

Reduce, Reuse, Refill!

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Introduction

What environmental and economic benefits could refillable beverage containers bring to the U.S.? What policies effectively promote refillable beverage containers? Which ones can best be applied to the U.S.? This report seeks to address these and other questions. Also see ILSR's and GRRN's Web site on refillable beverage containers at <http://www.grrn.org/beverage/refillables/index.html>.

In the U.S. today, beverage containers are designed for a single use. Once used, two-thirds are landfilled. The remaining one-third are reprocessed and recycled into new products. Not too long ago, Americans had a more efficient way of handling used beverage containers -- we refilled them. When compared to non-refilling systems, refilling systems contribute less to global warming, acid rain, smog, and solid waste. Refilling systems also use less energy and water. In addition, refilling eliminates the need to find markets for green and brown glass bottles and plastic bottles. Indeed, Finland embraced refilling because its capacity for recycling glass is limited, and markets for recovered glass are unstable. It also has no facilities for converting recovered PET into feedstock.

While many people believe that environmental gains come with economic sacrifices, refilling beverage containers does not involve such trade-offs. By reusing containers multiple times, refilling cuts the public costs of waste management, creates jobs, and can reduce the prices of beverages. In addition, some policy instruments implemented to support refilling (such as packaging taxes), can raise millions of dollars in government revenue.

Germany's Packaging Ordinance, for instance, not only increased refilling but also encouraged many medium-sized beverage companies to invest in refilling systems. Of the 161,000 jobs directly connected to the manufacture and filling of beverage containers and to the distribution and selling of packaged beverages in Germany, 73 percent involve refillable containers. One study estimated that 53,000 jobs would be lost if one-way containers completely overtook refillables. Yet if a transition occurred in the opposite direction, 27,000 new jobs would be created.

In Denmark, refillable 500-ml PET bottles are almost 15 times cheaper than their one-way counterparts (on a price per filling basis). Its packaging tax raised 101 million Euros in 1999 (only 255,000 Euros were spent to set up administration and collection of the tax and 1999 operating costs were 27,000 Euros). The country's refilling requirement for soft drinks and beers has prevented an estimated 390,000 tons of waste annually. In Finland, refilling has prevented 380,000 tons of waste annually.

Yet, in spite of the many advantages of refilling, the beer and soft-drink industries in the U.S. have dismantled their refilling systems. While American soft-drink companies have replaced refillable glass bottles with single-use plastic bottles and aluminum cans in the U.S., they have been using state-of-the-art refillable containers in many European and Latin-American countries. Unlike the United States, these countries have policies that specifically require or promote refillable beverage containers or have economic incentives to use them. (See table on following page.)

The increasing use of one-way containers began to concern Canadians and Western Europeans in the 1970s. To reduce litter or to prevent the further decline of refilling, many European countries and a few Canadian provinces enacted policies to promote or require the use of refillable beverage containers. These policy instruments mimic those used to address other environmental problems. Whenever legislation is proposed to promote or require refillable beverage containers, proponents of the legislation cite the environmental benefits of refilling. Life-cycle analysis (LCA) studies show that refilling can reduce many of the environmental impacts and natural resource demands of beverage packaging. In fact, refilling can bring environmental benefits without requiring economic sacrifices.

Refillable containers now hold most of the volume of soft drinks and beer in places that long ago had enacted effective policies while refilling was still common. These places include Denmark, Finland, and the Canadian province of Prince Edward Island. For the Canadian beer industry, in addition, provincial policies have helped preserve refilling. Policies that have helped preserve refilling are in effect also in Norway, the Netherlands, Belgium, and Germany. The German Packaging Ordinance, in fact, has helped

maintain a noticeable presence of refillable containers for beverages other than soft drinks and beer. Refilling systems thrived in most Latin American nations until 1990, the year when a deluge of one-way PET soft-drink bottles and beer cans began in some South American markets. However, Coca-Cola and other companies still put a significant volume of their soft drinks in refillable bottles in order to make packaged beverages affordable to more people in Latin America.

Refillables as a Portion of Total Beverage Sales

	Soda	Beer	Policies
Prince Edward Island (Canada)	~100%	~100%	Bans non refillables
Finland	98%	73%	Levy on one-way containers
Denmark	90%	100%	Banned cans and required refillables for domestic soda/beer (can ban repealed in 2002)
The Netherlands	75-80%	~100%	Packaging covenant--cannot substitute one-ways for refillables unless environmental impact is same or less
Germany	75%	75%	Quota--72% must be packaged in refillables or be subject to mandatory deposits
Ontario (Canada)	NA	81%	~9¢ tax on one-way beer containers
Quebec (Canada)	NA	80%	Quota--no more than 37.5% of beer can be in one-ways
U.S.	<3%	<5%	

Source: Institute for Local Self-Reliance, 2002.

The Basic Refilling System

Before 1960, locally-operated and locally-owned refilling systems were the standard way of delivering soft drinks (and beer) in the U.S. and elsewhere. Upon the purchase of soda pop at the store, Americans would pay a deposit on the bottles. For returning each empty bottle, the store would refund the amount of the deposit. The local bottler retrieved the empty bottles from the store upon the delivery of soda pop and returned them to the bottling plant to be washed and refilled. In 1959, a soda pop bottle typically made 21 such trips. Although the technology has advanced significantly since 1959, the basic processes of refilling systems have remained the same.

Trippage. The term *trippage* means the number of trips that a bottle makes, including the initial filling, until it is taken out of circulation. A bottle can be taken out of circulation because of breakage, scuffing, or contamination. Scuff marks on a refillable bottle are made by the washing, filling, and bottle-handling machinery. Contamination may come from improper use of the bottle, including filling it with paint thinner or with another toxic liquid. Bottles come out of circulation also when they are not returned. Indeed, trippage depends on the *return rate*, the percentage of bottles that are returned. High return rates are an indicator of an effective *deposit-return system*, a system in which empty bottles are returned from the consumer to the bottling plant and in which deposits and refunds are exchanged between the bottler and the seller and between the seller and the consumer. In some European countries, deposit-return systems operate as part of bottle pools in which brewers and soft-drink bottlers share a few types of industry-standard bottles.

Technologies. Refilling systems now use advanced technologies that were developed during the 1980s and 1990s. At stores, reverse vending machines take bottle returns, pay refunds, and even allow the customer to donate their refund to their favorite charity. Lightweight, reusable plastic crates also facilitate bottle handling and make transportation efficient. Other bottle-handling machines at the store and at the bottling plant have made refilling systems highly automated. One such machine puts bottles on a conveyor which takes them to the bottlewasher. After bottles are washed, an electronic sniffer inspects the bottles for contamination. The sniffer is important especially for inspecting refillable plastic bottles because they can trap micro-organic contaminants. Refillable plastic bottles have probably been the most important technological advancement because they have enabled refilling systems to package beverages in multi-serve bottles that are lightweight and shatterproof.

Refillable container materials. Refillable bottles can be made from glass and from several types of plastics, the most common of which is polyethylene terephthalate (PET). Soft drinks, water, and beer come in refillable PET bottles. Polyethylene naphthalate (PEN), which is superior to PET in many ways, is being used for refillable beer bottles in Denmark. Refillable bottles can also be made of high-density polyethylene (HDPE), which is commonly used for one-way milk and water jugs and commonly called #2 plastic. For refillable plastic milk bottles, however, many dairies who operate refilling systems have used polycarbonate (PC) rather than HDPE.

Terminology. Beverages are delivered for consumption in one of three ways: in refillable containers, in non-refillable containers, and in bulk containers. Because refillable containers include mostly bottles but can take other forms and shapes, this report mostly uses the term "refillable containers" rather than "refillable bottles." Refillable containers are also called "returnable containers," "reusable containers," "reusable packaging," or "deposit bottles." Non-refillable containers, which include both cans and bottles, are also called "one-way containers," "one-trip containers," "single-trip containers," "single-use containers," "disposable containers," "throwaway containers," "non-returnable containers," or "non-reusable containers." Beverages in refillable or non-refillable containers are known as "packaged beverages." Non-packaged beverages include draught beer and fountain soft drinks, both of which are delivered in bulk containers. Draught beer is beer that is delivered in kegs or barrels, mostly to pubs and restaurants. Although bulk containers are refillable, this report focuses on packaged beverages. Another word in beverage packaging jargon is the term *presentation*, which refers to a product-container combination. Coke in a 330-ml can and Coke in a 330-ml glass bottle are two different presentations. Coke in a 330-ml can and Sprite in a 330-ml can are also two different presentations. The terms "returnable presentation" and "non-returnable presentation" distinguish presentations with refillable containers from those with non-refillable containers.

Delivering packaged beverages involves three types of packaging: *primary packaging*, *secondary packaging*, and *tertiary* or *transport packaging*. Primary packaging consists of the beverage containers themselves. Secondary packaging enables the handling of a set of containers as a single unit; examples include six-pack rings or paperboard 12-pack cases for cans, corrugated cardboard cases for cans, paperboard carrying cases for six-packs of bottles, and reusable plastic crates for bottles. Transport packaging facilitates the safe and efficient delivery of packaged beverages by truck from one point in the distribution network to another. Transport packaging usually consists of reusable plastic crates, wood and plastic pallets, and shrink wrap. Secondary and transport packaging is just as important as the beverage containers themselves in beverage packaging systems.

Some Observations

Probably most of what is written about refillable beverage containers is summarized in three major reports: the 1978 report *Beverage Containers: Reuse or Recycling* by the Organisation for Economic Co-operation and Development; the 1994 report *Case Reopened: Reassessing Refillable Bottles* by David Saphire of INFORM, Inc.; and the 1999 report *Reuse of Primary Packaging* prepared by Andreas Golding for the European Commission. (The bibliography has more information about these reports.) Much of the material for our report came from these publications, and the Institute for Local Self-Reliance (ILSR) gratefully

acknowledges these sources. Based on our research for this report, we make some observations about refilling that may not have been previously highlighted. These include the following.

- In places that have refilling laws, survey results indicate that a large majority of consumers support these laws or prefer refillable over one-way containers when purchasing beverages. These surveys were conducted in Finland, Germany, and the Canadian province of Prince Edward Island.
- In some beverage markets, refilling may be necessary because recycling can be impracticable. In Canada, weak markets for recovered brown glass make recycling beer bottles difficult. Finland lacks much of the infrastructure needed to recycle glass, PET, and aluminum and cannot justify investments in extensive collection programs because of the low population density and the low levels of packaging waste that Finns generate.
- Refilling laws are not necessarily trade barriers. In the early 1990s, the United States brought Canada to a hearing before a GATT panel and alleged that the refilling laws of some provinces interfered with U.S. exports of canned beer to Canada. After the panel ruled in favor of Canada in 1993, U.S. beer companies decided to work with the Canadian refilling systems rather than try to beat them. Now the major U.S. brewers cooperate with the major Canadian brewers to package American beers in refillable bottles and sell them in Canada.
- Retailers have been driving the decline of refilling, especially for soft drinks. Although much has been written about how retailers resist refilling and how they influence beverage packaging, this research has found that this resistance and influence have been consistent over time and across the western world. Retailers began their war on refillable soft-drink bottles in the U.S. in the 1950s with their private-label canned soda pop and continue it today with the takeover of major Latin American markets by international retailing giants such as Walmart and Carrefour. In Europe, supermarket and discounter chains exploit opportunities to stock beverages in one-way containers.
- Policies are what have preserved refilling. Although refilling in some markets is supported by the beverage industry or by an economic or other necessity, refilling is threatened in some way by pressure to use more one-way containers. Only a policy can mitigate such pressure.
- Eco-taxes on one-way containers may be the best policies for preserving or promoting refilling. Such taxes provide an economic incentive to package, sell, and purchase beverages in refillable containers. Taxes on one-way containers can promote the environmental benefits of refilling without sacrificing choices in beverage packaging. In addition, a government can formulate a tax policy in many ways and can accumulate revenue from it. Finally, taxes on one-way containers consistently have survived international trade disputes and have proven themselves effective in Finland, Norway, Sweden, Denmark, and the Ontario beer market.

The Institute for Local Self-Reliance intends to continue its work to promote refillable beverage containers. As we update our research and findings, we suspect these initial observations will be further refined and expanded.

The Environmental Benefits of Refillable Beverage Containers

A transition from one-way to refillable beverage containers could have many environmental benefits. These potential benefits include reductions in:

- greenhouse gas emissions,
- carbon monoxide emissions,
- solid waste generation,
- energy consumption, and
- water consumption.

The discovery of these environmental benefits has come through life-cycle analysis. *Life-cycle analysis (LCA)*, which is also called *life-cycle assessment* or *eco-balances*, has become a useful methodology for evaluating the potential environmental impacts and natural resource demands of beverage containers.

Around 1970, Harry Teasley, Jr., of Coca-Cola directed one of the first LCA studies of beverage containers. Like the Coca-Cola study, most of the early LCA studies of beverage containers were investigations of a particular type of container that a company was using or was wanting to use. Such investigations can help a company comply with regulations, reduce waste, cut costs, or evaluate its use of scarce or expensive raw materials.¹ In the 1990s, governments began conducting LCA studies in order to guide them in policymaking. One country, in fact, has directly incorporated LCA into its policy. Under the Dutch Packaging Covenant, bottlers cannot substitute refillable with one-way beverage containers unless they can demonstrate that the overall environmental impact of their proposed one-way containers is less than or equal to the impact of their refillable containers. The results of a recent LCA study, however, told Dutch soft-drink bottlers to continue refilling. Another application of LCA to policymaking is Denmark's packaging tax, whose rates are based on the environmental impacts of different packaging materials. For more details about these policies, see the Europe chapter.

Although ways to improve LCA methodologies are being investigated, LCA still has many methodological limitations. The usefulness of an LCA study is limited also because it may include some processes and exclude others and may evaluate only a limited set of environmental impacts and resource demands. Because the geographic scope, the containers under investigation, the beverages included, and other factors of LCA studies determine their findings, applying the findings of one LCA to other beverage markets is difficult. For these three reasons, the interpretation of LCAs in this report refrains from concluding in absolute terms that one beverage packaging system is environmentally superior to another.

A life-cycle analysis study can serve as a comparison not only between refillable and one-way containers but also between refilling and recycling. Many LCA studies assume that one-way containers are recycled at a given rate but must also consider collection, sorting, and other recycling processes in order to effectively compare refilling to recycling. Comparisons between refilling and curbside recycling and between refilling and deposit-return systems for one-way containers would be useful.

Life-Cycle Analysis of Beverage Containers

Life-cycle analysis studies attempt to estimate the environmental impacts and natural resource demands of beverage containers per unit volume of packaged beverage. The natural resources usually include energy, water, minerals, timber, land, and fossil substances used either as fuel or as raw materials. Environmental impacts usually include solid waste, emissions to water, and emissions to air but may also include hazardous waste, organic waste, nuclear waste, noise, and dust. The LCA findings may be expressed in terms of individual pollutants and resource demands or in terms of impact categories such as the following: global warming, which includes greenhouse gas effects; acidification, which includes acid rain; and ground-level ozone formation, which contributes to smog. Finally, the sponsor of an LCA study may apply a ranking scheme to express the findings in terms of the relative acceptability of the environmental impacts and resource demands.²

Life-cycle analysis studies usually consider the entire life cycle of a beverage container, from the extraction of the natural resources that are used to manufacture it to the disposal of the container through recycling, landfilling, or incineration. This life cycle includes several processes that contribute to the environmental impacts and the resource demands of the container. Among these processes, an LCA of beverage containers may include the following: extraction of raw materials, production of container materials from both virgin and recycled materials, manufacture of the containers, filling, distribution, retailing, consumers' refrigeration of the product, return of the containers, washing, recycling, incineration, and landfilling. An LCA can also include the manufacture of secondary and transport packaging, the production of materials for this packaging, and the reuse, recycling, or other disposal of this packaging. Other processes may include the generation of energy by power plants, the production of chemicals for washing the bottles, the generation of energy and of solid waste by incineration, the generation of methane from landfills, and the dynamics of the market for recovered materials.³

Many of the processes that make up the life cycle of a beverage container are characterized by critical parameters which can significantly affect the findings of an LCA. These parameters include the trippage of refillable containers, the recycling rates of both one-way and refillable containers, the transportation distances involved in delivering beverages from the bottling plants to the points of sale, and the recycled content of new containers. The values of these parameters can be actual values or sets of arbitrarily-chosen values which are used to ascertain how the LCA results vary with these values. Reliable values are usually available for the critical parameters but may not be available for other input data. Studies conducted for individual companies can use the company's proprietary data,⁴ but studies conducted for governments may not have access to such proprietary data and usually must use data from a variety of sources. The variety of sources of data for LCAs causes variation in the data and in turn limits the precision of the results of LCA studies. Normal statistical variation also affects the precision of LCA results. The variation in the data is one limitation of LCA methodology. Other limitations include the following.⁵

- The availability or the quality of data can limit the accuracy of an LCA study.
- The methods used for estimating or evaluating the environmental impacts are limited by the assumptions on which they are based. Estimation or evaluation methods may not be available for all potential impacts.
- The purpose of the study or other subjective influences may determine which processes are included, which data sources are used, and which impacts are included. Time and budget limitations may also determine the scope of the study.
- The results of an LCA study become less useful over time as the manufacturing, filling, transportation, handling, disposal, and other processes become more efficient and as the weight, recycled content, and other intrinsic features of beverage containers change over time.

What Life-cycle Analyses Most Often Reveal

Because almost every LCA study of beverage packaging systems is unique, a useful way to present the results of several LCA studies may be to tally their findings for specific environmental impacts and resource demands. Such a presentation can suggest how consistently one type of beverage container compares to another with regard to a set of criteria but cannot conclude absolutely that one type is better than another. By tallying the results of eleven different LCA studies, the following presentation shows comparisons between beverage containers with regard to energy consumption, solid waste generation, water pollution, and air pollution. Five well-known air pollutants are considered. First, carbon monoxide (CO) mainly affects human health by impairing the respiratory and cardiovascular systems and in turn impairing many functions of the brain. Nitrogen oxides (NO_x) also impair the respiratory system, and they contribute significantly to ground-level ozone formation and to acid rain. One of the sulfur oxides (SO_x), sulfur dioxide (SO₂), also contributes significantly to acid rain.⁶ Finally, carbon dioxide (CO₂) and methane (CH₄) are greenhouse gases.⁷ The following table lists the eleven LCA studies for our tallies.

Life-cycle Analysis Studies for Tallies

Author	Sponsor	Initials	Year	Sources
Lundholm and Sundstrom	Tetra Pak, Inc.	LS	1985	[HEC]
Franklin Associates	NAPCOR*	FA	1989	[HEC][SAPH]
Sundstrom	Swedish Brewers Association	GS	1990	[HEC][SAPH]
Deloitte & Touche Canada, Inc.	Tetra Pak, Inc.	DT	1991	[HEC][SAPH]
Proctor and Redfern, Ltd.	Liquor Control Board of Ontario	PR	1991	[HEC][SAPH]
First Consulting Group	OMMRI**	FCG	1992	[HEC][SAPH]
Schmitz, Oels, and Tiedemann	German Fed. Env. Agency (UBA)	UBA1	1995	[HEC]
US EPA	US EPA	US	1997	[HEC]
Chalmers Industriteknik and Inst. for Prod. Dev.	Danish EPA	DEPA	1998	[CHAL][HEC]
Prognos, IFEU, GVM, Pack Force, and UBA	German Fed. Env. Agency (UBA)	UBA2	2000	[OKO]
Gesellschaft für Umfassende Analysen, GmbH	Austrian Ministry of the Env.	GUA	2000	[GUA]

* National Association for Plastic Container Recovery

** Ontario Multi-Material Recycling, Inc.

Before proceeding to the tallies, some background information about them is needed. As the table above indicates, the tallies rely on one source for information about several of the LCA studies considered here. Original copies of three other LCA studies were obtained. In regard to a particular environmental impact, the "number reporting the impact" refers to the number of studies for which results were available from the sources consulted. For each of the five types of air pollutants, the estimated emissions in grams or kilograms is the basis for comparison. For each LCA study for which water pollution estimates were available, the total weight of all of the water pollutants is the basis for comparison. However, no two LCAs included the same combination of water pollutants, and some appeared to have omitted some types of pollutants that could have tipped the balance in favor of the otherwise unfavorable container. Finally, the comparisons of refillable glass to refillable PET bottles involve glass bottles that are about 25-35 percent smaller in volume capacity than the PET bottles. These comparisons include 1-liter glass to 1.5-liter PET, 0.7-liter glass to 1-liter PET, and 330-ml glass to 500-ml PET.

Tally of Results of 8 LCAs--Refillable vs One-way Glass Bottles LS, FA, DT, PR, FCG, UBA1, US, DEPA

Environmental Impact	Air Pollution					Water Pollution	Solid Waste	Energy
	CO	CO ₂	CH ₄	SO _x	NO _x			
Number favoring one-way containers	1	0	0	0	0	0	0	2
Number favoring refillables	3	2	2	3	4	4	5	5
Number reporting the impact	4	2	2	3	4	4	5	7

Tally of Results of 7 LCAs--Refillable Glass Bottles vs Aluminum Cans FA, GS, PR, FCG, UBA1, DEPA, GUA

Environmental Impact	Air Pollution					Water Pollution	Solid Waste	Energy
	CO	CO ₂	CH ₄	SO _x	NO _x			
Number favoring cans	0	0	0	0	1	2	1	3
Number favoring refillables	4	3	3	4	3	1	3	2
Number reporting the impact	4	3	3	4	4	3	4	5

Tally of Results of 5 LCAs--Refillable vs One-way PET Bottles GS, DEPA 500 mL, DEPA 1.5 L, GUA mineral water, GUA soft drinks

Environmental Impact	Air Pollution					Water Pollution	Solid Waste	Energy
	CO	CO ₂	CH ₄	SO _x	NO _x			
Number favoring one-way containers	1	0	0	0	0	0	0	0
Number favoring refillables	4	4	4	5	5	2	4	5
Number reporting the impact	5	4	4	5	5	2	4	5

Tally of Results of 3 LCAs--Refillable Glass vs Refillable PET Bottles DEPA, UBA2, GUA

Environmental Impact	Air Pollution					Water Pollution	Solid Waste	Energy
	CO	CO ₂	CH ₄	SO _x	NO _x			
Number favoring glass	1	0	0	2	0	0	0	0
Number favoring PET	2	2	2	1	3	2	2	1
Number reporting the impact	3	2	2	3	2	2	2	1

In terms of five types of air pollutants, the tallies indicate that the use of refillable containers puts less pollution into the air. The conclusion that refillables generate less solid waste per unit volume of packaged beverage should come as no surprise. The comparisons of refillable to one-way bottles, furthermore, reveal that refillables emit less water pollution and use less energy. For water pollution and energy use, however, the comparisons of refillable glass bottles to cans apparently favor cans. In terms of energy use and of the environmental impacts considered, finally, PET appears to be the better material for refillable bottles.

Because estimates of water consumption were available for only one of the LCA studies considered here, this resource demand is not included in the tallies. That particular LCA study, the Danish EPA study, found that 330-ml refillable glass bottles use less water than do 330-ml one-way glass bottles and do 330-ml aluminum cans. For both the 500-ml and the 1.5-L PET bottles, the DEPA study found that the refillable systems use less water. In addition, a review of some literature concluded that the amount of water required to wash refillable glass bottles is much less than the amount used to manufacture new one-way glass bottles for a given volume of beverage.⁸

To better understand how refillable containers can generate less pollution and waste and can use less of the earth's precious natural resources, further reading about life-cycle analysis studies of beverage containers is highly recommended. The Danish EPA has an English-language version of its 1998 study that is written for a general audience.⁹ If you know German, then the UBA2 study would be worth reading.¹⁰ In his 1994 book,¹¹ finally, David Saphire presents a thorough and worthy explanation of the environmental aspects of beverage containers that puts less emphasis on LCA studies themselves. However, understanding LCA studies themselves is necessary because they have been and will continue to be an important part of the debate over refillable beverage containers.

Environmental Cost-Benefit Analysis

Environmental Cost-Benefit Analysis (CBA) takes LCA a step further by assigning monetary values to the environmental impacts and natural resource demands of beverage packaging systems. While the assignment of these values has many methodological limitations,¹² its ethical limitations probably draw the most vociferous criticism. Many critics of CBA argue that the environment is something on which you cannot place a monetary value.

