapacities" (Brink, 2007:112). In particular, the financing mechanism, through which revenues from the plastic bag levy are supposed to be channelled toward developing the recycling industry, seems to be seriously flawed. This highlights the difficulties associated with allowing government to become involved in the financing of an EPR program, particularly in developing countries, given the existence of government incapacities and corruption.

By contrast, other models in the packaging industry in SA, relating to cans, glass, and PET, highlight the benefits of voluntary industry initiatives (Brink, 2007). Although these models have important differences, they are all essentially examples of voluntary EPR initiatives based on the establishment of a PRO that coordinates the industry's EPR activities and ensures that its responsibilities are met. For example, in all cases, the respective PRO aims to promote recycling and to stimulate recovery by providing incentives and infrastructure for collection; although Collect-a-Can differs from the other initiatives in that it is also involved in the physical recycling process (Brink, 2007). In the case of glass and PET, recycling is undertaken by large manufacturers, and, in the case of PET, by another joint industry initiative, South African Polyester Recyclers.

Furthermore, while Collect-a-Can was established and is funded exclusively by two shareholders, SA's largest steel company and its largest beverage can producer; both GRC and PETCO have numerous shareholders across their respective value chains, and are funded by levies paid by member companies based on product sales. However, in the case of the GRC, the levy is paid only by fillers on finished glass containers purchased from glass manufacturers, whereas in the PETCO case, levies are paid by PET converters (on resin purchased from PET resin manufacturers) and importers as well as bottlers (on bottles purchased from converters); while resin producers and brand owners pay annual grants. However, in all cases, shareholder commitment is crucial to the success of the models, and in all three cases shareholder commitment has proved to be effective, highlighting the benefits of voluntary industry action over government-imposed regulation in stimulating recycling.

One possible reason for this finding relates to the different sources of market failure associated with recycling as opposed to those associated with waste generation and disposal. Externalities associated with waste generation and disposal are true market failures in the classical sense whereby the private costs associated with a particular activity (waste generation and disposal in this case) don't reflect the social (e.g. environmental) costs, a situation which is unlikely to resolve itself in the absence of government intervention, since there is no incentive to the private producer or consumer to rectify the situation of his or her own accord. By contrast, in the market for recycling, market failure arises due to the existence of information failure, technical constraints, search costs, etc, which act as barriers to the development of a viable recycling industry (Stromberg, 2004), but from which there are private gains (to the manufacturing industry) to be made from overcoming. To the extent that these gains can be achieved at relatively low cost, as in the PETCO case (Brink, 2007), it is in the industry's best interest to play a facilitative role (or

to create a separate body responsible for doing so) in order to overcome information failure and search costs. Role players in the industry would in this case commit themselves to EPR voluntarily (Brink, 2007), without the need for government intervention. Indeed, if the industry expects the government to implement legislation, this would itself provide an impetus for industry action so as to avoid potentially harmful legislation, as was the case with the glass and PET industries in SA, who wanted to avoid the type of industry-wide legislation imposed on the plastic bag industry. In both cases, memorandums of understanding were signed with government, who are partners in the respective organisations.

Indeed, the South African experience suggests that there is no need for government intervention in the management of an industry's post-consumer liability "if the industry itself is prepared to take the initiative and can do a better job" (Brink, 2007:117). Government intervention is only justified where industry fails to take action, for example because the private gains from such action don't justify the costs, as in the plastic bag case in SA, where high costs were involved in terms of acquiring new technology capable of manufacturing thicker, more recyclable plastic bags (Fridge, 2001). Even then, intervention should be restricted to providing the initial impetus for the creation of a recycling industry in the first place, e.g. by means of a subsidy to cover initial capital costs, after which economies of scale will be realised and the industry becomes self-sustaining, such that no further intervention will be required.

Acknowledgements

This study was funded by the CSIR through the Parliamentary Grant budget. … and … provided useful insights and comments on an early draft.

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