Two CBA studies are considered here. The tallies of LCA results use some of the findings from a CBA study that was completed for the Austrian Ministry of the Environment in 2000.¹³ In 2001, the consulting firms RDC-Environment and Pira International completed a CBA study for the European Commission (EC), who intended to use the findings to set new recovery targets for the EC Directive on Packaging and Packaging Waste. This study compared 330-ml refillable glass bottles with one-way glass bottles of the same size by investigating the container manufacturing, filling, distribution, and waste management processes under the following assumptions.¹⁴

- The return rate for the refillable bottles is 100 percent.
- All bottle losses occur during washing and refilling.
- The round-trip distance from the warehouse to the store is 100 Km.
- Consumers recycle their commingled bottles and other containers only at drop-off centers. Industry bears all of the costs of recycling.
- The portion of one-way bottles that are not recycled is split equally between landfilling and incineration.

The study concluded that refillable glass bottles cost less environmentally than one-way glass bottles do whenever the distance from the bottling plant to the warehouse is less than 3,500 Km with 20 trips for the refillable bottle and a 91 percent recycling rate for the one-way bottle; less than 4,200 Km with 20 trips and a 42 percent recycling rate; less than 2,300 Km with 5 trips and a 91 percent recycling rate; and less than 3,000 Km with 5 trips and a 42 percent recycling rate. The RDC-Pira study also attempted a similar comparison for PET bottles, but it apparently omitted the costs of washing bottles.

The Economics of Refillable Beverage Containers

Through reduced beverage prices and reduced waste management costs, refilling costs the public less than packaging beverages in one-way containers. Refilling can cut costs for bottlers, most of whom, along with most retailers, adamantly resist stocking beverages in refillable containers. In fact, refilling rewards bottlers more than any other actor in the packaging chain. In Europe, for instance, refilling a PET bottle is one-tenth the cost of filling a one-way PET bottle. The bottling industry can cover retailers' costs by paying them a handling fee to cover the extra labor and operating costs for accepting and storing refillables. And, automatic take-back machines, widely used in Europe, can minimize and even eliminate retailers' labor costs. Enjoying the economic benefits of refilling, however, requires having established refilling systems. Establishing refilling systems where only non-refilling systems exist is not as difficult as it might appear, especially when considering the ease of converting from one-way to refillable PET bottles. This section explains some of the economic obstacles to establishing refilling systems and the economic advantages of refilling for industry and for the public.

Establishing Refilling Systems

Refilling can be profitable for bottlers in the long term, but the large initial investments that refilling requires make this packaging option a much greater economic risk than one-way containers.¹⁵ Although the general decline in refilling in most parts of the world exacerbates this risk, it has not daunted some bottlers. While refilling was slowly declining in Germany during the 1980s and 1990s, some medium-sized beverage companies there invested in refilling systems shortly after that country's packaging ordinance became effective in 1991.¹⁶

Bottling Plants. Establishing a refilling line requires at minimum bottle-handling equipment, a bottle washer, bottle-inspection equipment, a filling machine, and a supply (float) of bottles and bottle crates. Converting bottling plants from one-way to refillable PET bottles may seem like a daunting and expensive task, but existing equipment can facilitate such a conversion. Bottlers can fill and label refillable PET bottles by using existing equipment for one-way PET bottles--without modifications or additional costs. For any conversion to refilling, however, bottlers would need to purchase additional equipment: a case de-packer (which removes bottles from crates and then loads them onto a conveyor), a bottle washer, and a sniffer to inspect the washed bottles for remaining contaminants.¹⁷ Washing and inspection equipment is required also for refilling glass bottles. Equipment to treat wastewater from the washing process is another additional expense for both PET and glass.¹⁸ Adding bottlewashing equipment may require expanding the bottling plant, but bottlers who cannot expand their plants may be able to consign their bottlewashing operations to other companies. This type of arrangement has been used successfully in many instances.

Retailers. To participate in a refilling system, retailers must dedicate floor space for bottle returns and stockroom space for bottle storage. Dedicating space for these purposes seems difficult for most American supermarkets because they have just enough space to accommodate their current retail operations and often evaluate their cost-effectiveness in terms of dollars per unit area. Although competition in the retail grocery industry is mostly based on price, moreover, competition based on customer service has compelled a few supermarket chains to provide ticket sales, money orders, video rentals, film processing, and other convenient services. Indeed, the features of the typical American supermarket apparently leave no room for bottle returns. However, some of the most advanced reverse vending machines that are used in Europe for taking bottle returns occupy less than one square meter of floor space. In such a small space, these machines can take bottles individually or in crates and can sort the bottles.¹⁹ Even with such compact equipment, a store may need to establish outside bottle-handling facilities. The oversized parking lots of many suburban and rural supermarkets may be able to accommodate bottle return stations. Separate, independent bottle depots are another option for returns but present an additional errand in the consumer's busy day. While depots can spare retailers the expenses of bottle returns, they increase costs for bottlers and their distributors by forcing them to make separate stops for product delivery and bottle retrieval. In

the Canadian province of Prince Edward Island, where all beer and soft-drink containers must be refillable, both stores and depots take back empty bottles.

Packaging manufacturers. To convert their existing operations to making refillable PET bottles, manufacturers of one-way PET bottles would need only to add some extra equipment. Except for a few special procedures required for refillables, the processes for manufacturing refillable PET bottles are identical to those for one-way PET bottles.²⁰

Industry-wide Costs. Knowing what equipment and facilities are needed to convert from non-refillable systems to refillable systems for beverage packaging, the next question about establishing refilling systems concerns the total cost of such a conversion. This cost will depend on the following factors.

- What policy instruments government will enact and the packaging mix that will result from them
- How the beverage industry will geographically restructure its bottling operations
- For a bottling plant in a particular geographic region, the productivity levels required to meet consumer demand and to maintain profitability
- The additional equipment required for bottle handling and filling
- The additional labor required
- The sizes of the required bottling and distribution facilities
- The role of existing bottling plants and distribution facilities
- The number of bottles required for the initial bottle float
- Whether beverage companies will collaborate to use industry-standard bottles or will prefer to use proprietary packaging
- Whether or not bottling companies will consign processes such as bottlewashing to bottle pools or to other third parties
- Whether stores or depots will take bottle returns
- The equipment and labor required for bottle returns

Although this list is probably not complete, it illustrates what a conversion from one-way to refillable containers involves. Estimating the cost of such a conversion is beyond the scope of this report but may be a worthwhile study.

Costs and Benefits of Established Refilling Systems

Once a refilling system has been established, bottlers can earn a return on their investments. For bottlers, the essential cost savings from refilling come through trippage. To attain the trippage required to reap these cost savings, bottlers depend on consumers' returning their empty bottles. In almost all refilling systems that exist, consumers return their bottles to stores. Therefore, the success of any refilling system depends on the cooperation of retailers. Because retailers would much rather stock beverages in one-way containers, inducing their cooperation is easier when their costs of handling bottles are addressed.

Bottlers. The reuse of containers several times rewards bottlers more than any other actor in the packaging chain. Although a refillable container initially costs the bottler more than its one-way counterpart, the cost-per-filling of the refillable container is less. To illustrate this point, consider the typical costs of 500-ml beverage containers in Europe that are shown by the table on the right.²¹

Costs of 500-ml Beverage Containers in Europe

Type	Container Cost (Euros)	Trips/Life	Production Cost/Trip (Euros)
Refillable Glass Bottle	0.103	20	0.005
Refillable PET Bottle	0.133	20	0.007
One-Way Glass Bottle	0.047	1	0.047
One-Way PET Bottle	0.069	1	0.069
Aluminum Can	0.103	1	0.103

Based on these figures, the cost-per-filling of the refillable PET bottle making 20 trips is 0.007 Euro, which is about one-tenth of the cost-per-filling of the one-way bottle. The cost-per-filling of the refillable glass bottle making 20 trips is 0.005 Euro, which is about one-twentieth of the cost-per-filling of the aluminum can. Comparing one-way to refillable containers requires examining not only the costs of the containers themselves but also the costs of labor. A study involving 1-liter juice containers--cartons, one-way glass bottles, and refillable glass bottles--concluded the following.²²

- Refilling glass bottles costs less than packaging juices in cartons, the least-expensive one-way packaging option that the study considered.
- The most expensive option is one-way glass bottles.
- For refillable glass bottles, 50 percent of the cost of production is labor, and only 20 percent is packaging. Most of that 20 percent involves caps and labels.
- For production with one-way containers, more than 50 percent of the cost is packaging.

The findings of this study may suggest that the extra labor costs incurred by refilling can be offset by the reduced packaging costs. Another cost comparison, one which investigated the bottling and distribution of soft drinks in refillable and one-way PET bottles, found that the cost-per-filling is about four cents less for the refillables.²³

Production rates are another important aspect of the economics of packaging beverages. Because filling machines for one-way PET bottles can be used for refillable PET bottles, the production rates for refillables will match the rates for one-way bottles of the same size if empty refillable bottles enter the filling line at the same rate that new one-way bottles do. If that filling line originally processed 2-liter one-way bottles, however, then processing 1.5-liter refillables on it will result in a slower rate per unit volume.

Retailers. Selling beverages in refillable containers is expensive for retailers, who are stuck with managing a deposit-return system for the containers and with almost no inherent way to make profits from such a system. For the retailer, half of the cost involves managing a deposit-return system and the other half entails storage space for both full and empty containers.²⁴ Deposit-return systems not only occupy valuable retail space but also incur labor and other operating costs. Automatic take-back machines, which are widely used in Europe, can minimize or eliminate labor costs. In spite of automation, however, retailers who sell beverages in refillables still have bottle-handling costs. In some European countries, the beer and soft-drink industries compensate retailers for the costs of stocking beverages in refillable containers and for the costs of handling empty containers. Such arrangements have worked well in markets with only a few large bottlers and a few large retailers.²⁵ Finland's breweries, mainly the four largest, deliver beverages directly to stores, retrieve the empty bottles, and pay them a handling fee of 0.15-0.17 FMK per bottle. The stores' actual handling costs range from 0.08 FMK to 0.30 FMK per bottle.²⁶ Instead of receiving a handling fee from the bottler, the retailer could keep part of the consumer's deposit as a handling fee. Another example of bottler-retailer cooperation is found in Denmark, where brewers and soft-drink bottlers

recently established a non-profit organization to provide technical assistance to retailers and to administer the payment of bottle-handling fees to retailers.²⁷

Deposit-return systems for refillable containers can cut costs for retailers. Brewers Retail, Inc., (BRI) also known as The Beer Store, is Ontario's leading beer retailer. BRI and Ontario brewers together operate a deposit-return system for refillable bottles which facilitates the recovery of almost all secondary and transport packaging. BRI's recovery operations reduced its waste disposal costs from a peak of C\$1,500,000 in 1992 to only C\$129,000 in 1994. By recovering almost all of its post-consumer packaging--plastic bags, beer cans, and even bottle caps--in addition to its secondary and transport packaging, the Ontario beer industry has earned a noteworthy reputation for its packaging stewardship.²⁸

Systemwide. Cost-benefit analysis (CBA) studies can provide the best cost comparisons between refilling and non-refilling beverage packaging systems. In 2001, the consulting firms RDC-Environment and Pira International completed a CBA study for the European Commission (EC), who intended to use the findings to set new recovery targets for the EC Directive on Packaging and Packaging Waste. This study compared 330-ml refillable glass bottles with one-way glass bottles of the same size by considering the costs of container manufacture, filling, distribution, retailing, and waste management under the following assumptions.²⁹

- The return rate for the refillable bottles is 100 percent.
- All bottle losses occur during washing and refilling.
- The round-trip distance from the warehouse to the store is 100 km.
- Consumers recycle their commingled bottles and other containers only at drop-off centers. Industry bears all recycling costs.
- The portion of one-way bottles that are not recycled is split equally between landfilling and incineration.

The study concluded that refillable glass bottles cost less than one-way glass bottles whenever the distance from the bottling plant to the warehouse is less than 125 km with 20 trips for the refillable bottles and a 91 percent recycling rate for the one-way bottles; less than 150 km with 20 trips and a 42 percent recycling rate; less than 100 km with 5 trips and a 91 percent recycling rate; and less than 120 km with 5 trips and a 42 percent recycling rate. (When external costs were factored in, refillable bottles were more cost-effective at even greater distances to the bottling plant -- from 2,300 to 4,200 km away.) The results of this comparison suggest that refilling can be less expensive than recycling in settings in which industry legally or voluntarily assumes responsibility for its packaging waste. Because the assumed method of recycling collection is uncommon in the United States, deriving conclusions for the United States from this study is difficult. The RDC-Pira study also attempted a similar comparison for PET bottles, but this comparison apparently omitted the costs of washing the bottles. Another CBA study,³⁰ which is worth reading but is available only in German, was completed in 2000 for the Austrian Ministry of the Environment.

Benefits to Society

Refilling can put more money in people's pockets by reducing the prices of beverages, cutting the public costs of waste management, and increasing employment.

Consumers. Although refilling can cost less to beverage companies, they may not necessarily pass the cost savings to the consumer. Marketing strategies rather than production costs often affect beverage prices.³¹ Some evidence and opinion suggest that consumers generally pay less for beverages in refillable containers. This conclusion was reached by a 1976 US EPA study and by a survey conducted by the National Environmental Law Center in 1992.³² Moreover, an Austrian consumer information association says that the price-per-liter of soda pop is usually less in refillable bottles than in one-way bottles.³³ Anecdotal evidence further indicates that beverages in refillable containers cost less to consumers. In Norway, without taxes or deposits, the cost-per-liter of lager in 330-ml refillable glass bottles is 0.51 Euro less than the cost-per-liter in 500-ml cans. This price advantage for refillables affects a significant portion of Norway's beer market, where 91 percent of beer is lager, about 30 percent of beer is sold in 330-ml refillable bottles, and about 31 percent is sold in 500-ml cans.³⁴ Beer drinkers in New Brunswick, Canada,

pay one cent per liter less for beer in refillable glass bottles than they do for canned beer.³⁵ In Latin America, the use of the refillable PET bottle makes soft drinks affordable to more consumers.³⁶ In Mexico, the price of soda pop in a refillable bottle is about 18 percent less than the price of the same product in a one-way bottle of the same size. In stores near Mexico City, Coke in a 2-liter refillable PET bottle costs 11 Pesos but costs 13 Pesos in a 2-liter one-way PET bottle.³⁷ In Argentina, consumers pay 25 percent less for Coke in a 1.5-liter refillable bottle than for Coke in a one-way PET bottle of the same size.³⁸ (By reducing the prices of packaged beverages and making them affordable to more people, refilling can increase retailers' sales of packaged beverages.)

Another bit of evidence suggests that refillables may cost more to the consumer. For home delivery from Marcus Dairy of Danbury, Connecticut, a half gallon of milk costs \$2.13 in a carton or a one-way plastic jug but costs \$2.39 in a refillable glass bottle. This cost figure for the refillable bottle does not include the \$1.75 deposit.³⁹ From these bits of anecdotal evidence, the best conclusions that we can draw are the following. Where refillable containers are prevalent, the prices of beverages in refillables are less than or equal to the prices in one-way containers. In markets where refillable containers are rare, consumers may pay more but not much more.

Taxpayers. Refilling not only cuts the costs of packaged beverages but also cuts the costs of waste management. By removing them from the municipal solid waste stream, refilling transfers the costs of managing beverage containers from the taxpayer to the producer. These costs are significant because beverage containers occupy a significant amount of space in city and county trash and recycling collections. Some facts and figures from Canada illustrate the burdens that beverage containers put on taxpayers. In a typical curbside recycling program in Ontario, PET occupies about 20 to 25 percent of the volumetric capacity. The significant volume of PET in recycling collections and its low market value contribute to the high costs of managing discarded PET containers. At one time during the mid-1990s, in fact, the provincial auditor reported that collecting PET by curbside recycling was costing Ontario C\$1,800 per tonne. Other cost estimates for managing discarded PET containers are C\$1,100 per tonne for net recycling costs and C\$400 per tonne for volume-adjusted landfilling costs. With these costs and a 50 percent recycling rate, the management of 360-million one-way PET soft-drink bottles costs Ontario municipalities about 12 million dollars (Canadian) per year.⁴⁰ Local governments would save millions, therefore, if the soft-drink industry used refillable PET bottles.

Because a simple deposit law for recycling one-way containers can also remove beverage containers from the municipal waste stream, the effects of such a law on curbside recycling are like those of refilling. With that thought in mind, let us consider some more facts and figures from Ontario. According to the City of Toronto's data, beverage containers occupy about half of the volume of the city's recycling collections. With a deposit law for all beverage containers, the city's curbside recycling program could have only one collection day per month instead of nine and thus save C\$900,000 per year.⁴¹ With the money saved, the city could hire 21 more police officers if it needed them.⁴² Although the numbers would be different for U.S. cities, they could benefit in a similar way from refilling.

Rather than reduce recycling programs, counties and cities could use the capacity vacated by beverage containers to collect other materials that make up a significant portion of the waste stream. These materials include yard trimmings and food scraps for composting, electronics, appliances, and building materials. Diverting these materials from landfills can bring additional savings for local governments.

Workers. Refilling also can generate tax revenue by putting people to work. Although the processes for recovering, handling, washing, and inspecting refillable containers are highly automated, refilling often requires more labor than filling one-way containers. Recovering, washing, and processing refillable glass beer bottles employs over 2,000 persons in Ontario.⁴³ A 1993 study by Andreas Golding, author of the European Commission report *Reuse of Primary Packaging*, concluded that refilling creates many more jobs than using one-way containers does. Of the 161,000 jobs that were directly connected to the manufacture and filling of beverage containers and to the distribution and selling of packaged beverages in Germany, 73 percent involved refillable containers. In that setting, 27,000 new jobs would be created by moving completely to refilling. If one-way containers completely overtook refillables, then 53,000 jobs would be

lost.⁴⁴ One new job in the one-way sector eliminates nine jobs in the reuse sector, according to the European Environmental Bureau.⁴⁵

Policies to Promote Refillable Beverage Containers

Policies are what have driven the success and preservation of refilling in many Canadian and European beverage markets. The Canada and the Europe sections of this report describe particular implementations of several types of policy instruments that promote or require refillable beverage containers. These implementations illustrate the many possible variations of each policy instrument. Furthermore, the experiences of some Canadian provinces and of some European nations illustrate the strengths and the weaknesses of the policy instruments that they have instituted and illustrate the characteristics of effective refilling laws. In a unifying context, this chapter discusses the types of policy instruments that can be used to promote or require refillable beverage containers, their strengths and weaknesses, and the ways in which they can be formulated. These include:

- Deposit Laws
- Eco-taxes
- Quotas
- Bans
- Agreements

Refilling laws are usually formulated under the authorization of a broader legal framework. An act regarding waste management, environmental protection, product control, beverages, beverage containers, or packaging authorizes the government to pass legislation or to make regulations specifically for beverage containers. Policy instruments for refilling fall into three broad categories: economic, regulatory, and contractual. Economic instruments include deposit laws, eco-taxes, tradeable permits, and government subsidies. Regulatory instruments include bans, mandatory refilling laws, quotas, and mandatory stocking laws. A contractual policy instrument usually requires industry to enter into an agreement with the government.

Whether it is an economic, regulatory, or contractual instrument, formulating an effective refilling policy requires understanding how each actor in the packaging chain influences the packaging mix in an unregulated beverage market. Packaging manufacturers have no interest in refillable containers, but they have no influence on the beverage packaging mix.⁴⁶ Consumers can influence the packaging mix in three ways. First, by refusing or neglecting to return empty bottles, consumers can deprive bottlers of the economic advantages of refilling and thus force bottlers to consider packaging more of their products in one-way containers. Consumers can also explicitly demand beverages in refillable containers, but only the most environmentally-conscious consumers likely will do so. Finally, many consumers in Latin America and in other parts of the world can afford to buy Coca-Cola and other soft drinks only in refillable bottles.

Bottlers who want to offer consumers beverages in refillable bottles must find a retailer, bar, restaurant, or other market that is willing to accommodate refillables and willing to take bottle returns. The market must also be close enough to the bottler to make the refilling system economically advantageous. On the other hand, bottlers who can control the marketing and distribution of their products may also be able to control their packaging choices.⁴⁷ In the United States, for example, some dairies own and operate chains of convenience stores. One such company, Stewart's, packaged and distributed milk and soft drinks in refillable bottles to its stores in New York and Vermont,⁴⁸ but stopped using refillables during the 1990s. In Europe, many breweries own restaurants and pubs, and this arrangement makes refilling the ideal packaging option for beer.⁴⁹ Bottlers can influence the packaging mix also by manufacturing a beverage product that is unique and popular in its market or a product that consumers identify as a local brand to which they are loyal.⁵⁰ Finally, just as Coke and Pepsi used advertising to glamorize one-way containers during the 1960s,⁵¹ they and other soft-drink giants can promote refillables in the same way. Beer companies can do likewise with their own vast advertising resources. Without proprietary or other special markets, however, the bottler's control of the packaging mix is constrained by retailers' preferences.

Of all of the actors in the packaging chain, indeed, retailers are the most powerful and the most adamant opponents of refilling.⁵² The retailer is the actor who determines the packaging mix by demanding that bottlers deliver beverages in one-way containers⁵³ or by selling their private-label (store-brand) beverages

in one-way containers at prices much lower than those of the national brands. Retailers can indirectly demand one-way containers, moreover, by refusing to take bottle returns or by otherwise interfering with the bottle return process.

Because retailers have the most influence on the packaging mix in any particular beverage market, a successful policy instrument must either compel or motivate retailers to sell beverages in refillable containers, through either direct or indirect means. Most importantly, the government must consider the current packaging mix when choosing a policy instrument and formulating its implementation as a refilling law. For example, economic instruments which are designed to give refillables a price advantage can fail in markets in which consumers have very few choices of beverage products in refillable containers or in markets in which an insignificant volume percentage of beverages is packaged in refillables. In markets in which one-way containers dominate, the most effective policy instrument is one which forces a complete or partial transition to refillables. In markets in which refillable containers dominate but one-way containers are gaining market share, the most effective policy instrument is one which is designed to preserve refilling. In such markets, the government has more policy options--economic, regulatory, or contractual--than it does in markets in which refilling is insignificant. All of the refilling laws in Europe and most of the laws in Canada were implemented while refillables still dominated the beverage markets in these places.

In order to work effectively, any refilling law must have a few essential provisions. One of the most important provisions is a set of criteria to define the refillable container(s) and refilling system. Such criteria may include any combination of the following.

- The type of product with which the container must be refilled
- A minimum number of refillings that the container must be able to withstand
- The physical characteristics of the container
- The amount of the deposit under which the container is sold
- Minimum return rates, which gradually increase after the refilling system has been established
- How effectively the labelling of the container indicates that it is refillable and that it is sold under a deposit
- Other specifications for the deposit-return system

A successful refilling law must also enable clear and unambiguous detection of violations or have provisions for reporting compliance. The fines or any other economic sanctions must exceed the benefits of violating the law.⁵⁴ Furthermore, governments must be prepared to administer and enforce the law by having the personnel, the resources, and the legal authority to do so. Other aspects of a refilling law help ensure its success in promoting or requiring the use of refillable beverage containers. Continued support for a refilling law from the public and from lawmakers may depend on how well it accomplishes its designated environmental, economic, or market objectives. Such objectives often include waste diversion or litter reduction. To ensure its success, finally, a refilling law must be effectively promoted and publicized.⁵⁵ For more discussion about policy instruments that require or promote refilling, see the European Commission's *Reuse of Primary Packaging* (1999), The Organisation for Economic Co-operation and Development's *Beverage Containers: Reuse or Recycling* (1978), the European Commission's *Study on the Economic and Environmental Implications of the Use of Environmental Taxes and Charges in the European Union and its Member States* (2001); and Canada's Citizens' Network on Waste Management's *Strategy to Promote Refillables and Reuse in Ontario*.⁵⁶

Deposit Laws

A deposit law requires beverages to be sold under a deposit-return system, a system in which consumers pay a deposit for the containers when purchasing beverages and receive a refund of the deposit when they return the containers. Most of the deposit laws that were enacted in the U.S. and in Canada during the 1970s, 1980s, and 1990s were intended primarily to reduce litter and to recover and recycle one-way containers. When the first set of deposit laws became effective in the 1970s, refilling advocates hoped that the mandatory deposits would reverse the decline in return rates for refillable bottles and reverse the decline of refilling overall. However, deposit laws alone cannot put more refillable beverage containers on

store shelves, but they do support refilling systems by giving consumers an incentive to return their empty containers.

Role in refilling. Deposit laws usually have an auxiliary role in laws that promote or require refilling. In this role, deposit laws may be separate laws or may be provisions of refilling laws, and they primarily regulate the deposit-return systems that bottlers and retailers operate. The regulations often specify minimum deposits, minimum refunds, or other rules that govern the return of empty containers. Minimum deposit amounts can prevent the use of deposit reductions as a competitive weapon, a tactic that bottlers used in the early days of deposits.⁵⁷ By specifying minimum refund amounts which are less than the deposit amounts, deposit laws give retailers the option of keeping part of the deposit as a handling fee. Such a deposit scheme is used in the province of Prince Edward Island, Canada, but most retailers there give their customers the full refund.⁵⁸ Rather than specify minimums, some deposit laws specify ranges or fixed amounts for the deposits. Other regulations that deposit laws often include pertain to the labelling of containers, the visibility of return stations, the transactions between the bottler and the retailer, the submission of reports to the government, and the licensing of the deposit-return system. Deposit laws may also specify deposit amounts for secondary packaging such as bottle crates.

Half-back deposit. One type of deposit law is designed to promote the sale of beverages in refillable containers. Under this type of law, often called a "half-back" deposit law, the consumer receives a full refund of the deposit for a refillable container but only half of the refund for a one-way container. One important concern about the half-back deposit is how to allocate the half of the deposit that the consumer does not receive for returning a one-way container. If that money is allocated to retailers or to bottlers, then they will have a disincentive for selling beverages in refillable containers. Consumers will have less of an incentive for buying beverages in refillables if the price of a beverage product in a refillable bottle is greater than the price plus half of the deposit of the same product in a one-way bottle of the same size. To promote refilling through a half-back deposit law, therefore, deposits not only must be high enough to motivate consumers to return containers but also must be high enough to give refillables a price advantage. The half-back deposit can be effective in markets in which refillables effectively compete with one-way containers, but bottlers or retailers may try to undermine its effectiveness by selling beverages at prices that ensure an advantage for one-way containers.⁵⁹

Consumers can buy beer in refillable bottles in the Canadian province of New Brunswick, which applies the half-back deposit to almost all beverage containers. Although the refillable bottle dominates the beer market in New Brunswick because Canadian brewers and beer drinkers prefer refillables, the effect of the half-back deposit on the beer packaging mix there may be a worthwhile investigation. The research for this report focused on New Brunswick's soft-drink market, where refillables had almost disappeared when the half-back deposit became effective in 1992. Two other Atlantic Canada provinces, Nova Scotia and Newfoundland also have the half-back deposit.

Eco-taxes

Like the half-back deposit law, eco-taxes are economic instruments which most often are designed to give beverages in refillable containers a price advantage. Usually, an eco-tax imposes a tax on all beverage containers except those that qualify as refillable. Eco-taxes are the most prevalent and the most effective economic instrument for promoting refilling. Some European countries have successfully used eco-taxes since the 1970s for this purpose. Finland, Norway, Denmark, Belgium, and the Canadian province of Ontario levy eco-taxes on one-way beverage containers.

Types of eco-taxes. Most eco-taxes on beverage containers fall into one of three categories according to their intended function. One type of eco-tax is a cost-covering charge to finance environmental programs, including those that involve monitoring or controlling the use of natural resources. A cost-covering charge on one-way containers could be used to help finance waste management programs,⁶⁰ including recycling. An eco-tax whose revenues are used in this manner is an attempt to internalize the monetary costs associated with the environmental impacts of the use of one-way beverage containers. To internalize these costs means to force industry and perhaps consumers to pay for the environmental impacts of one-way

containers. Because assigning monetary values to these environmental impacts is not yet an exact science, setting the amount of an eco-tax on this basis may spark controversy.⁶¹ Another type of eco-tax is an incentive tax levied solely to correct environmentally destructive behavior. Taxes on one-way containers can provide incentives for consumers to buy beverages in refillables rather than one-way containers. A third type of eco-tax is one that is intended mainly to raise revenue, although it may be associated with some environmental goal. An eco-tax program may fall into more than one of these three categories.⁶²

Formulation. Formulating an eco-tax on one-way beverage containers involves deciding who will pay the tax, how to set the tax rates, and where the revenue will go. The effectiveness of an eco-tax on one-way containers can depend on which actor in the beverage packaging chain pays it. A policy of taxing packaging manufacturers for producing one-way containers would discriminate against makers of beverage cartons or aluminum cans because they cannot make refillable versions of their products. Because any bottler of any packaged beverage can use both refillable and non-refillable containers, taxing them seems to be the fairest and most effective way to use eco-taxes to influence the packaging mix. For many of the eco-taxes discussed in this report, the bottler, importer, or distributor pays the tax upon shipment of beverages to the retailer or other point of sale. The recommendation that the bottler pay the tax instead upon purchase of a new container from the packaging manufacturer is proposed by the Organisation for Economic Co-operation and Development.⁶³ Taxing the bottler seems to contravene the assertion that the retailer effectively controls the packaging mix. However, eco-taxes can compel retailers to stock beverages in refillable containers when the tax amounts are high enough to diminish their profits from beverages in one-way containers.⁶⁴ When bottlers pay the tax, indeed, they pass the resulting price increase to the retailer, who then passes it to the consumer. Hence, the retailer and ultimately the consumer pay the tax indirectly. Directly taxing retailers or consumers rather than bottlers has its disadvantages. First, it complicates collection by increasing the number of establishments from which the tax must be collected. Second, taxing consumers directly for the purchase of one-way containers provides only a weak incentive for bottlers and retailers to offer beverages in refillables and requires consumers' awareness of the tax.

Setting tax rates for one-way beverage containers involves three major decisions. The first is whether to use a per-liter rate or a per-unit rate. Under a per-liter rate, the tax increases with the volume capacity of the container, and so does the price difference between a refillable container and a one-way container of the same beverage: the price advantage of a 2-liter refillable PET bottle over its one-way counterpart will be greater than that of a 500-ml refillable PET bottle over its one-way counterpart. The second decision concerns whether to use a common rate for all packaging materials or to set different rates for different materials. For different packaging materials, the relative environmental impacts or the net costs of recycling may provide a basis for setting the tax rate for each material. The most important decision involves setting the tax rates high enough to diminish retailers' profits from selling beverages in one-way containers. These rates may need to be raised in the future if new technology or cheaper labor lowers the costs of packaging beverages in one-way containers.

Having the tax rates and some beverage sales statistics enables the government to estimate the revenue from its eco-tax on one-way containers. Where to put that revenue is another major decision in formulating an eco-tax. For most of the eco-taxes discussed in this report, the revenue goes to the national or provincial treasury. Using the revenues from beverage container taxes to finance the annual budgets of waste management or other programs can be difficult because the revenue depends on beverage sales and especially on sales of one-way containers. Revenues will fall if the tax has the desired effect--to decrease the market share of one-way containers.

Advantages and disadvantages. Eco-taxes on one-way containers not only bring revenue but also let bottlers, retailers, and consumers have choices in beverage packaging. Eco-taxes motivate rather than force consumers to buy beverages in refillable containers. The allure of revenue from an eco-tax, however, is one of its disadvantages.⁶⁵ Because of its ability to generate revenue, a government may choose an eco-tax over policy instruments that are more effective or more appropriate in its jurisdiction for promoting refillable containers. Most importantly, eco-taxes and other economic instruments are effective only in markets where consumers can buy almost all brands of beverages in both refillable and one-way containers and where refillables hold a fairly significant percentage of the packaged volume of beverages.

Quotas

Having covered two economic instruments, this discussion will now turn to regulatory instruments. One well-known regulatory instrument is the quota, which requires that an entire industry or individual companies package or sell a specified percentage of the packaged volume of their beverage products in refillable containers. The Ontario soft-drink market⁶⁶ and the experiences of Germany and of Portugal have shown that quotas do very little to promote refilling. Quotas imposed as regulations have at least two disadvantages. First, quotas do not provide effective incentives for the consumer, retailer, or bottler to maintain a market for beverages in refillable containers.⁶⁷ Second, quotas require costly and time-consuming collection of packaging data, and government and industry may have disputes over the accuracy of the percentages in packaging mix and over how they are calculated.

Quotas are more effective in stopping the decline of refilling than in increasing refilling. To stop the decline of refilling, a quota could be set at or below the current volume percentage of refillable containers in the packaging mix. Requiring each beverage company to meet the quota may be more effective than requiring the beverage industry collectively to meet it.

Bans

For a given type of beverage, a quota of 100 percent is a ban on all non-refillable containers for that beverage. Bans have proven themselves to be the simplest but most robust policy instrument for mandating refillable containers. When implementing a ban, the government needs few additional staff members to administer the policy.⁶⁸ Enforcing a ban is easy also because of its inherent simplicity. Detecting a violation requires simply inspecting store shelves and finding a beverage product in cans or in one-way bottles. Indeed, anyone can detect a violation of a ban. The only disadvantage of a ban is that it denies consumers the option to buy beverages in cans. Consumers may occasionally want to buy canned beverages because of their portability. To provide consumers a choice of beverage packaging while promoting refillable containers, a ban could be applied only to non-refillable glass and plastic containers. Bans can be targeted also at specific markets, say, restaurants and bars.

To provide consumers a choice between domestic and imported beverages, imports could be exempted from the ban. Such an exemption would be reasonable also because refilling may be impractical for beverages imported from overseas bottlers. Denmark's policy allows non-refillable glass and plastic containers for imported beer, soft-drinks, and carbonated mineral waters but requires these imports to be sold under a deposit-return system. For these three types of beverages, in addition, Denmark bans all non-refillable containers for products made and sold in Denmark and bans all cans. The only other ban on non-refillable containers is that of the Canadian province of Prince Edward Island, which bans all non-refillable containers for all beer and soft drinks. Unlike Denmark, Prince Edward Island must impose its ban on all beer and soft drinks regardless of where they are produced. Allowing one-way containers for beverages from other provinces would certainly bring cans and probably bring one-way PET bottles to the island.

The ease of imposing a ban depends on how prevalent refillable containers are when the ban becomes effective. If refillables command nearly 100 percent of the market, then beverage companies would need to invest little money and effort to comply. If the market share is much less than 100 percent but nevertheless significant, then industry will need to invest some time and effort to achieve full compliance. Where refillable beverage containers still hold a significant market share, however, the cost of making the transition completely to refilling will be much less than the cost of maintaining the packaging status quo.⁶⁹ If refillable containers hold an insignificant share of the beverage market, then a ban should give beverage companies plenty of time to make the transition from one-way containers to refillables.

Agreements

Although quotas have yet to work effectively as regulations, quotas have proven effective in agreements between government and industry. The agreement between Quebec brewers, the provincial government, and Recyc-Quebec requires that no more than 37.5 percent of the total number of containers in a brewer's

sales be non-refillable. Another agreement, the Dutch Packaging Covenant II, stipulates that beverage companies and importers cannot substitute refillable with one-way beverage containers unless they can demonstrate that the environmental impact of their one-way containers is less than or equal to the impact of their refillable containers. Agreements such as these take a contractual rather than a regulatory or economic approach to managing beverage containers. This approach involves enforcing a contract rather than enforcing laws. Other advantages of an agreement include the flexibility that they give industry⁷⁰ and the choice in beverage packaging that they ultimately give consumers. One inherent disadvantage of agreements is the lack of any provisions that force industry to enter into them. To compel industry groups to enter into an agreement, the agreement can be an alternative to a more restrictive policy instrument. In Quebec, hazardous materials regulations govern the containers of brewers and distributors who choose to not sign the agreement or to not sell beer only in refillables.

Canada's Experience with Refillable Beverage Containers

Canada's soft-drink industry has followed its U.S. counterpart in switching to non-refillable containers. The Canadian market share for soft drinks in refillable bottles declined from about 47 percent in 1985 to less than 5 percent in 1997.⁷¹ One Canadian province, Prince Edward Island, has successfully resisted this trend by imposing a ban on all types of non-refillable soft-drink containers. Less restrictive policies, such as New Brunswick's half-back deposit, have been unsuccessful in stopping the decline of refillables in the soft-drink market. In New Brunswick and in other provinces, the Canadian soft-drink industry has opposed or defeated pro-refilling legislation and promoted taxpayer-funded curbside recycling as the solution to beverage container waste.⁷²

Canada's beer industry, on the other hand, prefers the refillable bottle mainly because it is the least-expensive packaging option, says Usman Valiante, a consultant for the Brewers of Ontario.⁷³ The crucial cost savings come from Canada's near-100-percent return rates, which help ensure that bottles are reused 15-20 times.⁷⁴ Consumers inveterately return bottles and do not regard returning them as an inconvenience.⁷⁵ The refillable bottle's appeal to generations of Canadian beer drinkers has also influenced the industry's choice of packaging.⁷⁶ In addition, some Canadian policies supporting the refillable infrastructure, such as Ontario's tax on non-refillable containers, may help Canada's beer industry remain competitive with U.S. imports.

Although the popularity of refillable beer bottles makes refilling laws seem unnecessary, a few provinces have policies to ensure their use. The beverage container policies of Prince Edward Island and New Brunswick apply also to beer containers. Quebec uses a quota to maintain a market for refillables, and Ontario uses a levy to influence the packaging mix of beer sold in that province. All of these policies have boosted sales of beer in refillable bottles, says Ed Gregory of the Brewers Association of Canada. Canada's beer industry has a well-established refilling infrastructure, and Gregory does not foresee any movement away from refilling.⁷⁷ In 2001, in fact, several major Canadian brewers and several microbreweries entered into a renewed agreement among themselves to continue their use of the refillable bottle. The Brewers Association of Canada prepared the agreement and presented it to the brewers.⁷⁸ This agreement should help maintain the 70 percent market share of beer in refillable bottles.⁷⁹

Prince Edward Island

Only one Canadian province--Prince Edward Island--has successfully preserved refilling by compelling soft-drink companies to use refillable containers. Its success is due to a simple but robust policy: a ban on all non-refillable containers for soft drinks and beer.

Policy development. Prince Edward Island's movement to preserve refillable soft-drink bottles began in the early 1970's, when litter on beaches and roadsides led to the 1973 Litter Control Regulations. These regulations ban the sale of canned beer and require that beer be sold only in refillable containers.⁸⁰ In 1977, Prince Edward Island began regulating soft-drink containers by banning non-refillable bottles for soft drinks which have at least a 26 percent market share.

In the early 1980's, most Islanders preferred refillable bottles, and local soft-drink producers did not use cans. At that time, however, out-of-province soft-drink producers were dumping canned soft drinks at low prices on the island during the summers. This dumping created more litter, some of which damaged farm implements. These events, limited landfill space,⁸¹ the absence of aluminum recycling plants on the island, the presence of a glass recycling plant in New Brunswick, and the desire to preserve the local bottling industry led to the 1984 expansion of the 1973 Litter Control Regulations. The expanded regulations effectively banned cans by requiring that all carbonated flavored beverages be sold only in refillable containers.⁸² Finally, in 1999, Jones Soda's attempt to evade the ban by not refilling its bottles with soda pop led to the revised legal definition of "refillable."⁸³ Further explanations of this definition are available on the Internet.⁸⁴

The province's Environmental Protection Act grants the Lieutenant Governor in Council the authority to regulate the use of beverage containers.⁸⁵ Regulations establish minimum deposits and minimum refunds for different sizes of bottles and require retailers to take returns for any product that they sell. The minimum deposits by container volume are the following: 500 ml or less, 20 cents; 501-1500 ml, 40 cents; greater than 1.5 L, 80 cents. The minimum refunds are 17, 34, and 70 cents, respectively.⁸⁶

Deposit-return system. For every order of beverages, the retailer pays the bottler the associated deposits and then charges them to customers [CRI, p. 39]. Customers return their empty containers to stores or depots, and the bottlers retrieve them for refilling. While stores and depots may keep a minimum portion of the deposit to compensate themselves for handling and storage costs, most stores fully refund the deposit to customers. Soft-drink bottlers keep the unredeemed deposits, which compensate them for unreturned bottles. In 1999, this system brought Prince Edward Island a 98 percent recovery rate for soft-drink containers--the highest among all of the provinces.⁸⁷

Results. The ban on non-refillables has helped control beverage container litter and has made Islanders more aware of the need to reduce litter and waste, according to Darin MacKinnon of the Department of Fisheries, Aquaculture, and Environment.⁸⁸ The province's policies have also brought economic benefits. Seaman's Beverages, the only soft-drink bottler in the province, employs nearly 100 full-time workers and 20 seasonal workers.⁸⁹ About 10 of the 20 production workers at Seaman's help wash and process empty bottles. Rundell Seaman, chairman of Seaman's Beverages, guesses that he would probably employ 37 persons in all if he used only non-refillable containers.⁹⁰ Nevertheless, the job security of all of Seaman's staff depends on the ban. A former sales manager for Coke's Atlantic Canada Region says that Seaman's would have to close if the province repealed the ban on non-refillable soft-drink containers.⁹¹ Rundell Seaman would agree.⁹²

Outlook. In spite of Coke's aggressive lobbying to repeal the ban on non-refillable soft-drink containers, the provincial government has firmly upheld it.⁹³ In fact, the government is considering extending the ban to newer types of beverages such as sports drinks. With the government's firm support of the ban, the future of refillable soft-drink bottles appears secure in spite of the threats against the policy. These threats come not only from Coca-Cola, but also from residents of the island. Expansion of recycling programs has caused some Islanders to question the need for the ban.⁹⁴ Other Islanders apparently have been spending about \$4 million a year on purchases of canned soft drinks from the mainland, according to a 1998 University of Prince Edward Island study that was sponsored by Coca-Cola Beverages, Ltd.⁹⁵

New Brunswick

While Prince Edward Island has enjoyed success with its beverage container policies, its mainland neighbor, New Brunswick, has encountered many obstacles to reviving a market for refillable soft-drink bottles. In the early 1990's, New Brunswick legislators proposed beverage container deposit laws that emphasized the use of refillables but ultimately passed only part of the legislation.⁹⁶ One of the surviving provisions, a full refund of the deposit for refillable containers and only a partial refund for non-refillables, has yet to result in a viable market for refillable soft-drink bottles in the province. In fact, less than two percent of the soda pop sold in New Brunswick comes in refillable bottles.⁹⁷ New Brunswick's experience provides valuable lessons about the difficulties that come with proposing legislation to promote refilling and about the insufficiency of deposit incentives.

Policy development. Concern about litter motivated the government to propose beverage container deposit legislation. The 1991 legislation, the Beverage Containers Act, originally required bottlers to supply refillables in all locations and to give them the same exposure and pricing as non-refillables. Lobbyists from the soft-drink industry successfully persuaded legislators to reject this provision and to reduce the mandatory deposits.⁹⁸ The deposit is 10 cents per single-serving container for any non-alcoholic beverage, and the refund is 5 cents for non-refillable containers and the full 10 cents for refillables.⁹⁹ This "half-back" deposit provision is the only part of the Act which explicitly promotes the sale of soft drinks in refillable containers. Another part of the original legislation required retailers to take bottle returns, but lobbyists from the retail grocery industry successfully defeated this provision.¹⁰⁰

Results. "Shortly after the legislation was proclaimed, refillables started to disappear from store shelves. Within about 8 months, it was difficult to find them," says Mary Ann Coleman of the New Brunswick Environmental Network.¹⁰¹ Joanne Glynn, a waste management planner in the New Brunswick Department of Environment and Local Government, adds that New Brunswick consumers now do not have many choices of soft drinks in refillable containers.¹⁰²

The negligible market share for these soft drinks has been attributed not only to the weakened legislation, but also to the province's deposit-return system. In this system, the consumer receives five cents for returning each empty single-serving non-refillable container. The other five cents from the 10-cent deposit is ultimately split between the provincial government's environmental trust fund and the beverage companies. The portion that goes to beverage companies helps them finance their recycling operations.¹⁰³ These funds appear to be a strong disincentive for the beverage industry to package its products in refillable bottles.

The beverage industry not only has an incentive for resisting refillables, but also an instrument for doing so. The industry and New Brunswick retailers operate a consortium, Encorp Atlantic, that manages the province's deposit-return system. When Seaman's Beverages tried to put its products on New Brunswick's store shelves in refillable bottles, Encorp insisted that only its redemption centers could legally collect the empty bottles. Seaman's, however, wanted to retrieve the bottles directly from stores during delivery stops because this is more efficient than making separate stops for delivery and for retrieval. Rundell Seaman, chairman of Seaman's Beverages, says that New Brunswick's system effectively bans refillables. High stocking fees and the vertical integration of the grocery industry also have discouraged Seaman's from marketing its old-fashioned soda pops in refillable bottles in New Brunswick.¹⁰⁴

Outlook. Any movement toward stronger refilling legislation for soft drinks appears to be non-existent. Both Coleman and Glynn say that they know of no citizens' campaigns to persuade the provincial government to make laws that further promote the use of refillable soft-drink bottles.¹⁰⁵ Furthermore, New Brunswick consumers perceive the Beverage Containers Act as "environmental legislation," but it really "is not driving a positive environmental change."¹⁰⁶ Such complacency about beverage container waste could undermine any movement to strengthen the Act. The availability of curbside recycling also could extenuate any demands to improve refillable beverage container policies. In fact, the only policy change that Glynn foresees is an increase in the deposit from 10 cents to 15 or 20 cents.¹⁰⁷

Quebec

While Canadian soft-drink bottlers have dismantled most of their refilling operations, Canadian brewers have firmly and loyally upheld their tradition of refilling. Provincial governments have helped maintain this tradition by enacting policies such as Quebec's quota on non-refillable beer containers. This quota is not a regulation but a provision of an agreement that brewers and distributors sign with the provincial government.

Policy development. Concern about beverage container litter led to a provision in the 1984 agreement which required that brewers package no more than 37.5 percent of the volume of their beer in cans.¹⁰⁸ Because some brewers were packaging beer in one-way bottles,¹⁰⁹ the provincial government instituted a new quota in its 1995 agreement. The 1995 quota, which is part of the 2001 agreement, requires that no more than 37.5 percent of the total number of containers in a brewer's sales be non-refillable. The fines for exceeding this quota are 15 cents per container for the first 10 percent of excess and 30 cents per container for any excess above 10 percent.¹¹⁰ If 42.5 percent of the containers in a brewer's sales are non-refillable, for example, then the fine is 15 cents per container. If 52.5 percent are non-refillable, then the brewer pays 15 cents per container for the first 10 percent of its excess and 30 cents for the remaining 5 percent.

A law titled An Act Respecting the Sale and Distribution of Beer and Soft Drinks in Non-returnable Containers requires that anyone who sells or distributes beer in Quebec in non-refillable containers must obtain a permit to do so from the Minister of the Environment.¹¹¹ To obtain a permit, the applicant must either enter into an agreement with the Société Québécoise de Récupération et de Recyclage (Recyc-Quebec) and the Minister of the Environment or comply with beverage container regulations that have been

established under the authority of Section 70 of the Environment Quality Act.¹¹² Section 70 addresses hazardous materials and authorizes the Minister of the Environment to regulate their handling.¹¹³ In summary, a brewer or distributor who wants to sell beer in Quebec has three options: sell beer only in refillable containers, sign an agreement with the provincial government, or have their containers regulated as hazardous materials.

Results. The prevalence of refillable beer bottles, which make up about 80 percent of the volume of all beer in the Quebec market,¹¹⁴ and return rates of nearly 98 percent¹¹⁵ help brewers reduce packaging costs and help the province reduce its waste. Although U.S. brewers generally prefer to package their products in aluminum cans,¹¹⁶ they work with major Canadian brewers to sell American beer in Quebec in the industry's standard refillable bottle. Labatt packages Budweiser and Bud Lite beers, and Molson does likewise with Miller and with Coors. Another U.S. brewer took a more direct approach to refilling for the Quebec market. Before Sleeman acquired Stroh Breweries, Stroh sold about 70-75 percent of its beer in Quebec in refillable bottles. Stroh's empty bottles were washed in Quebec and returned to Pennsylvania for refilling.¹¹⁷

Outlook. Yvon Millette, President of the Quebec Brewers Association, says that Quebec brewers will continue refilling for the following reasons: refilling is still the most economical way to package beer; beer drinkers have loyally maintained the tradition of buying their beer in refillables and returning the empties; and Quebec brewers have joined other Canadian brewers in a formal agreement to continue the use of the refillable bottle.¹¹⁸

Ontario

While Quebec uses agreements with brewers to maintain a prevalence of refillable beer bottles, Ontario uses a tax instrument to alter its beer market to favor refillables. This tax instrument is a \$0.0893 tax for each non-refillable container. The 10-cent levy is the sum of this container tax, a 7-percent federal goods and services tax on the final sale price of the container, and a 12-percent provincial sales tax on the final sale price of the container. All brewers who sell or distribute beer in Ontario pay the levy to the provincial government.¹¹⁹ Although the levy is known as the "environmental levy," some Canadian observers¹²⁰ and U.S. brewers have construed it to be a policy to protect Ontario's beer industry.

The levy, however, helps protect the refillable bottle, which is an essential component of Ontario's beer industry. Ontario brewers prefer refillables because they minimize the costs and the environmental impacts of beer packaging. Moreover, weak markets for recovered brown glass make one-way bottles an environmentally inferior option.¹²¹ The advantages of using the refillable bottle give Ontario brewers compelling reasons to campaign for policies that protect its use.

Policy development. The government of Ontario began actively promoting refillable beer bottles in 1989 with a five-cent levy on wines, liquors, and imported beers. At that time, U.S. and other foreign beers were not subject to a deposit, and foreign brewers could choose not to join Canadian brewers in recovering all packaging waste from the distribution and sale of beer.¹²² Although the rationale behind the levy was the need to compensate the province for the disposal of non-refillable alcoholic beverage containers, its waste management and other environmental programs did not directly receive the revenues.¹²³

After a 1991 GATT ruling required Ontario to improve market access for U.S. beer,¹²⁴ the province's beer industry urged its government to impose regulations that would mitigate the threat of U.S. beer and preserve the successful deposit-return system for beer bottles. After considering both a regulatory and a tax policy, in 1992 the provincial government increased the levy from five to ten cents and applied it to all beer in cans. Doug Macdonald, Ph.D., a lecturer in environmental studies at the University of Toronto, has suggested that Ontario preferred the levy increase for three reasons: the risk of complicating negotiations with the soft-drink industry over funding for curbside recycling, the difficulty of enforcing regulations such as quotas, and the revenues that the levy could generate.¹²⁵

The levy rendered a competitive disadvantage to American beer, most of which was canned, by effectively increasing the price of a can of beer by 10 percent.¹²⁶ However, an analysis of Brewers Association of

Canada data suggests that the levy only temporarily affected the competition between American and Canadian brewers. The Ontario market share for Canadian beer, which had been slowly declining, increased from 96 percent in 1992 to 97 percent in 1993. After this jump occurred, the market share continued its decline to 92 percent in 1999.¹²⁷

Results. Although the 10-cent levy had almost no impact on U.S.-Canada competition for the Ontario beer market,¹²⁸ it apparently changed the packaging mix shortly after it became effective. Sales of canned beer fell by almost 50 percent in 1992,¹²⁹ while the market share of beer in refillable bottles jumped from 80 percent in 1990 to 92 percent in 1995.¹³⁰ In 2000, 81 percent of beer sales came in refillable bottles,¹³¹ while only 9 percent came in cans.¹³² Macdonald believes that the levy has had a significant impact on sales of beer in refillables through its impact on consumer behavior.¹³³

The preservation of Ontario's market for beer in refillable bottles has helped to preserve the deposit-return system and other operations that specifically support refilling. The retailers' deposit-return system not only recovers almost 98 percent of refillable bottles,¹³⁴ but also facilitates the reuse or recycling of secondary and transport packaging and the recovery of aluminum cans.¹³⁵ Brewers Retail, Inc. (BRI) claims that it recovers almost 98 percent of its packaging and diverts about 500,000 metric tons of material from the waste stream each year.¹³⁶ BRI's recovery operations reduced its waste disposal costs from a peak of \$1,500,000 in 1992 to only \$129,000 in 1994.¹³⁷ In fact, all foreign brewers now participate in these recovery operations.¹³⁸ In addition, recovering, washing, and processing of refillable bottles employs over 2,000 persons in Ontario.¹³⁹ Finally, another economic benefit of the 10-cent levy has been the revenue that it has generated for Ontario--more than \$40 million in 1998.¹⁴⁰

Ontario beer drinkers can still buy their favorite brews--Canadian or American--in cans or in bottles. In fact, under agreements with these American companies, Ontario breweries package Anheuser-Busch and Coors beers in the industry's standard refillable bottle. Other American brands, including Stroh and Old Milwaukee, are sold in cans.¹⁴¹

Outlook. Ontario's 10-cent levy on non-refillable beer containers has survived the 1993 resolution of a U.S.-Canada trade dispute¹⁴² and the aluminum industry's 1999 ad campaign against it.¹⁴³ The levy has also survived a conservative provincial government, which abrogated many other environmental protection laws during the late 1990s. There is no guarantee that the levy will remain, Macdonald says, but its ability to generate revenue may ensure its survival.¹⁴⁴ Regarding its ability to boost sales of beer in refillable bottles, the levy might lose some of its effectiveness if new technology reduces the cost of canning beer and brewers pass this cost savings to Ontario consumers.

Western Europe's Experience with Refillable Beverage Containers

This chapter presents policies in Europe that promote or require refillable beverage containers, the development of these policies, what they have achieved, and what may happen in the near future. Another topic that deserves attention is the logistics of refilling in Europe, but that topic is already thoroughly covered by three reports.¹⁴⁵ In this chapter, all Euro amounts of taxes and deposits are based on October 22, 2001, exchange rates.¹⁴⁶

- Overview
- Denmark
- Finland
- Germany
- The Netherlands
- Other Nations (Portugal, Norway, Belgium, Sweden)

Overview

Refilling advocates, especially those in the United States and Canada, look to Western Europe's thriving refilling systems for inspiration and for technical guidance. Wherever refillable beverage containers are prevalent in Europe, refilling systems exemplify the use of advanced technology. One of the most important innovations is the 1.5-liter refillable PET bottle, which has enabled refilling systems to package beverages in lightweight, shatterproof, multi-serve containers. When European consumers return these bottles to stores, they most likely use a fully-automated take-back machine. Bottles are automatically sorted at the store or at another distribution point and then returned to the bottling plant, where they are automatically put on the washing line. After the bottles are washed, an electronic sniffer inspects them for contaminants. The clean bottles are refilled on production lines whose speeds match those of one-way bottles. Innovations in packaging have come also to the beer industry, where many European brewers have been working to perfect the use of refillable PET and PEN bottles. The development or refinement of these technological innovations in Europe has certainly depended on viable markets for beverages in refillable containers. In turn, these markets have depended on policies that effectively promote or require refilling. Europe has served as a proving ground for the successful use of such policies.

In almost every European nation, regardless of the presence or absence of a policy, refillable containers are used to some extent for at least one type of beverage.¹⁴⁷ In France, however, refillable beverage containers have become almost extinct. In Ireland and the United Kingdom, refilling has almost disappeared, but most of the beer sold in these two countries is draught beer.¹⁴⁸ In Belgium, Greece, Portugal, Italy, and Spain, refilling has disappeared for most types of beverages but has remained for other types, mainly alcoholic beverages. In Sweden, Germany, Austria, Norway, and The Netherlands, consumers can buy almost any type of beverage in refillable bottles, but one-way containers hold a significant market share.¹⁴⁹ In Finland and Denmark, almost all beer, soft drinks, and packaged water come in refillable containers. Refillable bottles for wine and for liquors also are very prevalent in these two countries.¹⁵⁰

In spite of the high prevalence of refillable beverage containers in many countries, refilling has been slowly declining across Europe. In 1997, 41 percent by volume of the mineral water sold in European Union (EU) countries came in refillable bottles. In 1996, about 39 percent of soft drinks were consumed from refillable bottles. The amount of beer sold in refillable bottles fell from 81 percent in 1979 to about 60 percent in 1997 because the growth in the European beer market has favored one-way containers. Non-carbonated beverages such as fruit juices and flavored milk are packaged mainly in cartons, and only a few refilling systems exist for these types of drinks.¹⁵¹

The changes in the beverage and retail industries that caused the decline of refilling in the United States are forcing the decline also in Europe. Coca-Cola, which has more than 50 percent of the European market, had a decentralized bottling and distribution structure until the mid-1980s. Around that time, Coca-Cola's European subsidiary began transforming itself from a multi-company organization of franchise bottlers and

distributors to a single corporation. Coca-Cola's consolidation led to the centralization of its bottling and canning operations. One of these operations, the Bergues plant in Northern France, cans Coca-Cola products for the entire European market.¹⁵² The availability of canned soda pop from this and other plants should please retailers, who prefer one-way containers. Food retailing in Europe has become much like that in the United States, where supermarket chains dominate the retail food industry. One of the driving forces in food retailing in Europe has been the discounters, who adamantly refuse to stock anything in reusable packaging. One of Europe's leading discounters, the German company ALDI, also has stores in several U.S. states. The following are some of the characteristics that distinguish the discounters' stores from other retail stores.¹⁵³

- Consistently the lowest prices
- Stock limited to only the most basic goods, usually about 500 items
- Display of merchandise in boxes or on pallets
- Minimal storage space
- Only cardboard for transport packaging

Stores with such features do not accommodate refillable beverage containers very well.

Besides the retail industry, another adamant opponent of refilling in Europe is the packaging industry. The packaging and the consumer products industries express their opposition to refilling policies through the European Organisation for Packaging and the Environment (EUROPEN). EUROPEN asserts that laws which favor certain types of packaging unnecessarily restrict trade and distort competition. To demonstrate that refilling laws are trade barriers, EUROPEN has made the following equivocal argument: In European countries where the market share of one-way containers is less than five percent, the market share of imported soft drinks and beer also is less than five percent.¹⁵⁴ To argue against refilling laws and other packaging laws, EUROPEN also has criticized the use of life-cycle analysis in policymaking.

In its effort to abolish refilling laws, EUROPEN has a powerful ally--the European Union (EU). The executive branch of the EU, the European Commission (EC), has referred Germany and Denmark to the EU Court on charges that their beverage container laws violate trade agreements between EU member states.¹⁵⁵ The EC has also argued that the beverage container laws of these two countries are not the types of laws that conform to the EC Directive on Packaging and Packaging Waste. The directive, however, barely mentions the reuse of packaging and instead emphasizes recycling and recovery. The directive aims to harmonize the packaging laws of EU member states and to reduce the environmental impacts of packaging and packaging waste without impeding commerce. To comply with the directive, each member state has implemented laws and strategies that work with its existing waste management policies.¹⁵⁶ The directive requires the EC to revise its waste diversion targets by 2001, but the EC was still discussing them in mid-2001. The Environment Committee of the EU Parliament has recommended stronger reuse provisions for the revised directive and has suggested that manufacturers use life-cycle analysis studies to justify their choices of packaging for their products.¹⁵⁷ The European Environmental Bureau, a federation of grassroots organizations from across Europe, has also called for stronger reuse provisions in the revised directive.¹⁵⁸

While the retail and packaging industries clearly dislike refillable beverage containers, the attitude of the beverage industry appears to vary from country to country and from product to product. While the Finnish beverage industry boasts about how its use of refillables has contributed to Finland's noteworthy waste diversion achievements,¹⁵⁹ the Dutch soft-drink bottlers explicitly state their preference for one-way containers.¹⁶⁰ German mineral-water bottlers have expressed pride in their refilling systems,¹⁶¹ but French bottlers have expressed their resentment of Germany's beverage container laws.¹⁶²

One industry group that has traditionally preferred refillable bottles is HoReCa: hotels, restaurants, (pubs), and caterers. Hotels, restaurants, and pubs in Europe prefer to sell packaged beverages in refillable bottles because of their customers' preference for local and regional beverages in refillables and because of the cultural value of eating and drinking in these places. In addition, many breweries own restaurants and pubs, and this arrangement makes refilling the ideal packaging option for beer.¹⁶³

Regardless of whatever opposition or support exists, many European governments consider refilling the best option for managing beverage containers. Many European countries face a shortage of space for landfills and therefore must do everything possible to divert waste from them.¹⁶⁴ Although recycling is a viable option for waste diversion in most European countries, it is less so in others. The need to prevent beverage containers from going to landfills or from littering public spaces has provided many European governments the impetus to enact laws that promote or require refilling. In most of the nations that have such laws, most of the volume of packaged soft drinks, mineral water, and beer is sold in refillable containers; these nations have been able to prevent or decelerate the decline of refilling and to preserve and improve their refilling systems. Without refilling laws, the forces that oppose the use of refillable containers would prevail, and one-way containers would dominate the European beverage market. Indeed, the policies are what drive refilling in Europe.

Denmark

Denmark applies both a regulatory and an economic instrument to deliver a one-two punch to one-way containers. This country requires refillable containers for all packaging of domestic beer and soft drinks, and bans cans for both domestic and imported beer and soft drinks. These regulations apply also to carbonated mineral water. In addition, a tax on almost all consumer packaging gives refillables a price advantage. In the latest version of this tax, the results of life-cycle analysis (LCA) studies determine the per-kg rates for different packaging materials, but volume-based rates apply to beverage containers. The Netherlands apparently was the first country to use life-cycle analysis in its beverage container policy, but Denmark's LCA-based packaging tax has gained the attention of environment ministers from other European countries.

Policy development. In 1977, Denmark began requiring refillable containers for all beer and soda pop sold there by domestic producers. The soft-drink industry and Denmark's two leading brewers supported this requirement in order to protect their refilling systems, which were threatened by a brewery that had begun to package its beer in cans.¹⁶⁵ A 1989 law, with its 1991 and 1997 amendments, requires refillable containers also for carbonated, unflavored mineral water and specifies criteria that all domestic refillable containers must meet in order to be approved by the Danish Environmental Protection Agency (DEPA). For imported beer and soft drinks, the law allows refillable or non-refillable containers that are not made of metal and that are sold and recovered under a deposit-return system. A violation of the 1989 law may result in a fine of an unspecified amount.¹⁶⁶ Denmark's beverage container laws effectively ban metal cans. Because non-alcoholic, non-carbonated beverages such as iced tea, juices, and flavored milk have an insignificant share of Denmark's beverage market, they are allowed to be sold in cans. If significant shifts in the markets for these beverages occur, then the DEPA will review its policies.¹⁶⁷

In 1978, Denmark complemented its refilling requirement with a tax on all new beverage packaging.¹⁶⁸ The Danish Action Plan for Waste, which became effective in 1993, stimulated discussion about taxes on all packaging. The interest in such taxes waned and remained dormant until 1996, when the parliament asked the government to re-study the possibilities of a packaging tax. While the government was finishing its study in 1997, the parliament approved a limited packaging tax, which became effective in 1998. This tax applied to beverage bottles and to bottles and jars of only a few types of food products. Some of the recommendations of the government's study were the basis for an expanded packaging tax scheme, which became effective in 1999.¹⁶⁹

One of the other recommendations of the 1997 study, a tax scheme based on the findings of life-cycle analysis studies, evolved into a DEPA proposal to set tax rates which are indexed to the environmental impacts of glass. Under this scheme, packaging materials whose environmental impacts are greater than glass are subject to higher tax rates, and materials with less impact are subject to lower rates.¹⁷⁰ For beverage containers, however, the final version of the tax law only distinguishes cartons from other beverage containers. The tax scheme assigns six different per-container rates for six different volume-capacity ranges for cartons and likewise assigns another set of six per-container rates for all other types of beverage containers.¹⁷¹ For beer, soft drinks, liquor, and wine, fillers and importers pay the tax on each container. The revenue from the tax goes to the treasury, but some of this money has helped to fund the

government's environmental programs.¹⁷² This latest version of the packaging tax became law in December 2000 and was scheduled to become effective on April 1, 2001.¹⁷³

Because the tax on beverage containers is based on volume capacity rather than weight, the tax on a one-way bottle of a given size is equal to the tax on a refillable bottle of the same size. When a refillable bottle is refilled several times, however, the tax per filling is less than that of the one-way bottle.¹⁷⁴ To illustrate how the tax magnifies the cost difference between a one-way bottle and a refillable bottle, consider the typical costs of 500-ml PET bottles in Europe. A one-way PET bottle of this size costs 0.069 Euro, a comparable refillable bottle costs 0.133 Euro.¹⁷⁵ The refillable bottle only has to be filled twice to make the price per filling cheaper than the one-way bottle. If we assume that the refillable bottle makes 20 fillings, the average for PET bottles in Denmark,¹⁷⁶ the cost difference between the bottles is 0.062 Euro without the tax, but grows to 0.167 with the 0.11 Euro tax.¹⁷⁷ Furthermore, the refillable bottle on average is almost 15 times cheaper than its one-way counterpart -- 0.012 Euro per filling as compared to 0.179 per filling for the one-way container. See the tables below.

Price of 500-ml PET Bottles in Europe, One-Way v. Refillable (in Euros)

		Refillable Refilled Twice	Refillable Refilled 20 Times
	Container Cost	Container Cost/Filling	Container Cost/Filling
One-Way bottle	0.069	0.069	0.069
Refillable bottle	0.133	0.067	0.007
How much cheaper is a refillable in Euros?	-0.064	0.003	0.062

Impact of Tax on Price of 500-ml PET Bottles in Europe, One-Way v. Refillable (in Euros)

	Container Price/Filling	Tax/Filling	Total Price/Filling
One-way bottle	0.069	0.110	0.179
Bottle refilled 20 times	0.007	0.006	0.012
How much cheaper is a refillable in Euros?			0.167
How many times cheaper is a refillable?			14.7

Results. Together, the refilling requirement and the packaging tax have effectively promoted the use of refillable bottles in Denmark's beverage market. Because of the refilling requirement, Danes consumed 100 percent of their packaged beer and at least 90 percent of their soft drinks and mineral water in refillable bottles in 1999.¹⁷⁸ For beverages not subject to the refilling requirement, the tax has effectively promoted refilling. Because of the price advantage that the tax gives to refillables, most retailers in Denmark sell wine and other alcoholic beverages only in refillable bottles. One of these retailers is the discount store ALDI, one of Europe's most adamant opponents of refilling. ALDI and other retailers sell soft drinks and alcoholic beverages in Denmark in refillable bottles and have experienced very few difficulties with costs and logistics.¹⁷⁹ On store shelves in Denmark, moreover, consumers see a variety of beverage packaging. Soft-drink companies--who like to use packaging to distinguish their products from competitors' products--have been allowed to use their own bottles or to choose their packaging from the five standard PET bottles and one standard glass bottle.¹⁸⁰

Denmark's beverage container laws have greatly benefitted the public. The refilling requirement for soft drinks and beer has prevented 390,000 tons of waste annually. The use of refillable wine bottles, which is encouraged by the tax, has prevented 60,000 tons of waste annually.¹⁸¹ While helping Denmark reduce waste management costs, the packaging tax raised 109 million Euros in 1998 and 101 million Euros in 1999.¹⁸² The Danish Tax and Customs Administration spent 254,800 Euros and many man-hours of labor to establish the information systems required to administer and collect the tax. Operating costs for the tax collection system were 27,000 Euros in 1999. The complexity of the packaging tax scheme makes collection seem difficult in comparison to other taxes.¹⁸³ On the other hand, the administration and enforcement of the refilling requirement for soft drinks and beer has been easy, and compliance has been easy for the beverage industry.¹⁸⁴

Outlook. If the EU Court rules against Denmark, then Danes may see many more one-way containers. In 1999, the European Commission (EC) referred Denmark to the EU Court of Justice for that country's ban on cans,¹⁸⁵ and the case went to trial June 2001. The EC argued that the ban on cans violates the EU Directive on Packaging and Packaging Waste because it contravenes the Directive's purpose of harmonizing the management of packaging across the EU. The EC also argued that the ban is a trade barrier under Article 28 of the EEC Treaty and attempted to debunk Denmark's use of life-cycle analysis studies to defend its beverage container policies.¹⁸⁶ In its defense, Denmark cited a 1986 ruling by the EU court that found the ban is not a barrier to trade as long as the EU does not require a beverage container reuse policy for all member states. The EU, in fact, has not required such a policy through its packaging directive or through any of its other directives.¹⁸⁷ In the debate leading to the trial, furthermore, Denmark has argued that ". . . the Directive is at present not fully operational as a harmonisation directive," and has viewed the ban on cans ". . . as a natural extension of the environmental objectives of the Directive."¹⁸⁸

Denmark's vulnerability to canned beverages from surrounding countries underscores the importance of the trial. In Sweden, Denmark's northern neighbor, 63 percent of beer comes in cans.¹⁸⁹ To the south, the Bergues plant in Northern France cans Coca-Cola products for the entire European market.¹⁹⁰ The slow decline of refilling in Germany and the anticipated softening of that country's beverage container laws will also put more cans closer to Denmark's borders. ". . . Denmark risks being inundated with all possible types of non-refillable packaging," says Svend Auken, Danish Minister of Environment and Energy.¹⁹¹ If the EU Court rules against Denmark, then Denmark may join Germany in softening its policies by introducing a deposit law.¹⁹² However, Denmark could make refillable beverage containers exempt from its packaging tax and maintain the success that it has had with promoting refilling.

Late-Breaking News. According to the February 2002 Danish Environment Newsletter, "the Minister of the Environment has repealed the prohibition on disposable packaging that has kept beer and soft drink cans off the Danish market. Denmark has called on the EU Commission to drop the pending lawsuit, which is now unnecessary. A common, obligatory deposit and return system will ensure that the used cans are collected." By January 15, 2002, new deposit regulations covering all beer and soft drink containers are slated to be effective. By summer 2002, breweries and retailers are slated to install new recycling machines for cans and other one-way packaging.¹⁹³ The deposit is expected to be DKr 1.5 (0.20 Euro) for containers smaller than a liter and Dkr 4.25 (0.61 Euro) for those larger than a liter.¹⁹⁴

Finland

Among the European countries that promote or require refilling, Finland has become one of the most successful by implementing a simple levy on one-way beverage containers. Although this policy instrument allows one-way containers, consumers and the domestic beverage industry overwhelmingly prefer refillable bottles. Refilling is almost a necessity in Finland, in fact, because recycling is an expensive and impractical option for managing used beverage containers. The prevalence of refillable containers and the prevention of waste are measures of Finland's success with refilling, and the lack of an EU challenge will help ensure that the levy stays in place.

Policy development. Since the 1970s, Finland has used a tax system to promote refilling. Under the current laws, which became effective in 1994, a container levy on both alcoholic and non-alcoholic

beverages supplements other food and beverage taxes. The amount of the levy is based on the method for managing the containers.¹⁹⁵

- No recovery of packaging waste, 0.67 Euro per liter
- Recycling, 0.17 Euro per liter
- Refilling, no tax

To obtain an exemption from the levy on beverage containers, the refilling system must meet three main requirements.¹⁹⁶

- A deposit of 0.08-0.25 Euro
- Return rates of 75 percent in the first year, 85 in the second, 90 in the third, and 95 percent in the fourth year
- Submission of reports to the Ministry of the Environment

The bottler, brewer, or importer pays the levy upon shipment to stores,¹⁹⁷ and the revenue goes to the treasury.¹⁹⁸ The Ministry of Finance and the Ministry of the Environment jointly administer the levy program.¹⁹⁹

The prevention of beverage container waste motivated the implementation of the levy,²⁰⁰ but the impracticality of recycling in Finland necessitates it. Finland's capacity for recycling glass is limited, and markets for recovered glass are unstable. In addition, Finland does not have any facilities for converting recovered PET and other plastics into feedstock, and no plans exist to build such a facility there. In fact, Finland exports almost all of its recovered PET and aluminum. Finally, Finland's low population density and trickle of packaging waste do not justify investments in extensive recycling collection and sorting systems. The difficulties of recycling glass and plastic bottles make refilling the most practical packaging option for beverages.²⁰¹

In spite of the apparent need for it, the levy has been the subject of debate within the government. In 2000, the Finnish Competition Authority (FCA) demanded the abolition of the beverage container levy and the deposit laws because the FCA believed that both laws were effectively closing the beverage market to new companies, to small companies, and to foreign companies. One barrier was the minimum amount of beverage that a new company would have to sell before it could earn profits from refilling. Another possible barrier to entering Finland's beverage market was the one-time membership fee of 17,000 Euros required to participate in Panimoliitto's bottle management system. (Panimoliitto is the Federation of the Brewing and Soft Drink Industry, a trade association that manages the refillable bottle pool for its members.) To help the smaller bottlers compete, the government proposed to exempt manufactured mineral water from the beverage container tax system. The parliament rejected this proposal, but Panimoliitto offered to replace its fixed membership fee with a fee that is based on the number of different products that a beverage producer annually offers.²⁰²

The levy has survived a challenge also from the packaging industry, which argued that the purpose of the levy was the preservation of deposit-return systems for beverage containers. In 1996, moreover, the European Aluminum Association and the Beverage Can Makers of Europe complained to the European Commission that the tax discriminates against recyclable one-way containers because it still applies even when recycling rates are high. The commission responded by saying that the amount of the tax was too low to validly argue that its purpose is something other than environmental protection.²⁰³

Results. The levy has effectively promoted refilling, reduced the consumption and waste of packaging materials, and brought revenue to the government. In 2000, Finns consumed 73 percent of their beer and 98 percent of their packaged soft drinks and mineral water from refillable bottles.²⁰⁴ Moreover, the prevalence of refilling has kept pace with the growth of Finland's beer market. In the soft-drink market, one bottler unsuccessfully tried to sell beverages in 500-ml one-way PET bottles.²⁰⁵ The levy not only has thwarted one-way bottles but also has forced the establishment of a deposit-return system for aluminum cans. This system recovers 95 percent of the cans that are sold under it and allows its participants to pay the amount of the levy that corresponds to recycling.²⁰⁶

Besides the recovery of cans, the levy has brought some other amazing results in regard to waste prevention. Refilling has prevented 380,000 tons of waste annually²⁰⁷ and has made Finland the EU champion in the prevention of packaging waste. In 1998, Finland generated 83 kg per capita of packaging waste, while other EU member states generated an average of 159 kg per capita.²⁰⁸ On a weight-per-person basis, in fact, 84 percent of glass packaging in Finland is reusable packaging.²⁰⁹

The total revenue from the levy from 1995, 1996, and 1997 combined was 37.5 million Euros, and the estimated revenue from 1998 was 11.6 million Euros. From 1995 to 1996, the revenue dropped by 40 percent because of the establishment of the deposit-return system for cans.²¹⁰ The cost of administration of the levy is low,²¹¹ probably because it is co-collected with other food and beverage taxes.

Outlook. Because of the popularity of refillable bottles among consumers, the support by both government and industry for refilling, and the European Commission's lack of concern about the levy, the future of refilling in Finland looks bright. The results of a January 2001 Gallup poll indicate that 79 percent of Finnish beer drinkers prefer to buy beer in refillable bottles and that 94 percent of consumers who buy soft drinks prefer refillables.²¹² Both the Ministry of the Environment and the major brewers want to keep Finland's beverage container laws in place. Abolishing the tax system would begin the abolition of all environmental protection regulations, according to the environment minister, and would begin to undermine the competitiveness of the refilling system, according to the brewers.²¹³

Germany

After it enacted its Packaging Ordinance in 1991, Germany gained a worldwide reputation as a pioneer in mandating producer responsibility for packaging waste. Special provisions of the ordinance also hold beverage companies responsible for their containers, but the slow decline of refilling in Germany in the last few years has revealed the weaknesses of these provisions. One strength of these provisions, however, is that they apply not only to soft drinks and beer, but also to water, juice, wine, and milk.

Policy development. Germans have been concerned about packaging since the early 1970s, when the emergence of beverage cartons and one-way glass bottles and the concurrent decline of refilling started the discussion about beverage packaging. The first German waste law of 1977 authorized the government to regulate markets by ordinances. In 1978, industry and government made an informal agreement to preserve the refilling systems that were operating at that time. In 1989, the beverage industry and government again made agreements to preserve refilling, with the understanding that regulations would follow if industry failed to fulfill its obligations. Only six months after the parties signed these agreements, the government realized that industry was failing to fulfill its refilling obligations.²¹⁴ In response to industry's failure, the government enacted a deposit law for one-way PET bottles in 1989.²¹⁵

Observing the industry's inexorable transition to one-way containers, the government began drafting an ordinance to preserve refillable beverage containers in the early 1990s. In spite of aggressive opposition from the beverage and the packaging industries, the 1991 Packaging Ordinance became law that year. The ordinance requires the beverage industry to package at least 72 percent of the volume of its products in refillable containers.²¹⁶ Containers of water, carbonated soft drinks, fruit juices and other non-carbonated soft drinks, beer, and wine are subject to the beverage packaging provisions of the ordinance. If less than 72 percent of all of these beverages combined is packaged in refillable containers during a given year, then the government conducts a survey of beverage packaging over the following year. If this survey reveals that the 72 percent quota again is not met, then those types of beverages that did not meet their individual quotas are subject to a mandatory deposit. Under the deposit provision, producers of these non-complying beverages must establish deposit-return systems and thus must forfeit their option to have Duales System Deutschland or a similar recycling organization recover their one-way containers. For one-way containers whose capacity is 1.5 liters or less, the mandatory deposit is 0.25 Euro; for larger containers, the deposit is 0.50 Euro. The individual quota for each beverage is the percentage of that beverage that was packaged in refillable containers in 1991. These percentages are the following: water, 91; carbonated soft drinks, 73; juices and other non-carbonated soft drinks, 35; beer, 82; wine, 29. The Packaging Ordinance treats milk separately by requiring dairies to package 20 percent of their milk in refillable containers.²¹⁷

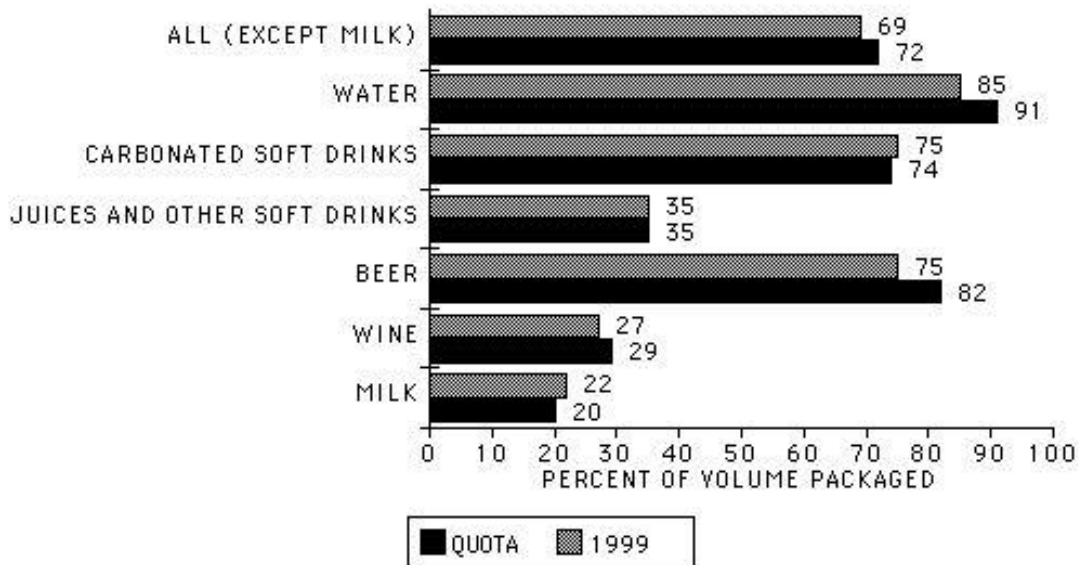
Although the volume of beverages packaged in refillable bottles increased after the ordinance became effective in 1991, the volume percentage decreased because the growth of the beverage market outpaced the growth of refilling. In 1997, this percentage fell below 72 percent for the first time because of the increasing prevalence of beer cans and of one-way mineral-water bottles. The combined market share of beverages in refillable containers was 71.3 percent in 1997 and was 70.1 percent in 1998. The beverage industry's failure to meet the quota for two years in a row stimulated discussion in Germany about alternative policy instruments to stop the decline of refilling. One alternative that the government and some environmentalists favored is a Danish-style tax on all packaging. For any given beverage container, the amount of the tax would be based on the environmental impacts and resource demands of the container material.²¹⁸ Another alternative, tradeable permits, was also discussed. Under a tradeable permits system, beverage producers would have to buy permits for a fixed quantity of one-way containers.²¹⁹ The tinplate industry contributed to the discussion by supporting a proposal for a "flexible packaging mix" of both one-way and refillable beverage containers and for the refilling or recycling of 90 percent of all beverage containers.²²⁰ This industry has supported this plan apparently as a Trojan horse for a complete transition to one-way containers.

In spite of the many suggestions about policy instruments, in 2000 Environment Minister Jürgen Trittin proposed a variation of the existing law. Trittin proposed to require a deposit simply for all beverages except wine rather than for only those beverages whose packaging did not comply with the ordinance. Trittin's proposal also called for the abolition of the quota,²²¹ leaving only the proposed mandatory deposit on one-way containers to stop the decline of refilling. A third component of the proposal classified beverage containers as ecologically advantageous or ecologically disadvantageous rather than as refillable or non-refillable and exempted ecologically advantageous containers from the mandatory deposit.²²² The classification of a particular type of beverage container was to be determined by results of life-cycle analysis (LCA) studies. Surprisingly, a recent German LCA study had concluded that disposable cartons are ecologically comparable to refillable bottles, and thus cartons would have been exempt from mandatory deposits.²²³

In early 2001, the Federal Environment Ministry and the Federal Ministry of Economics and Technology agreed on the proposal for a mandatory deposit law,²²⁴ and the Federal Cabinet approved it in May.²²⁵ In July 2001, the Bundesrat narrowly rejected the proposal. In response to the Bundesrat's vote, Environment Minister Trittin said that he would uphold the existing law to require deposits on only those beverages whose packaging mix did not satisfy their quotas.²²⁶ Under the existing Packaging Ordinance, the quotas remain in force, and one-way containers of beer, wine, and water will be subject to a deposit in early 2002.²²⁷

Results. Although the Packaging Ordinance has not stopped the slow decline of refilling, it has had some positive effects. The 1999 percentages of beverages packaged in refillable containers are respectable figures that show refilling is still very prevalent in Germany. Unlike other European countries with refilling laws, furthermore, Germany has maintained noticeable levels of refilling for many types of beverages--not just beer and soft drinks. The following bar graph shows the levels of refilling for the types of beverages whose packaging is subject to the quotas.²²⁸

Refillable Beverage Containers in Germany



The bar graph clearly reveals which beverages--water, beer, and wine--will be subject to a mandatory deposit because their packaging did not meet their respective quotas. Generally, the percentage of beverages in refillables slowly increased after 1991, peaked in 1993, and declined after 1993.²²⁹ The Packaging Ordinance not only increased refilling slightly but also encouraged many medium-sized beverage companies to invest in refilling systems.²³⁰ These new refilling systems certainly created some jobs. Refilling has indeed boosted employment in Germany's beverage and packaging industries, according to a 1993 study. Of the 161,000 jobs that are directly connected to the manufacture and filling of beverage containers and to the distribution and selling of packaged beverages in Germany, 73 percent involve refillable containers. In that case, if one-way containers completely overtook refillables, then 53,000 jobs would be lost. If a transition occurred in the opposite direction, then 27,000 new jobs would be created by moving completely to refilling.²³¹

Outlook. If current trends continue, the packaging of both carbonated and non-carbonated soft drinks may not meet their respective quotas in the near future, and then all beverages except milk will have their one-way containers subject to a mandatory deposit. Other than the threat of a mandatory deposit, the Packaging Ordinance has no fines or other penalties for failing to meet the quota.²³² The lack of such penalties leaves the government with no way to enforce the quota and with only a deposit law to stop the decline of refilling.

Many experts have doubts about the effectiveness of the deposit law. First, the deposits would not give beverages in one-way containers a price disadvantage. In addition, neither retailers nor producers will have an economic incentive to favor refillable containers,²³³ and deposits do not address the factors that have been contributing to a decline in refilling.²³⁴ Nevertheless, Environment Minister Tritten believes that deposits will promote the use of refillable containers and considers the deposit law a market-based alternative to a ban.²³⁵ Tritten and other refilling advocates in Germany might be encouraged by a 2000 poll which found that 69 percent of Germans prefer to buy beverages in refillable containers.²³⁶ If current trends continue, however, these consumers may find it increasingly difficult to exercise their preference.

The Netherlands

While other European nations have taken an economic or a regulatory approach to preserving refilling, the Dutch have taken a contractual approach. The Packaging Covenant II is a contract between government and industry that governs the management of packaging and packaging waste in the Netherlands. Apparently, the beer, packaged water, and soft-drink industries have fulfilled their covenantal obligations to preserve the refilling systems that they have had in place.

Policy development. In 1979, the Dutch parliament passed a motion which made prevention and reuse the two top priorities in the hierarchy of waste management strategies. In 1990, the environment minister introduced the strategy of producer responsibility, which was given a legal foundation in 1994 by the Environmental Management Act. The act holds every generator of solid waste responsible for managing it and authorizes the government to require industries to take back and recycle their end-of-life products. Rather than impose regulations, the Dutch government has implemented producer responsibility by negotiating voluntary agreements with industries. These agreements, called covenants, are intended mainly for industry sectors in which laws, licensing, or other government controls already exist. If an industry does not enter into a covenant or does not fulfill the terms of a covenant that it has signed, then the government might impose regulations on that industry. Covenants have been established also for industry sectors in which the government does not impose regulations but could impose them. In anticipation of the EU Directive on Packaging and Packaging Waste, the government and the Dutch packaging industry signed the Packaging Covenant I in 1991. After the European Parliament approved the Directive in 1994, government and industry established Packaging Covenant II in 1997.²³⁷

Covenant II includes a reuse protocol which is intended to preserve refilling. Under this protocol, beverage producers and importers cannot substitute refillable with one-way beverage containers unless they can demonstrate that the environmental impact of their one-way containers is less than or equal to the impact of their refillable containers.²³⁸ The Dutch soft-drink industry recently tried to justify a transition to one-way containers. A recent life-cycle analysis study conducted by the Dutch research institute TNO concluded that replacing 1.5-liter refillable PET bottles with similar one-way bottles in the Dutch soft-drink market presented no environmental advantages. Under the covenant, therefore, the results of the TNO study imply that soft-drink bottlers cannot replace their current float of 1.5-liter refillable PET bottles with similar one-way bottles.²³⁹ Arjan Hess, an environment and packaging manager at the Dutch soft-drink association NFI, believes that the TNO study favored refilling because of the short transportation distances in the Netherlands.²⁴⁰ Another factor besides geography favors refilling. The Dutch government subsidizes the water that the beverage industry uses to wash refillable bottles.²⁴¹

Results. The covenant has apparently preserved most of the refilling that was occurring when it was signed. In the Netherlands, about 75-80 percent of soda pop and mineral water comes in 1.5-liter refillable PET bottles.²⁴² In addition, the Dutch consume all of their packaged beer in refillable bottles.²⁴³

Outlook. Because Covenant II expired on December 31, 2001,²⁴⁴ the government and industry met in 2001 to negotiate a third packaging covenant which was supposed to become effective in 2002.²⁴⁵ Because the Dutch soft-drink industry apparently likes the marketing and logistical advantages of one-way containers,²⁴⁶ it may want to weaken the reuse provisions of the packaging covenant. In 2001, the government was also considering a Danish-style, LCA-based packaging tax.²⁴⁷

Other Nations

Portugal. The decline of refilling in Portugal's soft-drink market happened over a few years rather than a few decades. For both carbonated and non-carbonated soft drinks, the market share in refillable containers plummeted from 88 percent in 1987 to 20 percent in 1997.²⁴⁸ In 2000, the market share was about 13 percent, and one-way PET bottles dominated soft-drink packaging with 80 percent of the market share.²⁴⁹ The decline of refilling in the beer industry has been much slower. For packaged beer, the market share in refillable containers was about 100 percent in the early 1980s and has remained about 80 percent throughout the 1990s.²⁵⁰ Although refilling had begun to decline sharply in the early 1990s, Portugal did

not establish its current beverage container laws until 1997. Like the Packaging Covenant II of The Netherlands, Portugal's beverage container laws are part of its efforts to comply with the EC Directive on Packaging and Packaging Waste.

Retail sector. Until 1990, refillable bottles dominated the market in Portugal because they made packaged beverages affordable to more Portuguese and because most retailers were small stores. The arrival of supermarket chains and discounters during the 1990s accelerated a takeover by one-way containers, especially in the soft-drink market. These retailers have strongly resisted selling beverages in refillable containers and have been able to undermine refilling by selling cheap, canned soft drinks from other countries.²⁵¹ On the other hand, most of Portugal's beer comes from two domestic brewers who successfully overcame retailers' opposition to selling beer in refillable bottles.²⁵²

During the mid-1990s, the rapid decline of refilling and the concurrent increase of urban solid waste motivated the government to promote the reuse of beverage containers through its laws on packaging waste. The laws affecting the packaging of soft drinks, water, beer, and table wine include the following.²⁵³

- No one may put reusable packaging into a bin designated for municipal trash collection.
- Producers or distributors who sell beverages in refillable containers must establish a deposit-return system for the containers.
- The beverage industry must meet product-specific quotas for the packaging of beverages in refillable containers. The quotas gradually increase from 1997 to 1999.
- Any retailer or distributor who sells a beverage product in a one-way container must also offer that same product in a refillable container.²⁵⁴ For this report, this type of law is called a "mandatory stocking" law.
- Any retailer who sells beverages in refillable containers must provide a facility for taking returns.²⁵⁵

Although these laws together regulate the three parts of the packaging chain--consumers, producers, and retailers--their inherent weaknesses have made them ineffective. Because none of the laws requires producers to package beverages in refillable containers, only those who do so have their data counted in calculating the percentages that are used to measure compliance with the quotas.²⁵⁶ Moreover, retailers have cleverly flouted the mandatory stocking law by finding many unattractive ways to display beverages in refillable bottles. For those retailers who absolutely refuse to comply with the mandatory stocking law, the fines do not exceed the cost savings that they get from their non-compliance. Non-compliance has been allowed by the government because of the unexpectedly high costs of enforcing the law.²⁵⁷

HoReCa sector. Portugal has enacted separate laws for beverages sold in hotels, restaurants, pubs, and other locations where they are directly served to customers for on-premise consumption. These establishments must either sell all packaged beverages in refillable bottles or sell them in one-way containers and send all of their empties to a recycling facility.²⁵⁸ The recycling option resulted from the EU's pressure on Portugal to rescind its ban on one-way containers for on-premise consumption.²⁵⁹ Hotels and restaurants have consigned the recovery of their one-way beverage containers to Ponto Verde, the primary industry organization for the recovery of packaging waste in Portugal.²⁶⁰ This deal with Ponto Verde was likely necessitated by the rise of one-way containers for on-premise consumption, which has traditionally been a significant part of Portugal's beverage market and has traditionally favored refilling. However, the dominance of one-way soft-drink containers in the retail sector,²⁶¹ and the absence of refilling in the Spanish and French soft-drink and bottled-water industries,²⁶² may leave Portugal's hotels, restaurants, and pubs no choice but to serve these beverages in one-way containers. Because these establishments make up almost half of the beer market,²⁶³ however, and because one-way containers hold only about 16 percent of all beer consumed in Portugal,²⁶⁴ refillable bottles should still be widely available for on-premise consumption of packaged beer.

Norway. While refillable soft-drink and water containers are disappearing in Portugal, they command 98.5 percent of the market in Norway. Among refillables, Norwegians consume almost 97 percent of the volume of their soda pop and packaged water from 0.5- and 1.5-liter PET bottles. On the other hand, cans have been conquering the beer market. The market share of canned beer jumped from 0.9 percent in 1998,

to 16.6 percent in 1999, and then to 30.5 percent in 2000. Meanwhile, the market share of beer in refillable bottles dropped from 57 percent in 1999 to 44 percent in 2000.²⁶⁵ Two factors may explain the rising percentage of canned beer. First, almost 70 percent of beer is sold in stores,²⁶⁶ which generally favor cans and other one-way containers. Second, from 1998 to 1999, the volume of imported beer doubled.²⁶⁷

Refilling has apparently thrived under Norway's beverage container tax system, which consists of two components. The first component is a fixed rate of 0.10 Euro per unit for only one-way containers. The second is a variable component that applies to both one-way and refillable containers and specifies a maximum rate per unit for metal, plastic, and glass. For each type of material, the maximum rate applies when the return rate for beverage containers is less than 25 percent. When the return rate is at least 25 percent but less than 95 percent, the tax is set according to an inverse relation with the return rate: increasing the return rate decreases the tax rate per unit. When the return rate is at least 95 percent for beverage containers of a specific type of material, then the tax rate-per-unit of the variable component is zero. For 2001, the maximum tax rates are 0.52 Euro for metal and for glass and 0.31 Euro for PET, and the actual tax rates are 0.08 Euro for metal and for glass and 0.03 Euro for PET. Therefore, the total per-container tax rates for 2001 are 0 for refillables, 0.18 Euro for cans and for one-way glass bottles, and 0.86 Euro for one-way PET bottles. Containers for milk, juice, and still water are exempt,²⁶⁸ but cartons have a maximum rate of 0.13 Euro.²⁶⁹ To promote the return of beverage containers, Norway has established a deposit law.²⁷⁰ Both the tax and the deposit law are authorized by the Product Control Act.²⁷¹

The tax system effectively increases the cost of beer in one-way containers. With a 0.18 Euro-per-unit packaging tax but without the alcohol tax or the value-added tax, the cost-per-liter of lager in a 330-ml refillable bottle is 0.87 Euro less than the cost-per-liter in a 500-ml can, and the cost of a single bottle of lager is 0.76 Euro less than the cost of a can of lager.²⁷² These cost differences affect most of the beer market in Norway. About 91 percent of beer sold there is lager, about 30 percent of beer is sold in 330-ml refillable bottles, and about 31 percent of beer is sold in 500-ml cans.²⁷³

Belgium. Belgian beer drinkers consumed almost 49 percent of their beer in refillable bottles, a little over 11 percent from one-way containers, and about 40 percent from draught in 1999.²⁷⁴ To address the environmental impacts of packaging waste, in 1993 the Green Party successfully persuaded the government to establish eco-taxes on beverage packaging.²⁷⁵ The 0.37-Euro tax applies to beer and to some types of soft drinks and to all containers of these beverages except those that qualify as reusable.²⁷⁶ To qualify as reusable, a beverage container must meet the following standards.

- Withstand at least seven refillings.
- Be sold and recovered through a deposit-return system with minimum deposits required by law.
- Be effectively reused.
- Wear a label that states the container is reusable and is subject to a deposit.

One-way beverage containers are exempt from the tax when specific recycling rates are met. The bottler or distributor pays the tax and must register with the Administration of Customs and Excise, and every beverage container that is subject to the tax must have the registration number and a distinctive mark on it.²⁷⁷ The symbol that marks refillable beverage containers is intended to clearly distinguish them from one-way containers. However, because the law does not specify a minimum size for the symbol in relation to other labelling on the container, a magnifying glass is sometimes required to see them. The lack of publicity or promotion of the symbol has also diminished its visibility.²⁷⁸

In 2000, the Belgian Green Party again actively participated in the formulation of eco-taxes by working with the coalition government to propose changes in beverage packaging taxes. The changes involve increasing the per-liter eco-tax rates on one-way containers of beer, wine, liquor, juices, carbonated soft drinks, non-carbonated soft drinks, and packaged water. Under the proposal, furthermore, increases in the eco-taxes would be offset by decreases in other beverage taxes. The eco-tax will increase by 0.18 Euro for beer, by 0.10 Euro for packaged water, and by 0.13 Euro for both carbonated and non-carbonated soft drinks. Under the new tax scheme, 330 ml of beer would cost 0.66 Euro in a one-way container but only 0.59 Euro in a refillable container. A 1.5-liter soft drink would cost 1.30 Euro in a one-way bottle but only 1.10 Euro in a refillable bottle. In March 2001, the government was still preparing the tax proposal for

approval by the executive and the parliament. If it is approved, the eco-tax scheme for beverages will replace the old one on January 1, 2002.²⁷⁹

Sweden. Although Sweden abolished its beverage container taxes in 1993,²⁸⁰ most of the effects of that policy instrument are still visible in that country's beverage market. About 82 percent of packaged water, 54 percent of soda pop, and 24 percent of beer is sold in refillable bottles.²⁸¹ The Swedish Brewers Association has reported that it is unaware of any significant impacts that the abolition of the tax has had on refilling.²⁸² However, promoting refilling was originally not the main purpose of the tax. In 1973, Sweden implemented the tax on beverage containers in order to replace the loss of revenue that resulted from a price freeze on food. Bottlers, brewers, and importers paid the tax for almost all soft-drink and alcoholic-beverage containers that they used. The amount of the tax was less for containers that were subject to a deposit. The country abolished this tax in 1984 and soon replaced it with a tax scheme that affected only containers that were subject to a deposit. This tax was effective until 1993, when Sweden abolished it and implemented producer responsibility regulations for a wide variety of packaging. This approach to waste prevention made the tax seem obsolete, and European Union laws made the tax seem illegal.²⁸³ In fact, Sweden's laws on packaging and packaging waste now do not include any provisions specifically for refillable beverage containers.²⁸⁴

Latin America's Experience with Refillable Beverage Containers

Refilling takes place just across the border from El Paso, Texas. In Ciudad Juárez, Mexico, a plant owned by Embotelladora Argos, S.A., packages Coca-Cola products in refillable bottles. In Mexico and in other Latin-American countries, refilling has made packaged beverages affordable to more people.²⁸⁵ Until the 1990s, refillable glass bottles dominated the packaging mix in Latin America.²⁸⁶ Refillable PET bottles entered the soft-drink market in the early 1990s, but one-way PET bottles are now conquering the markets of some countries. Among packaged beer, meanwhile, the market share in cans is surpassing 20 percent in some countries. Indeed, these packaging trends indicate a decline of refilling in Latin America. The concurrence of this decline with changes in the retail grocery market suggests that these changes are one of the forces that is causing the decline in refilling, especially for soft drinks. In many Latin American countries, foreign-owned supermarkets and hypermarkets are slowly conquering a market that small, family-owned grocery stores have traditionally dominated.²⁸⁷ Refillable bottles have enabled these grocery stores to compete with the supermarkets,²⁸⁸ who generally prefer to sell large quantities of beverages in one-way containers at the lowest possible prices. In its supercenters in Mexico, in fact, America's largest retailer sells no soft drinks in refillable bottles and sells only a limited amount of beer in refillables.

Mexico

Among the countries considered here--Mexico, Brazil, and Argentina--Mexico apparently has the strongest market for beverages in refillable containers but has experienced a decline in refilling. The percent of soda pop in refillable bottles from Embotelladora Argos has declined from 77 percent in 1998 to 62 percent in 2000, and most of its new presentations have been in one-way containers.²⁸⁹ Argos and its subsidiaries package Coca-Cola products for markets in Northwestern Mexico, which includes states that border the United States. In Southern Mexico, Coca-Cola FEMSA sold 45 percent of its soda pop in refillable bottles in 2000 but sold 88 percent in refillables in 1994.²⁹⁰ However, refillable multiple-serving bottles are still outselling their one-way counterparts: the 2-liter refillable PET bottle accounted for 33 percent of FEMSA's total sales volume in 2000, but the 2-liter one-way PET bottle accounted for only 15 percent.²⁹¹ The company plans to use refillable bottles to thwart the entry of "non-branded" products into its market and to maintain its strong sales in the small grocery stores. These small, mainly family-owned stores make up about 67 percent of the market in FEMSA's Mexico City territory.²⁹²

Throughout most of the 1990s, refillable glass bottles have held between 79 and 84 percent of the total sales volume in the Mexican beer market.²⁹³ Literature from Mexico's major brewers, FEMSA and Grupo Modelo, suggests that refillables held between 75 and 80 percent of the market share in 2000.²⁹⁴ The most popular refillable beer bottle is the 1-liter size, which accounted for 41 percent of the total sales volume in 2000.²⁹⁵

Brazil

Over the 1990s, Brazil's beverage markets saw a deluge of one-way containers: one-way PET for soft drinks and cans for beer. In the soft-drink market, meanwhile, the volume percentage in refillables plummeted from 96 percent in 1990 to 13 percent in 1998. Refillable PET bottles began to appear in 1990, held 6 percent of the market in 1995, but held only 3 percent in 1998. In the beer market, the volume percentage in refillable glass bottles dropped from 95 percent in 1990 to 67 percent in 1998, and canned beer rose from 2 percent to 25 percent during the same period.²⁹⁶ While supermarket chains have been slowly capturing the retail grocery markets from the traditional stores in Brazil, beverages in one-way containers have been capturing more shelf space.²⁹⁷ In Brazil, the top five supermarket chains controlled about 38 percent of the retail market in 1999.²⁹⁸

Argentina

Coca-Cola FEMSA also operates a bottling plant near Buenos Aires, Argentina. An examination of the company's 2000 report²⁹⁹ suggests that one-way containers are taking over Argentina's soft-drink market. In its Buenos Aires market, Coca-Cola FEMSA sold 10 percent of its soda pop in refillable bottles in 2000 but sold 70 percent in refillables in 1994. In low-income parts of the Buenos Aires metropolitan region, FEMSA offers its products in 1.5-liter refillable PET bottles and had planned to offer some new presentations in refillables in 2001.³⁰⁰ On the other hand, more affluent Coke drinkers are probably buying their beverages in one-way containers at supermarkets and hypermarkets, which provided about 31 percent of the market for FEMSA's products in Argentina in 2000.³⁰¹ The control of almost half of the retail grocery market by the top five supermarket chains in Argentina³⁰² may be limiting the market for beverages in refillable containers. This discussion focuses only on one bottler's experience in the Buenos Aires market, and therefore may not fully represent the packaging trends for the entire Argentine soft-drink market.

America's Experience with Refillable Beverage Containers

History

Carbonated soft drinks. The market share for soft drinks in refillable glass bottles declined from 100 percent in 1947³⁰³ to less than 1 percent in 2000.³⁰⁴ The figure (page 44) shows how this decline concurred with the rise of metal cans and plastic (PET) bottles. During the 1960s, the concurrence of two important trends in the U.S. soft-drink industry accelerated the decline of refillable bottles. One trend was the consolidation of the bottling industry, and the other was the rise of one-way containers.

In 1960, 4,519 bottling plants were operating in the U.S.,³⁰⁵ and most of them were local operations like the one shown in the photograph on the right. The independent bottler delivered its soft drinks directly to stores within its exclusive market territory. Until the 1960s, local bottling and delivery was necessary because of the value of soft drinks "relative to shipping costs" and because of the refillable glass bottle.³⁰⁶ Better highways, trucks, and technology induced bottlers in contiguous territories to merge in order to improve efficiency and reduce costs.³⁰⁷ The increasing importance of advertising and promotion through media whose coverage extended beyond the bottler's territory also created an impetus for consolidation. During the 1960s and 1970s, bottling operations consolidated also to adapt to the growing sophistication in the marketing of soft drinks and to the growing sophistication of their customer base. During the 1970s and 1980s, furthermore, Coke and Pepsi acquired many bottling companies in order to facilitate the introduction of new products and packages.³⁰⁸ By 1997, consolidation had reduced the U.S. bottling industry to 342 plants.³⁰⁹ Consolidation gave bottling and canning plants larger market territories with longer delivery distances, which diminished the economic advantages of refilling.³¹⁰



Coca-Cola bottling plant in Monahans, Texas. *Courtesy of Billy Wells, Vernon and Mary Ann Rowe.*

While the bottling industry was undergoing consolidation, one-way containers rose to prominence. One-way glass bottles made their debut in the 1940s. Although canned beer had already been popular for several years,³¹¹ canned soft drinks were not on store shelves until the 1950s. However, cans became popular before one-way bottles did. The large supermarket chains saw a small but stable market for soft drinks in one-way containers and quickly packaged their private-label soft drinks in cans. Soon afterward, these supermarket brands conquered one-fifth of the market, partly because their plants' productivity overcame the inherent cost of canning soda pop. Coke, Pepsi, and other major producers followed but could not immediately match the productivity of the supermarket brands. The steel and can industries contributed to the growth of canned soda pop with a nine-million-dollar campaign to promote the steel beverage can. Soon after canned soda pop had held about 13 percent of the market in 1965, the glass container industry responded to the soda can with a campaign to promote one-way glass bottles. Coke and Pepsi followed by packaging their products in one-way bottles and aggressively promoting them. The one-way glass bottle--convenience packaging without the steel can's bad aftertaste--gave Coke and Pepsi a way to reverse the gains that the supermarket brands had made.³¹²

One observer blamed the aggressive marketing and promotion of one-way containers for instilling in consumers a habit of discarding beverage containers and, in turn, for declining return rates for refillable

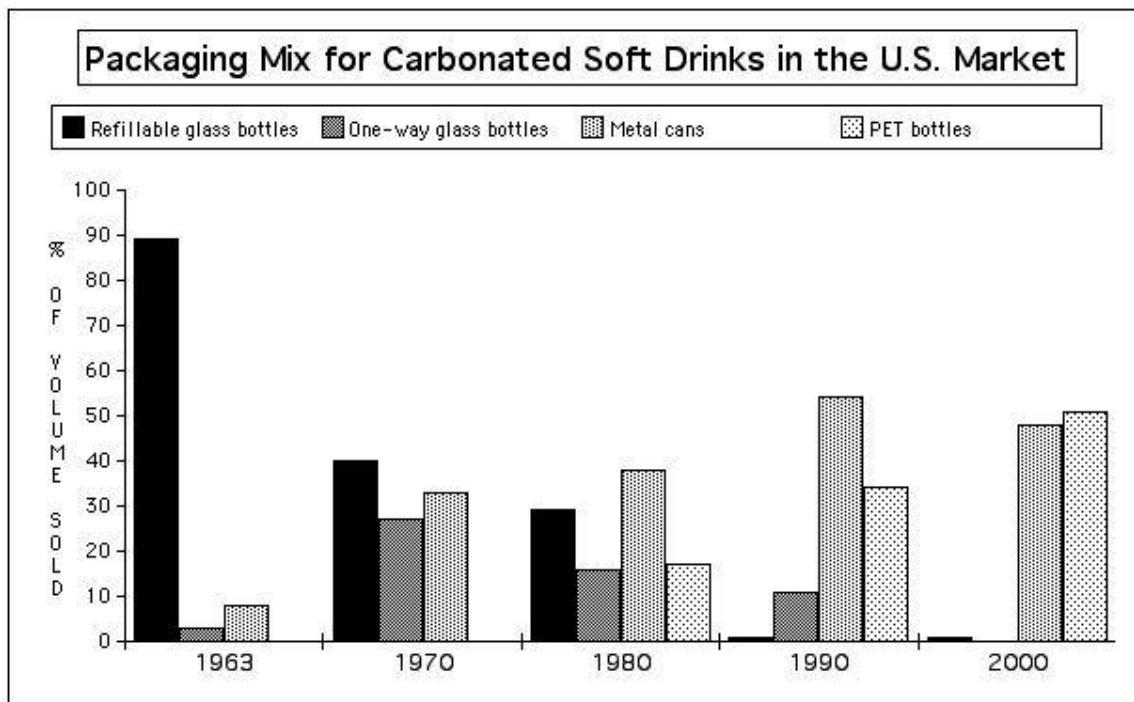
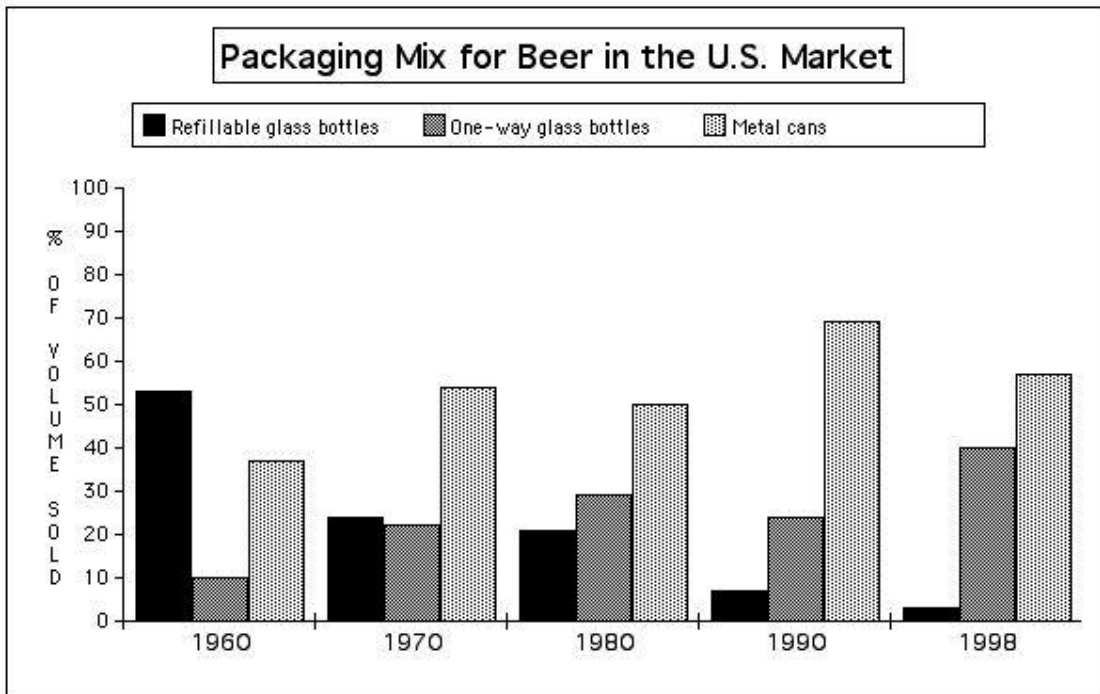
bottles.³¹³ Declining return rates result in fewer trips per bottle and thus diminish the cost-effectiveness of the refillable bottle. During the period in which the consolidation of the soft-drink industry and the rise of the one-way container occurred, from 1959 to 1969, the average number of trips per refillable bottle dropped from 21 to 14.³¹⁴ The one-way container not only liberated consumers from returning bottles, but also liberated retailers from the burden of managing deposit-return systems and bottlers from having to wash and inspect returned bottles.

Expanding market territories, the growing viability of one-way containers in the U.S. soft-drink market, and the declining trippage for refillable bottles concurred to give the one-way container a larger marketshare over the refillable bottle. Large multi-plant operations developed the ability to ship their canned soft drinks over distances of nearly 1,000 miles and then sell them at prices lower than those of a local bottler.³¹⁵ Furthermore, the can transformed many local bottlers into distributors of prepackaged products that came from faraway plants.³¹⁶ The replacement of steel cans with aluminum cans and the introduction of PET plastic bottles in the 1970s further diminished the popularity of the refillable glass bottle.

Beer. As soon as packaged beer became popular in the mid-1930s, cans competed with refillable glass bottles for the market. The figure (page 44) shows how the rise of metal cans and a fluctuating but significant demand for one-way bottles concurred with the decline of refillable bottles. One-way containers helped national beer companies conquer the U.S. market, and their conquest further diminished the use of refillable glass bottles.

Before Prohibition, most beer was served from draught in restaurants and bars. When the popularity of packaged beer rose shortly after Prohibition, canned beer appeared just shortly after refillable bottles had held 25 percent of the market. During the years between the end of Prohibition and the beginning of World War II, nevertheless, the U.S. beer market was still dominated by local and regional breweries, which shipped all of their beer in kegs and refillable bottles and sold almost all of it to restaurants and bars. The costs of returning empty bottles to the brewery maintained this dominance. A viable market for canned beer did not appear until World War II, when U.S. brewers shipped millions of cans of beer to military personnel overseas. Toward the end of the war, the Armed Forces received beer also in one-way bottles. After the war, veterans influenced the increasing popularity of one-way containers, but other post-war trends accelerated this trend in beer packaging. The veterans and many others could afford beer in one-way containers, which were more expensive. Furthermore, frequent cross-country migration and television advertising of the national brands made local breweries seem irrelevant. Indeed, these post-war influences and the inherent advantages of one-way containers put the national brewers in a position to conquer the American beer market. During the 1950s, the increasing efficiency of packaging and distributing beer in one-way containers accelerated the growth of national brewers such as Anheuser-Busch and Miller. Meanwhile, the difficulty of competing with the national brewers' mass production and mass marketing, and the inherent difficulties of managing a small business, forced many of the once-dominant local and regional breweries to close. During the 1960s, the national brewers expanded while both the trippage and the market share of refillable bottles declined. The 1970s brought the increased use of aluminum cans and the introduction of products such as light beer, which the locals could not readily offer.³¹⁷

Milk. The shift from home delivery of milk to retail sales, and the development of cartons and one-way plastic jugs, contributed to the decline of refilling in the milk industry. The development of one-way milk containers began with the paper carton in 1906 and progressed to the plastic-coated paper carton in 1932. In 1964, the milk industry welcomed one-way plastic jugs made of high-density polyethylene (HDPE). Refillable bottles made of another type of plastic, polycarbonate, entered some dairy markets in the late 1970s. During the 1980s and 1990s, many U.S. dairies supplied milk in refillable polycarbonate bottles to schools and to other institutions. Milk delivered to homes historically came in refillable glass bottles but came in cartons in some parts of the U.S. during the 1960s and 1970s. When supermarkets took the distribution of milk away from home delivery, they forced the use of one-way containers by packaging their private-label milk in cartons and by refusing to accept milk from other companies in refillable bottles.³¹⁸



U.S. Policies

You may be familiar with the deposit laws of Michigan, Maine, Oregon, and other states, but did you know that the first deposit law was imposed long before these states imposed theirs? In 1934, the National Recovery Administration required deposits of two cents for small bottles and five cents for large ones after bottlers had been using the non-collection of deposits as a competitive weapon.³¹⁹ Since 1934, concern about litter rather than about competition motivated the enactment of laws regarding beverage containers.

In 1953, Vermont enacted a ban on non-refillable beer bottles, the first law that restricted beverage containers. The state did not renew the law in 1957 because it apparently did not reduce litter.³²⁰ Concern about litter arose again during the late 1960s and early 1970s, when one-way containers packaged about 60 percent of the volume of soda pop in the U.S. and about 75 percent of beer. During that time, over 350 proposals were introduced in Congress, in state legislatures, and in local legislative bodies.³²¹ Many of these proposals included bans or taxes on non-refillable containers--policy instruments that have proven themselves effective in other countries. Nevertheless, from this flurry of legislation came some of the first deposit laws, which apparently intended to reduce litter and promote recycling rather than to preserve refilling. Oregon's deposit law was the first in the U.S. in 1972. During the 1970s, four other states enacted their deposit laws, and some of these states reported temporary surges in the sales of beverages in refillable bottles.³²² Four more states enacted deposit laws during the early 1980s. One of these four states, Iowa, saw an increase of two percent in the market share of beer in refillable bottles after it enacted its deposit law.³²³ Besides the 1953 Vermont law, only one other law in the U.S. took direct aim at one-way beverage containers. Under a law that was repealed on October 1, 1998, New York imposed a one-cent tax on non-refillable containers of carbonated soft drinks, mineral water, and soda water.³²⁴

Refilling in the U.S. Today

Soft Drinks. Ale-8-One Bottling Company of Winchester, Kentucky, is one of the few soft-drink companies in the U.S. that packages soda pop in refillable bottles. Excel Bottling Company in Breese, Illinois, is another. Excel is a family-run bottles company that produces frostie roots beer and other flavors in returnable bottles.³²⁵ Up until the early 1990s, Stewart's, a chain of convenience stores in New York and Vermont, bottled and sold soft drinks and milk in refillable bottles,³²⁶ but it no longer does so.

Beer. Massachusetts leads all 50 states in the use of refillable beer bottles: 16 percent of the volume of beer sold there comes in refillables. In 1998, three other states--Iowa, Connecticut, and Pennsylvania--reported that over 10 percent of their beer sales came in refillable glass bottles.³²⁷ Massachusetts, Iowa, and Connecticut have deposit laws, but sales in bars and restaurants or other market conditions may be what is boosting refilling. Pennsylvania's small but viable market for beer in refillable bottles has been attributed to that state's restriction of beer sales to special outlets.³²⁸

Milk. Home delivery of milk in refillable glass bottles is still available in many places. Marcus Dairy of Danbury, Connecticut,³²⁹ and Rosenberger's Dairies of Hatfield, Pennsylvania, deliver milk to homes in half-gallon refillable glass bottles. The half-gallon glass bottle is the only refillable container now used by Rosenberger's,³³⁰ who used to provide milk to schools in polycarbonate plastic bottles.³³¹ Oberweis Dairy of North Aurora, Illinois, delivers milk to both homes and stores in half-gallon refillable glass bottles. Oberweis' retail market includes its own stores, two supermarket chains in the Chicago metropolitan region, and some other stores in Illinois and in St. Louis.³³² Many natural food stores also offer milk in refillable glass bottles. Another dairy, Lowell Paul Dairy of Greeley, Colorado, also sells milk in refillable bottles.³³³

Reviving Beverage Container Refilling in the U.S.

Refilling puts people to work and saves money for taxpayers. By taking beverage containers out of the municipal waste stream, refilling greatly reduces the public costs of waste management. The capacity vacated by beverage containers allows collection of other materials for recycling, which in turn reduces landfill tipping fees. Refilling also can reduce the prices of beverages. The environmental benefits of refilling are compelling too. As David Saphire concluded in his 1994 book, *Case Reopened: Reassessing Refillable Bottles*, "With sufficient trippage, refillable glass or PET bottles use less material than one-way bottles made of the same material, use less energy in extracting raw materials and manufacturing bottles, use less total energy (including extraction, manufacturing, washing and distribution), and generate smaller quantities of pollutants during the manufacturing process."³³⁴

Despite these myriad benefits, America's leading soft-drink and beer companies have no plans to increase their use of refillable containers.³³⁵ The increased use of refillable milk bottles is also unlikely. Most milk is sold through retailers,³³⁶ who adamantly refuse to stock anything in reusable packaging. Indeed, if we want refillable beverage containers in America, we need to spark public demand for refillables and advocate for appropriate government policies to promote or require refilling. Unlike Europe, where policies focus on maintaining the existing refillable infrastructure, the United States is in need of policies to revive refilling and rebuild its dismantled refillable infrastructure.

Taxes on one-way containers, for instance, are a good policy instrument to preserve existing refilling systems, but may not work as well to jump-start new refilling systems. Such taxes, in effect, give refillables a price discount, which can act as an economic incentive to buyers to choose refillables over one-way containers. (They are also good in generating revenue, which could be used to support refilling or other environmental objectives.) But if beverage companies do not offer refillables in the first place, the incentive is non-existent. Furthermore, once refillables are available and the public has a packaging choice, the tax would have to be high enough to actually influence buying behaviour. More research might be worthwhile to explore how high the tax would need to be in order to impact sales of one-way beverages and encourage the beverage industry to offer more refillable containers. Saphire further points out that the U.S. public may view such taxes as an across-the-board price increase on beverages,³³⁷ thus, taxes may not be politically as viable as other policy approaches.

We know that some form of deposit system is vital to achieve high return rates for refillable containers. But we also know deposits alone are not enough. Saphire presents the following policy options to promote use of refillables in the United States:³³⁸

- Couple deposit legislation with refillable quotas or with mandatory refilling.
- Set deposit levels higher than are presently required in states with deposit laws to give the public a strong economic incentive to return bottles for refilling.
- Establish multi-tier deposits under which people receive a full deposit refund with refillable bottles and a "half-back" refund with recyclable containers. Set the maximum deposit level high enough to ensure high returns and to encourage the public to buy refillables. (To avoid building in an incentive that discourages the beverage industry from offering refillables, ILSR recommends that the beverage industry not automatically retain unredeemed deposits. Rather, government agencies can make funds available to industry for specific projects that invest in refilling.)
- Provide payments (and make the payments mandatory) to retailers and wholesalers who handle empty refillable bottles to cover their handling costs and to give them an incentive to accept refillables. (A sliding scale could compensate smaller stores that might be less efficient than larger supermarket chains.)
- Structure quota system to set a minimum reuse/recycling level for beverage containers, which could be met either through refilling, recycling, or some combination of the two.
- Make refilling part of a more comprehensive waste reduction strategy.

- Require or encourage industry to use generic bottles to simplify the return of refillables and the sorting and storage for retailers, and to reduce the number of bottles any one beverage company needs to purchase, thereby lowering beverage companies' costs.

Prince Edward Island (Canada) and Denmark, which have the highest refilling rates in the world, have combined deposits with outright bans on one-way containers. In the United States, a delayed ban on non-refillable beverage containers would ensure that all beverage containers are refillable or recyclable and give industry time to convert. A policy approach focusing on a ban of one-way containers could include the following provisions.

- All glass and plastic beverage containers must be refillable and must meet specific criteria in order to qualify as refillable. Government has the authority to establish these criteria, to establish a container registration system, and to require the labelling of containers to indicate that they are refillable.
- All secondary packaging must be reusable or recyclable.
- Cartons are banned.
- Government has the authority to set minimum deposits and minimum refunds for all beverage containers covered under this law.
- A deposit must be charged for all beverages packaged in cans. (Allowing aluminum cans would give consumers a choice of beverage packaging, ensure a supply of aluminum in American industry, and preclude opposition from the aluminum industry, can makers, and their unions. Charging a deposit on aluminum cans would help ensure that this supply of aluminum does not go to landfills.)
- The retailer or other seller must take back refillable containers or aluminum cans of any beverages that were purchased from them.
- All beverage companies, distributors, retailers, and other affected parties have six years after the effective date of this law to achieve full compliance.

While an outright ban on one-way beverage containers would certainly revive refilling in the United States and complement zero-waste planning, achieving such a ban would be a monumental political challenge. In order to ultimately reach high refilling levels in the United States, refillable container advocates might first pursue the following intermediate and complementary steps, many of which are discussed in Saphire's book, *Case Reopened*.³³⁹

- Educate the public, especially about the differences between refilling and recycling, the greater environmental benefits refilling may offer, and the benefits and purpose of deposit systems.
- Broaden deposit laws to cover all beverages, not just beer and soft drinks.
- Establish government procurement policies that favor refillables. Ideal candidates for such policies include military installations, schools, hospitals, and correctional facilities.
- Provide financial incentives for companies to use refillable bottles.
- Provide financial incentives for companies that switch from one-way containers to refillable bottles (these could include tax credits and low-interest loans to any player in the beverage chain that converts). Incentives, which could be funded from unredeemed deposits or even the half-back deposit, could encourage companies to invest in equipment and bottles.
- Focus on niche markets that offer the most immediate opportunities for expanding refilling. Niche markets include states with deposit laws; restaurants, bars, and cafeterias, which offer on-premise settings; and small-scale beverage companies operating within certain geographical regions such as micro brews.
- Encourage the public and community groups to ask beverage companies to offer their products for sale in refillable bottles.
- Challenge the beverage industry to reintroduce refillable containers and at minimum to support extended producer responsibility and a national deposit law.

- Implement policies that help establish a new infrastructure of outside contractors to collect, inspect, and wash refillable bottles. Such policies could be integrated into local economic development efforts.
- Establish policies that internalize the environmental costs of an economic activity so that industry absorbs these costs and accounts for them in pricing its goods and services. For example, taxes on virgin materials or energy consumption, would give industry an incentive to reduce material consumption.
- Establish two-tiered "pay-as-you-throw" fee systems that charge a higher fee for trash collection and a lower fee for recycling collection. Thus, residents would have an incentive to choose reusable products over recyclable ones. Most pay-as-you-throw programs only charge residents fees for setting out trash, recycling set-out is free.
- Further identify the opportunities, strategies, barriers, and environmental benefits of refillable beverage containers.

For more information about policy instruments for mandating or promoting refilling, see the policies section of this report.

Half-truths vs. Facts

Half-truth. Refilling will raise the prices of packaged beverages. **Fact.** If this statement were true, then Coca-Cola would not use refillable bottles in Latin America in order to make its products affordable to more consumers.³⁴⁰ After refilling becomes prevalent in the US again, in addition, competition could drive prices lower.³⁴¹ The economics section of this report gives examples and cites studies that show beverages in refillable containers cost less than those in one-way containers.

Half-truth. American consumers will not return containers at rates high enough to make refilling economical. **Fact.** In markets where refillable beverage containers are prevalent, the return rates exceed 90 percent and in most cases exceed 97 percent. Indeed, these markets are mostly in Canada and in Europe, but these high percentages show that people are willing and able to return containers. Americans would be willing to return containers if the deposits are high enough and would be able to do so if it is convenient. Moreover, just as Coke and Pepsi used advertising in the 1960s to instill in consumers a habit of throwing away beverage containers,³⁴² these and other companies could use their vast advertising resources to promote the habit of returning them. Brewers Retail, Inc., Ontario's leading beer retailer, successfully uses advertising to promote the return of refillable beer bottles [BRI].³⁴³

Bibliography

Unless noted otherwise, all of the documents listed here are available in English.

Refillable Beverage Containers---Background Reading

Saphire, David. *Case Reopened: Reassessing Refillable Bottles*. New York: INFORM, Inc., 1994. 348 pages.

This book compares the effects of refillable and non-refillable containers on solid waste, energy consumption, air pollution, and water pollution. It also discusses the history and economics of beverage containers, describes the conditions in which refilling thrives, and suggests ways to revive refilling in the U.S. Saphire's book provides a useful background for anyone who is interested in refillable beverage containers and how refilling can help reduce the environmental impacts of packaging. To read the executive summary on the Internet, go to <http://www.informinc.org/sp3-exec.html#refill>.

Organisation for Economic Co-operation and Development (OECD). *Beverage Containers: Reuse or Recycling*. Paris: OECD, 1978. 159 pages.

This report examines the impacts of different types of beverage containers on waste generation, natural resource consumption, and environmental pollution. It also discusses the effectiveness of policies that specifically address these impacts, including the policies that this report covers. To see the recommendations that came from this study, download the PDF file at <http://www.oecd.org//ehs/ehsmono/C788FNL.PDF>.

Citizens' Network on Waste Management (CNWM). *A Strategy to Promote Refillables and Reuse in Ontario*. Kitchener, Ontario: CNWM, 1997. 27 pages.

This report recommends steps that the government of Ontario can take toward increasing the use of refillable beverage containers in the province. It also discusses the advantages and disadvantages of the various policy instruments that can be used to promote refilling. To obtain a free copy of this report in a PDF file, go to <http://www.web.net/~jjackson/stratcov.html>.

Golding, Andreas. *Reuse of Primary Packaging*. Brussels: European Commission, 1999. Main report, 106 pages.

This study examines the reuse of post-consumer packaging in several European Union member states, focusing especially on the refilling of beverage containers. It discusses the amounts and types of reusable packaging on the market; systems for reuse; the costs, constraints, and obstacles to further reuse; and ways to promote the reuse of packaging. The main report also provides much useful background information about refilling, especially the logistics. The preface is available on the Internet at <http://europa.eu.int/comm/environment/waste/report4.htm>. For a PDF version of the report, go to http://europa.eu.int/comm/environment/waste/report4_main.pdf.

Refillable Beverage Containers---Economics

RDC-Environment and Pira International. *Evaluation of Costs and Benefits for the Achievement of Reuse and the Recycling Targets for the Different Packaging Materials in the Frame of the Packaging and Packaging Waste Directive 94/62/EC*. (Draft) Brussels: European Commission, 2001. 341 pages.

This report presents cost-benefit analyses of systems for managing packaging waste in Europe. It analyzes recycling, reuse, landfilling, and incineration by assigning monetary values to the

environmental impacts of each of these waste management options. The analysis of packaging reuse includes a comparison of refillable to one-way PET plastic bottles and a comparison of refillable to one-way glass bottles. The results of this study will provide background information to help the European Commission revise its packaging recovery targets. Go to http://europa.eu.int/comm/environment/waste/public_discussion.htm to read the preface or to http://europa.eu.int/comm/environment/waste/public_discussion.pdf to download a draft of the report in PDF.

European Environmental Bureau (EEB). *EEB Comments on the Draft Final Report Evaluation of Costs and Benefits for the Achievement of Reuse and the Recycling Targets for the Different Packaging Materials in the Frame of the Packaging and Packaging Waste Directive 94/62/EC*. Brussels: EEB, 2001.

This document presents some comments about the RDC-Environment and Pira International cost-benefit-analysis study of systems for managing packaging waste in Europe. The EEB is a federation of 134 grassroots environmental organizations from all European Union Member States and other European countries. For a PDF version of this document on the Internet, go to <http://www.eeb.org>.

"EUROPEN Warns of Limitations of Latest Cost/Benefit Study." *EUROPEN Bulletin* September 2001: 5.

This article presents EUROPEN's criticisms of the RDC-Environment and Pira International study. EUROPEN, the European Organization for Packaging and the Environment, is an industry and trade organization which voices industry's views about packaging and the environment. To obtain this issue of their bulletin in PDF format on the Internet go to <http://www.europen.be/bulletin.html>.

Gesellschaft für Umfassende Analysen (GUA), GmbH. *Volkswirtschaftlicher Vergleich von Einweg- und Mehrwegsystemen*. Vienna: Austrian Ministry of Environment, 2000. 296 pages.

In August of 1999, the Austrian government and the beverage industry commissioned this study in order to obtain information that could contribute to the discussion about quotas for beverage containers in Austria. By examining the economic and the environmental costs and benefits, this study compares one-way containers to refillable containers. Like the RDC-Environment and Pira International study, the GUA study is a cost-benefit analysis. On the Internet, go to http://gpool.lfrz.at/gpoolexport/media/file/getraenkestudie_gua_ifip.pdf for a PDF version of the study, and http://gpool.lfrz.at/gpoolexport/media/file/getraenkestudie_gua_ifip_zsf.pdf for a PDF version of the summary, both in German.

Valiante, Usman. "Pamper Your PET: Eco-efficiency and Refillable Plastic Bottles." *Solid Waste & Recycling* 2.6 (1997): 18.

This article (available on the Internet at <http://www.solidwastemag.com/library/articles/1297a.html>) explains the costs and benefits of using refillable PET bottles in the North-American soft-drink market.

Refillable Beverage Containers---Environmental Aspects

Chalmers Industriteknik and Institute for Product Development. *Life Cycle Assessment of Packaging Systems for Beer and Soft Drinks*. Environmental Project No. 399. Copenhagen: Danish Environmental Protection Agency, 1998. 382 pages.

This report presents life-cycle analysis (LCA) studies of the environmental impacts of glass and PET bottles and of steel and aluminum cans. This set of LCA studies is an update of a study that the DEPA completed in 1996. This 1998 report also presents an introductory explanation of LCAs. To download a PDF version of the main report (12 mb) from the Internet, go to

<http://www.mst.dk/udgiv/Publications/1998/87-7909-014-1/pdf/87-7909-014-1.PDF>. This project also produced reports by container type, which are available in PDF files, the largest of which is almost 6 mb:

refillable glass bottles: <http://www.mst.dk/udgiv/Publications/1998/87-7909-021-4/pdf/87-7909-021-4.PDF>

one-way glass bottles: <http://www.mst.dk/udgiv/Publications/1998/87-7909-022-2/pdf/87-7909-022-2.PDF>

aluminum cans: <http://www.mst.dk/udgiv/Publications/1998/87-7909-023-0/pdf/87-7909-023-0.PDF>

steel cans: <http://www.mst.dk/udgiv/Publications/1998/87-7909-024-9/pdf/87-7909-024-9.PDF>

refillable PET bottles: <http://www.mst.dk/udgiv/Publications/1998/87-7909-025-7/pdf/87-7909-025-7.PDF>

one-way PET bottles: <http://www.mst.dk/udgiv/Publications/1998/87-7909-026-5/pdf/87-7909-026-5.PDF>

Another report describes the related energy and transport scenarios (available in PDF at <http://www.mst.dk/udgiv/Publications/1998/87-7909-027-3/pdf/87-7909-027-3.PDF>)

Prognos GmbH, Institut für Energie und Umweltforschung Heidelberg, Gesellschaft für Verpackungsmarktforschung mbH, Pack Force, and the German Federal Environment Agency. *Ökobilanz für Getränkeverpackung II* Berlin: German Federal Environment Agency, 2000. 414 pages.

This life-cycle analysis study investigated packaging systems for wine and for several types of nonalcoholic beverages. It included refillable glass and refillable PET bottles, one-way glass bottles, aluminum and tinplate cans, and cartons. To download a summary and background of this study in German from the Internet, go to <http://www.umweltbundesamt.de/uba-info-daten/daten/bil.htm>. For a press release, in German, go to <http://www.bmu.de/presse/2000/pm423.htm>. For more information, or to obtain a German-language copy of the study with an English-language summary, contact Thomas Hagbeck of the German Federal Environment Agency at thomas.hagbeck@uba.de.

Lachance, Renuad, and Paul Lanoie. *Refillable and Disposable Beer Containers: An Analysis of the Environmental Impacts*. Montreal: École des Hautes Études Commerciales, 1999. 76 pages.

This paper compares eleven different life-cycle analysis studies of beverage containers and evaluates each study's relevance to Quebec's use of aluminum cans, one-way glass bottles, and refillable glass bottles for beer packaging. Tables in the appendix display detailed information about the assumptions and findings of these studies. The paper is available in PDF format on the Internet at <http://www.hec.ca/iea/docs/iea9907.pdf>.

"Are Refillable Bottles Better for the Environment?" *Hazardous Materials Management* 8.4 (1995): 92.

This commentary briefly discusses the role of life-cycle analysis studies in the debate over refillable beverage containers.

Bojkow, Egon. *Getränkeverpackung und Umwelt: Auswirkungen der Verpackung von Getränken und Flüssigen Molkereiprodukten auf die Umwelt*. Wien: Springer, 1989. 355 pages.

Professor Bojkow's book, published in German, discusses the environmental aspects of beverage containers.

Refillable Beverage Containers---Policies

Macdonald, Doug. "Beer Cans, Gas Guzzlers and Green Taxes: How Using Tax Instead of Law May Affect Environmental Policy." *Alternatives* 22.3 (1996): 12.

This paper explains the development of Ontario's 10-cent levy on non-refillable beer containers. Using this particular policy as an example, Macdonald discusses how the revenue-generating potential of environmental taxes can influence a government's selection of a policy to address a particular environmental problem. Doug Macdonald, Ph.D., author of *The Politics of Pollution*, is a lecturer in the Environmental Studies Program at the University of Toronto's Innis College. The InfoTrac database, which is available in many public libraries, has the full article.

European Organisation for Packaging and the Environment (EUROPEN). *Economic Instruments in Packaging and Packaging Waste Policy*. Brussels: EUROPEN, 2000. 22 pages.

This essay presents EUROPEN's position on several economic instruments--eco-taxes, deposit laws, government subsidies, and others--that are used to address the environmental impacts of packaging. Although it is tainted with the opinions of the packaging industry, this essay raises a few important concerns about some of these economic instruments. It's available on the Internet in PDF format at http://www.europen.be/issues/Economic_Instruments.pdf.

Levy, Geoffrey M., Ed. *Packaging, Policy, and the Environment*. Gaithersburg, Maryland: Aspen Publishers, Inc., 2000. 410 pages.

From the perspective of the packaging industry, this book discusses the use of policy instruments to address the environmental impacts of packaging and packaging waste. Topics include reuse, recycling, life-cycle analysis, producer responsibility, the social and environmental aspects of packaging, and packaging policies in many parts of the world.

Research Triangle Institute. *The Beverage Container Problem: Analysis and Recommendations*. Washington: U. S. Environmental Protection Agency, 1972. 190 pages.

This study examined the beverage container litter problems of the early 1970s, when cans and one-way bottles had conquered over half of the soft-drink market. The report discusses federal, state, and local policies that had been enacted or that were being proposed.

Refillable Beverage Containers---Canada

Crittenden, Guy. "The Blue Box Conspiracy." *The Next City* 3.9 (1997): 34.

This article summarizes the decline of refilling in the North American soft-drink industry, criticizes many of Canada's deposit-return systems, exposes the pitfalls of Ontario's curbside recycling programs, and concludes with a discussion about refilling. To download a copy of this article and readers' responses to it, go to <http://www.nextcity.com/main/town/9blue.htm>. Mr. Crittenden is the editor-in chief of the Canadian journal *Solid Waste & Recycling*.

Prince Edward Island Office of Legislative Counsel. *Environmental Protection Act. (consolidation)*. Charlottetown, P.E.I.: Island Information Service, 2001.

The Environmental Protection Act of Prince Edward Island authorizes the province's ban on non-refillable beverage containers. To download a PDF copy of this legislation from the Internet, go to <http://www.gov.pe.ca/law/statutes/pdf/e-09.pdf>.

"Environmental Protection Act: Litter Control Regulations Amendment." *Royal Gazette* [Prince Edward Island] 7 Aug. 1999, Part II: 83.

This amendment specifies which containers are considered refillable by the Litter Control Regulations of the Environmental Protection Act. To download a PDF copy of this amendment from the Internet, go to <http://www.gov.pe.ca/royalgazette/pdf/19990807.pdf>.

Menzies, David. "The Green, Green, Glass of Home." *Canadian Business* 10 Sept. 1999: 48.

This wonderful article discusses Prince Edward Island's ban on non-refillable beverage containers and explains how the ban has helped the island's only bottler, Seaman's Beverages, thrive in an industry dominated by the soft-drink giants. The article discusses Seaman's use of refillable bottles and presents a company profile. The InfoTrac database, which is available in many public libraries, has the full article.

Morawski, Clarissa. "P.E.I.'s Beverage Container Program." *Solid Waste & Recycling* 4.5 (1999): 16.

This article gives a brief history of Prince Edward Island's ban on non-refillable soft-drink and beer containers, describes the province's deposit-return systems, and mentions its curbside recycling program. The article also discusses the popularity of the ban on non-refillable soft-drink containers, the industry's opposition to it, and the possibility of bans on non-refillable containers of other types of non-alcoholic beverages. Ms. Morawski is the principal of CM Consulting in Toronto and an expert in extended producer responsibility.

Government of the province of New Brunswick, Canada. Acts of New Brunswick, Chapter B-2.2: Beverage Containers Act. (unofficial consolidation) Fredericton, New Brunswick: Queen's Printer of New Brunswick, 2000.

To download this document from the Internet, go to <http://www.gnb.ca/acts/acts/b-02-2.htm>.

Flaherty, Lora. "New Brunswick Law Brings Back Pop Bottle Debate." *Alternatives* 19.2 (1993): 11.

This article describes New Brunswick's Beverage Containers Act, which features the half-back deposit, and tells how the soft-drink industry persuaded lawmakers to weaken much of the original legislation. Flaherty also discusses the debate in Ontario between the soft-drink industry, which favors recycling, and advocates of refilling. The InfoTrac database, which is available in many public libraries, has the full article.

Morawski, Clarissa. "'R and R' in Quebec." *Solid Waste & Recycling* 4.3 (1999): 26.

This article discusses beverage container recovery in Quebec and describes the deposit-return system for refillable beer bottles. It's available in html on the Internet at <http://www.solidwastemag.com/library/diversion/0699.html>.

Government of the province of Quebec, Canada. The Environment Quality Act. R.S.Q., Chapter Q-2.

Under Section 70 of this law, beer and soft-drink companies may choose to have their containers regulated as hazardous materials. To download a copy from the Internet, go to http://publicationsduquebec.gouv.qc.ca/fr/cgi/frameset.cgi?url=/documents/lr/Q_2/Q2_A.html or for a PDF version, go to http://publicationsduquebec.gouv.qc.ca/en/cgi/telecharge.cgi//Q_2/Q2_A.PDF?table=lois&user=x&doc=/Q_2/Q2_A.PDF.

Government of the province of Quebec, Canada. An Act Respecting the Sale and Distribution of Beer and Soft Drinks in Non-returnable Containers. R.S.Q., Chapter V-5.001.

This law allows soft-drink and beer companies to choose one of two options for having their non-refillable containers regulated in Quebec. To download a copy from the Internet, go to

http://publicationsduquebec.gouv.qc.ca/fr/cgi/frameset.cgi?url=/documents/lr/V_5_001/V5_001_A.html.

Government of the province of Quebec, Canada. Minister of the Environment. Agreement relating to the Consignment, Recovery and Recycling of Non-Refillable Beer Containers.

This agreement between the Minister of the Environment, Recyc-Quebec, the Quebec Brewers Association, and other parties became effective on January 1, 2001. The agreement specifies the deposits for beer in non-refillable containers, a quota on the sales of beer in non-refillable containers, and the fines for exceeding the quota. This agreement is available in PDF format in English on the Internet at [QCagreeE.pdf](#).

Government of the province of Ontario, Canada. Liquor Licence Act--Manufacturers' Licences. Revised Regulations of Ontario 1990, Regulation 720. Toronto: Publications Ontario, 1998.

This set of regulations specifies the components of Ontario's 10-cent levy on non-refillable beer and alcoholic beverage containers. To download a copy from the Internet, go to http://192.75.156.68/DBLaws/Regs/English/900720_e.htm or <http://agco.on.ca/en/ft.features/ft6.acts.html>.

Menzies, David. "Kicking the Can." *Canadian Business* 24 Sept. 1999: 14.

This amusing article recounts the aluminum industry's 1999 advertising campaign, which promoted the aluminum beer can and attacked the refillable glass bottle. It explains why Ontario's beer industry prefers refillables and mentions the provincial government's support of its 10-cent levy on non-refillable beer containers. The InfoTrac database, which is available in many public libraries, has the full article.

Menzies, David. "Waste Blues." *The Financial Post* Sept. 1997: 36.

This article (available in html at <http://www.solidwastemag.com/library/Wasteb1.htm>) exposes the pitfalls of Ontario's curbside recycling programs and explains the debate in Ontario between the soft-drink industry, which favors these programs, and advocates of refilling.

Valiante, Usman. "Billions of Bottles of Beer on the Wall: The Brewer's Retail 98% Recovery Rate Reduces Costs." *Hazardous Materials Management* 8.4 (1995): 92.

This article discusses how Brewers Retail, Inc., Ontario's primary beer retailer, has reduced its costs by reusing or recycling much of its secondary and transport packaging along with recovering cans and refillable bottles. Valiante explains the crucial role that this retailer's deposit-return system has in its packaging recovery operations.

Canada--Import, Distribution, and Sale of Certain Alcoholic Drinks by Provincial Marketing Agencies. Report by the GATT Panel, 18 February 1992 (DS17/R - 39S/279). Washington: Organization of American States, 1999.

This report (available in html at <http://www.sice.oas.org/dispute/gatt/91alcoho.asp>) documents the proceedings before a GATT (General Agreement on Tariffs and Trade) panel regarding U. S. brewers' access to the Canadian beer market. One of the issues was Ontario's levy on beer containers.

Refillable Beverage Containers---Europe

ARGUS, ACR, and Carl Bro A/S. *European Packaging Waste Management Systems*. Brussels: European Commission, 2001. 397 pages.

This study describes how each European Union Member State manages its packaging waste through reuse, recycling, and source reduction. The preface (<http://europa.eu.int/comm/environment/waste/epwms.htm>) to the report, a PDF file of the executive summary (http://europa.eu.int/comm/environment/waste/epwms_xsum.pdf), and a PDF version of the main report (<http://europa.eu.int/comm/environment/waste/epwms.htm>) are all available from the European Commission web site.

ECOTEC Research and Consulting, et. al. *Study on the Economic and Environmental Implications of the Use of Environmental Taxes and Charges in the European Union and its Member States*. Brussels: European Commission, 2001. 418 pages.

This report provides useful background information about eco-taxes and evaluates the economic and environmental effects of eco-taxes in the EU Member States. The packaging and beverage container taxes of Sweden, Finland, and Denmark are discussed. To download various parts of the report from the Internet, go to http://europa.eu.int/comm/environment/enveco/taxation/environmental_taxes.htm and see the preface, which has links to all parts of the report.

Golding, Andreas. *Reuse of Primary Packaging*. Brussels: European Commission, 1999. Country-by-country report, 117 pages.

This study examines the reuse of post-consumer packaging in several European Union member states, focusing especially on the refilling of beverage containers. It discusses the amounts and types of reusable packaging on the market; systems for reuse; the costs, constraints, and obstacles to further reuse; and ways to promote the reuse of packaging. For an html version of the preface of the report, go to <http://europa.eu.int/comm/environment/waste/report4.htm> and to download a PDF version of the report itself, go to http://europa.eu.int/comm/environment/waste/report4_country_reports.pdf.

Danish Ministry of Environment and Energy. Statutory Order No. 124 of February 27, 1989 on Packaging for Beer and Soft Drinks, as Amended by Statutory Order No. 540 of July 9, 1991.

This law requires non-refillable containers for all domestic beer, soft drinks, and carbonated mineral water and specifies the criteria by which the Danish EPA approves new containers. The law also regulates the packaging of imported beverages, whose containers cannot be made of metal. To download a copy of this law from the Internet, go to <http://www.mst.dk/rules> and follow the link to "Ministerial Orders in Force" and then to "Waste and soil in force" (DOC).

Danish Ministry of Environment and Energy. Statutory Order No. 300 of 30 April 1997.

This amendment to Statutory Orders No. 124 and No. 540 clarifies the legal definition of "mineral water." To download a copy of this amendment, follow the links that are given above for 124 and 540 (DOC).

Government of Denmark. Statutory Order No. 1292 of December 20, 2000. Lov om Ændring af Lov om Afgift af Visse Emballager Samt Visse Poser af Papir Eller Plast m.v. og Lov om Forskellige Forbrugsafgifter og om Ophævelse af Lov om Visse Miljøafgifter. Copenhagen: Retsinformation, 2000.

This law, which specifies Denmark's LCA-based packaging taxes, was scheduled to become effective on April 1, 2001. To download an html copy of this law in Danish, go to:
http://www.retsinfo.dk/_GETDOCI_/ACCN/A20000129230-REGL.

"Packaging for Soft Drinks, Beer, Wine, and Spirits." *Faktuelt* 18 Jan. 1999.

This article (available in html at http://www.mem.dk/faktuelt/fak18_eng.htm) explains Denmark's ban on non-refillable containers for soft drinks and beer and many other aspects of refilling in that country. *Faktuelt* is published in Danish by the Ministry of Environment and Energy, and some articles are available in English from Miljøbutikken, the ministry's information center, on the web at:
<http://www.mem.dk/butik/ukindex.htm>.

Sakakeeny, Kaleel. "Denmark's Bottle Boom." *Beverage World International* Dec. 1993: 76.

This article discusses the political, logistical, environmental, cultural, and historical aspects of beverage packaging in Denmark.

Duales System Deutschland, AG. Packaging Ordinance (Verpack V).

When Germany enacted this law in 1991, that nation became the first to hold manufacturers responsible for managing their packaging and packaging waste. Regarding beverage packaging, the ordinance establishes quotas on the volume of packaged beverages that must be in refillable containers. To obtain a copy of the ordinance (html): <http://www.gruener-punkt.de/en/recht/grundlage/verpackung/index.php3>.

"Germany in Hot Water Over Packaging Waste Law." *European Report* 31 Mar. 2001: 487.

This article discusses the European Commission's view of Germany's 72 percent quota as a trade barrier to importers of natural mineral water. It also recounts the experiences of European mineral water bottlers with Germany's beverage container laws. The InfoTrac database, which is available in many public libraries, has the full article.

Dutch Ministry of Housing, Spatial Planning, and the Environment. Packaging Covenant II.

Under this agreement, which is set to expire at the end of 2001, any manufacturer or importer who puts packaging on the market in the Netherlands must reduce or recycle its post-consumer and industrial packaging waste. Regarding beverage packaging, the covenant requires bottlers and importers to use their existing refilling systems unless they can demonstrate that replacing them with one-way packaging systems is better for the environment. An unofficial translation of the covenant is available from the ministry's web site: <http://www.vrom.nl>.

Ministry of the Environment. [Norway] Product Control Act.

This law authorizes the Norwegian government to regulate beverage containers. An unofficial translation (HTML) of the law and related background information (HTML) are available from the web site of the Pollution Control Authority. Information:

<http://www.sft.no/english/legislation/dbafile4572.html>. Translation:

<http://www.ub.uio.no/ujur/ulovdata/lov-19760611-079-eng.html>.

Ministry of the Environment. [Norway] "Regulations Relating to Return Systems for Beverage Packaging." (T-1000)

This booklet explains the regulations of Norway's deposit-return systems and summarizes how the government uses the return rates to set the amounts of the beverage container taxes. To order a free copy of this booklet, go to:

<http://www.sft.no/english/legislation/get.cfm?1=1&kat=122&sprak=en>.

Institute for Applied Ecology. *Waste Prevention and Minimisation*. Brussels: European Commission, 1999. 119 pages.

This report documents some of the best practices in Europe for reducing both municipal and industrial waste, including hazardous waste. One of the report's case studies describes the reuse of champagne bottles in Spain. To read the preface (in html), go to:

<http://europa.eu.int/comm/environment/waste/report3.htm>. For a PDF version of the report, go to: http://europa.eu.int/comm/environment/waste/report3_en.pdf.

Deposit-Return Systems

Container Recycling Institute. *Beverage Container Reuse and Recycling in Canada*. Arlington, Virginia: Container Recycling Institute, 1998. 48 pages.

This report describes how Canada's ten provinces and two territories are reducing beverage container waste. While it focuses mostly on deposit-return systems, the report also briefly discusses policies that promote refilling. To see an executive summary (in html), go to: <http://www.container-recycling.org/publications/bevcanada/page66.htm>.

Comptroller General of the United States. *States' Experience with Beverage Container Deposit Laws Shows Positive Benefits*. Washington: U. S. General Accounting Office, 1980. 67 pages.

This report tells how beverage container deposit laws affected refilling in Maine and in Michigan. It also presents updates of findings from a 1977 General Accounting Office report about the impact of a nationwide beverage container deposit law.

Comptroller General of the United States. *Potential Effects of a National Mandatory Deposit on Beverage Containers*. Washington: U. S. General Accounting Office, 1977.

This study investigated the environmental and economic impacts of a federal deposit law for soft-drink and beer containers.

The Beverage Industry

"CSD Packaging 2000." *Beverage World* June 2001: 37.

This trade publication annually dedicates its June issue to articles about current trends in beverage packaging.

"1980 Beverage Packaging Mix." *Beverage World* June 1981: 44.

Zylstra, Peter. *The Beverage Industries: Two Markets*. Report 32-251-XIE. Ottawa: Statistics Canada, 1999.

Using data from the 1997 Annual Survey of Manufacturers, this Statistics Canada report discusses trends in that country's beverage industries and briefly mentions packaging. To download a free html copy, go to: <http://www.statcan.ca/english/freepub/32-251-XIE/1999/32-251a.htm>.

Louis, J. C., and Harvey Yazijian. *The Cola Wars*. New York: Everest House, 1980. 372 pages.

Although this book focuses mainly on the competition between Coke and Pepsi, it also recounts the rise of one-way containers and the consolidation of the soft-drink industry. (These two trends drove the decline of refillable bottles in the U. S.) The book also recounts the evolution of beverage container deposit laws in the U. S. and their effects on refilling.

Giles, Geoff A., Ed. *Handbook of Beverage Packaging*. Boca Raton, Florida: CRC Press, L.L.C., 1999. 397 pages.

This book explains the properties of various types of beverage containers, describes refilling processes, and briefly covers life-cycle analysis. The book was written for packaging and beverage industry professionals who want a broad knowledge of beverage packaging technology.

Woodroof, Jasper Guy, and G. Frank Phillips. *Beverages: Carbonated and Noncarbonated*. Westport, Connecticut: Avi Publishing Company, Inc., 1981. 592 pages.

This book describes the production and marketing of beverages, with an emphasis on non-alcoholic beverages, and includes a chapter which describes the development of the different types of containers for carbonated soft drinks.

United States Department of Commerce, Bureau of the Census. *Soft Drink Manufacturing*. 1997 Economic Census: Manufacturing Industry Series. Report EC97M-3121A. Washington: U.S. Census Bureau, 1999. 33 pages.

This report presents several statistics about the soft-drink industry and includes estimates of the quantities of soft drinks that were shipped in refillable glass bottles and in other container types. The bureau will conduct its next economic census in 2002. The report is available as a PDF file at: <http://www.census.gov/prod/ec97/97m3121a.pdf>.

Muris, Timothy J., Scheffman, David T., and Pablo T. Spiller. *Strategy, Structure, and Antitrust in the Carbonated Soft-Drink Industry*. Westport, Connecticut: Quorum Books, 1993. 260 pages.

This book thoroughly analyzes the consolidation of the soft-drink industry and tells how the industry restructured itself to adapt to national advertising and promotion strategies, multiple products and packages, and a sophisticated customer base. (Consolidation made refilling less economical.)

Links to Information on Refillable Beverage Containers

Environmental Organizations

Institute for Local Self-Reliance (ILSR)
2425 18th Street, N.W.
Washington, D.C. 20009-2096
Tel.: 202-232-4108
Web www.ilsr.org

ILSR is a nonprofit research and educational organization that provides technical assistance and information to government, citizens, and industry. With funding from the GrassRoots Recycling Network, ILSR researched the information and wrote this report about refillable beverage containers. For more information about ILSR's Waste-to-Wealth program and its *Reduce, Reuse, Refill!* project, visit its web site at: <http://www.ilsr.org/recycling>.

Container Recycling Institute
1911 Ft. Myer Drive, Suite 900
Arlington, Virginia 22209-1603
Tel.: 703-276-9800
Web www.container-recycling.org

This nonprofit organization is the national voice for beverage container deposit legislation. CRI plays a vital role in educating policy-makers, government officials, and the general public about the social and environmental impacts of the production and disposal of no-deposit, no-return beverage containers and the need for producers to take responsibility for their wasteful packaging. Its web site gives facts, figures, and commentaries about beverage container recycling. The CRI maintains another web site, the "Bottle Bill Resource Guide" at www.bottlebill.org, which provides information for promoting beverage container deposit laws.

INFORM, Inc.
120 Wall Street
New York, NY 10005-4001
Tel.: 212-361-2400
Web www.informinc.org

In addition to *Case Reopened*, this nonprofit environmental research organization has published several other books about waste prevention strategies.

Citizens' Network on Waste Management
17 Major Street
Kitchener, ON N2H 2R1
Tel.: 519-744-7503
Web www.web.net/~jjackson

This 15-year-old network of citizens' groups from all across Ontario advocates minimizing consumption, maximizing reuse, and eliminating waste disposal.

Toronto Environmental Alliance
401 Richmond St. West, Suite 104
Toronto, ON M5V 3A8
Tel.: 416-596-0660
Web www.web.net/~tea

This organization's web site presents arguments for refilling.

European Environmental Bureau (EEB)

34, BD de Waterloo
B-1000 Brussels Belgium
Tel.: +32 (2) 289.10.90
Web www.eeb.org

The EEB is a federation of 134 grassroots environmental organizations from all EU member states and other European countries. The mission of the EEB is to protect and improve the environment of Europe and to enable the citizens of Europe to participate in the fulfillment of that mission. To help fulfill its mission, the EEB monitors and addresses EU environmental policy. The EEB's position statement on the 2001 revision of the EU packaging directive calls for more specific provisions to promote the reuse of packaging (go to http://www.eeb.org/activities/waste/packaging_directive.htm). In 1999, the EEB issued another statement calling for a continent-wide tax on beverage containers (go to http://www.eeb.org/press/new_coalition_for_reuse.htm).

Greenpeace Austria

Siebenbrunnengasse 44
A-1050 Wien
Tel.: 01/545 45 80
Web www.greenpeace.at

For some information (in German) about the environmental and economic aspects of refillable beverage containers, go to <http://www.greenpeace.at/umweltwissen/chemie/flaschen/index.htm>.

Information Sources

Raymond Communications, Inc.
5111 Berwyn Rd., #115
College Park, MD 20740
Tel.: 301-345-4237
Web www.raymond.com

Raymond Communications publishes the newsletter *State Recycling Laws Update* and the newsletter *Recycling Laws International*, which provides the latest news about developments in the packaging laws of many countries. Raymond offers online and print subscriptions to both of these publications; see its web site for more information.

Solid Waste & Recycling
Southam Environment Group
1450 Don Mills Road
Don Mills, ON M3B 2X7
Tel.: 416-442-2292
Web www.solidwastemag.com

This Canadian journal often has articles about beverage container recycling and reuse in Canada. Its web site has selected articles from issues dating back to 1996 and from other publications.

Zenith International, Ltd.
7 Kingsmead Square
Bath BA1 2AB
United Kingdom
Tel. +44 (0)1225 327900
Web www.zenithinternational.com

Zenith International, Ltd, is a consulting firm for the food, beverage, and packaging industries worldwide. Its web site has dozens of links to beverage companies and trade associations.

Verpackungs-Rundschau
Kepler Medien Gruppe
P. Kepler Verlag GmbH & Co KG
Industriestraße 2
D-63150 Heusenstamm
Germany
Tel: +49/(0) 6104/606-207

Web www.verpackungsrundschau.de/englisch/f_start.html

Verpackungs-Rundschau is a magazine of the packaging industry in Europe. Its web site has news and information about developments in packaging, including beverage containers.

Packexpo.com
Packaging Machinery Manufacturers Institute
4350 North Fairfax Drive, Suite 600
Arlington, VA 22203
Tel.: 703-243-8555

Web www.packnet.com/news.html

The Packaging Machinery Manufacturers Institute is an association of manufacturers of packaging and packaging machinery in the U.S. and Canada. Its web site provides news bits about the latest developments in packaging legislation, technology, and commerce.

Dotpackaging
Packaging Magazine
CMP Information, Ltd.
Sovereign Way
Tonbridge
Kent TN9 1RW
United Kingdom
Tel.: +44 (0)1732 377486

Web www.dotpackaging.com/news/environment

The web site of *Packaging Magazine*, "Dotpackaging," provides news about packaging legislation in Europe.

Beverage Associations

The Canadian Soft Drink Association (CSDA)
121 Richmond St. W, Suite 901
Toronto, ON M5H 2K1
Tel.: 416-362-2424

Web www.softdrink.ca

Among the soft-drink associations worldwide, the CSDA is probably the most outspoken opponent of refilling. To read its equivocal assertions about Prince Edward Island's ban on non-refillable containers, go to <http://www.softdrink.ca/pspeen.htm>.

Brewers Association of Canada
1200 - 155 Queen Street
Ottawa, ON K1P 6L1
Tel.: 613-232-9601

Web www.brewers.ca/index_main.htm

The Brewers Association of Canada represents brewing companies operating in Canada. In Canada, refillable bottles make up almost 70 percent of beer packaging.

Federation of the Brewing and Soft Drinks Industry
PL 115 (Pasilankatu 2)
FIN-00241 Helsinki
Finland
Tel.: +358 9 148 871

Web www.panimoliitto.fi/english.htm

This trade association, also known as Panimoliitto, manages the refillable bottle pool for its members. Its web site boasts about the popularity of refillable bottles in Finland and discusses the environmental benefits and other aspects of refilling there.

Swedish Brewers Association
Box 8104
Polhemsgatan 29
S-104 20 Stockholm
Sweden
Tel.: +46 8 566 213 00

Web www.swedbrewers.se/eng/netscape_liten.htm

Although the membership of this trade association includes beer companies and soft-drink, cider, and bottled-water companies, its main mission is to promote the interests of the beer industry. Its web site has much information about refilling in Sweden.

Vereniging Nederlandse Frisdranken Industrie (NFI)
Heemraadssingel 167
Postbus 26155
3002 ED Rotterdam
The Netherlands
Tel.: 010 — 477 40 33

Web www.frisdrank.nl/english

The NFI is the trade association of the Dutch soft-drink and mineral-water industries. Its web site has information about refilling in The Netherlands and about bottling processes.

Centraal Brouwerij Kantoor (CBK)
Herengracht 282
1016 BX Amsterdam
The Netherlands
Tel: 020-6252251

Web www.cbk.nl

The CBK is the trade association of Dutch brewers. Its online brochure, available only in Dutch, has information about beer packaging in The Netherlands and in Europe.

The Brewers of Europe (CBMC)
Chausse de la Hulpe 181, Bte 20
B - 1170 Brussels
Belgium
Tel.: 32-2 672 23 92

Web www.cbmc.org

The CBMC is the trade confederation of the national brewers' associations from the 15 EU member states, Norway, Switzerland, and Romania. Its web site has statistics on the packaging mix for beer in several European nations (go to <http://www.cbmc.org/ukpages/stats/st08con.htm>).

The Danish Brewers' Association

Frederiksberggade 11

DK-1459 Copenhagen

Tel.: + 45 33 12 62 41

Web www.bryggeriforeningen.dk

The Danish Brewers' Association is the trade association of both the beer and the soft-drink industries in Denmark. Its web site has information about the management system in Denmark for refillable bottles (go to <http://www.bryggeriforeningen.dk/main.php?menu=m2n7>).

Dansk Retursystem A/S

Skagensgade 64 Høje

Taastrup

2630 Taastrup

Postboks 19

Denmark

Tel.: +45 43 32 32 32

Web www.dansk-retursystem.dk

Danish brewers and soft-drink bottlers established this non-profit organization in June 2000 to provide retailers reimbursement and technical assistance for the management of empty bottles. This organization also has been planning a deposit-return system for one-way containers, which are slated for introduction in early 2002 following the repeal of the can ban.

Norwegian Brewers and Soft Drink Producers

Postboks 7087 Majorstuen

N-0306 Oslo

Norway

Tel.: +47 23 08 86 9

Web www.brom.no

The web site of this trade association includes information about Norway's taxes on one-way beverage containers and about the packaging mix for beverages.

ANIRSF

Portuguese Association of the Soft Drink and Fruit Juice Industries

Av. Miguel Bombarda N° 110

2°Dt°

1050-167 Lisboa

Portugal

Tel.: 21 794.05.74

Web www.anirsf.pt

This association's web site has statistics about the consumption and packaging of non-alcoholic beverages in Portugal (go to <http://www.anirsf.pt/eng/stats.asp>).

Genossenschaft Deutscher Brunnen, e.G. (GDB)

Kennedyallee 36

53175 Bonn

Germany

Tel.: 0228/ 95 95 9-0

Web www.gdb.de

The GDB manages the refilling system for mineral water bottlers in Germany and describes this system on its web site.

Wirtschaftsvereinigung Alkoholfreie Getränke, e. V. (WAFG)
Friedrichstraße 231
10969 Berlin
Germany
Tel.: 030/259258-0

Web www.wafg-online.de

The WAFG is the trade association of producers of non-alcoholic beverages in Germany. Its web site, which is written only in German, includes press releases about its responses to developments in Germany's beverage container laws.

Beverage Companies

Seaman's Beverages
23 Fourth Street
Charlottetown, PE C1E 2B4
Canada
Tel.: 902-566-4700

Web www.seamansbeverages.com/home/home_index.html

Seaman's bottles Pepsi products and Seaman's own variety of old-fashioned soda pops in refillable bottles for the Prince Edward Island market.

Ale-8-One Bottling Company
P.O. Box 645
Winchester, Kentucky 40392
Tel.: 859-744-3484

Web www.ale-8-1.com

Ale-8-One is probably the only remaining soft-drink company in the U.S. that packages its products in refillable bottles. Its market includes Central and Eastern Kentucky and parts of Indiana and Ohio.

Brewers Retail, Inc.
The Beer Store Corporate Centre
5900 Explorer Drive
Mississauga, ON L4W 5L2
Canada
Tel.: 1-800-387-1314

Web www.thebeerstore.ca

Brewers Retail, Inc., (BRI) also known as The Beer Store, is Ontario's primary beer retailer. BRI not only collects aluminum cans and refillable bottles under its deposit-return system, but also reuses or recycles almost all of its secondary and transport packaging.

Labatt Breweries of Canada
Labatt House
200-181 Bay Street
Toronto, ON M5J 2T3
Canada
Tel.: 416-361-5050

Web www.labatt.com

Labatt is one of Canada's major brewers. Molson and Moosehead are among the others. Labatt's web site boasts about the company's use of refillable bottles and about its recovery of most of the packaging that comes with its products.

Oberweis Dairy
951 Ice Cream Drive, Sweet One
North Aurora, IL 60542
Tel.: 630-801-6100 or 1-888-MILK-TO-U
Web www.oberweisdairy.com

While most dairies that offer milk in refillable bottles deliver them only to homes or schools, Oberweis Dairy delivers milk in refillable glass bottles to both homes and stores. Its market territory includes the Chicago metropolitan region, some other parts of Illinois, and the St. Louis metropolitan region.

Government Organizations

Prince Edward Island Department of Fisheries, Aquaculture, and Environment (FAE)
P. O. Box 2000
Charlottetown, PE C1A 7N8
Canada
Tel.: 902-368-6664
Web www.gov.pe.ca/fae/index.php3

The FAE's web site explains Prince Edward Island's ban on non-refillable containers and gives a brief history of beverage containers.

New Brunswick Department of Environment and Local Government (ELG)
Marysville Place
P. O. Box 6000
Fredericton, NB E3B 5H1
Canada
Tel.: 506-453-3064
Web www.gnb.ca/elg-egl/index-e.htm

The ELG's web site describes New Brunswick's deposit-return system.

Danish Environmental Protection Agency (DEPA)
29 Strandgade DK-1401
København K
Denmark
Tel: +45 32 66 01 00
Web www.mst.dk/homepage

With its ban on non-refillable containers for domestic beer and soft drinks and its taxes on all beverage containers, Denmark has probably the world's most comprehensive approach to managing beverage packaging. (In 2002, the can ban was repealed; the country's beverage packaging will certainly be shifting.) The DEPA is an agency within the Ministry of Environment and Energy (www.mem.dk/ukindex.htm).

Ministry of the Environment
P.O. Box 380
FIN- 00131 Helsinki
Finland
Tel.: +358-9-19911
Web www.vyh.fi/eng/welcome.html

A summary of Finland's laws regarding beverage container taxes is available on the Internet at <http://www.vyh.fi/eng/environ/legis/waste/economic.htm>.

Norwegian Pollution Control Authority (SFT)

Strømsveien 96
P. O. Box 8100
Dep NO-0032 Oslo
Norway
Tel.: +47 22 57 34 00

Web www.sft.no/english

This agency of the Ministry of the Environment administers Norway's waste management programs.

The German Federal Environment Ministry (BMU)

Alexanderplatz 6
D - 10178 Berlin
Germany
Tel.: +49 1888 305-0

Web www.bmu.de/english/fset800.htm

The 1991, 1997, 1998, and 1999 volume percentages of beverage production in refillable containers are available on the Internet at <http://www.bmu.de/presse/2001/pm729.htm>.

Federal Environmental Agency (UBA)

Postfach 33 00 22
14191 Berlin
Germany
Tel.: +49 30 8903-0

Web www.umweltbundesamt.de/index-e.htm

This agency provides scientific and technical support for the Federal Environment Ministry. Its mission includes formulating regulations, collecting data, and educating the public about the environment. Some general information about refillable containers is available on the web at

<http://www.umweltbundesamt.de/uba-info-daten-e/daten-e/reusable-packaging.htm>.

To see the 1991-1997 volume percentages of beverage production in refillable containers, go to:

<http://www.umweltbundesamt.de/uba-info-daten-e/daten-e/reusable-packaging-tab2.htm>.

Instituto dos Resíduos

Av. Almirante Gago Coutinho
Nº 30 5º
1000-017 Lisboa
Portugal
Tel.: 21 842 40 00

Web www.inresiduos.pt

The Instituto dos Resíduos and CARGERÉ (Commission for the Management of Packaging and Packaging Waste) together administer Portugal's packaging waste management programs, including those for the reuse of beverage containers. Its web site, which will soon have an English version, has administrative documents pertaining to Portugal's refilling laws.

Database of Environmental Taxes in the European Union Member States,
plus Norway and Switzerland European Commission (EC)

200 rue de la Loi/Wetstraat 200
B-1049 Brussels
Belgium

Web http://europa.eu.int/comm/environment/enveco/env_database/database.htm

This database presents data and basic facts about environmental taxes, including those on beverage packaging, that many European nations use. Since the EC Directive on Packaging and Packaging Waste became effective in 1994, the EC has published several studies about the management of packaging in Europe. The EU environment web site (at

http://europa.eu.int/comm/environment/index_en.htm) has links to these studies, some of which are described in the bibliography page of this report.

OECD Environment Directorate
Organization for Economic Cooperation and Development
2, Rue André Pascal
75775 Paris Cedex 16
France

Web www1.oecd.org/env

The OECD database of environmental taxes has information about beverage container taxes in OECD member countries, available on the web (at

<http://www1.oecd.org/env/policies/taxes/index.htm>). The OECD also has a web site about extended producer responsibility (EPR); go to <http://www1.oecd.org/env/efficiency/epr.htm>.

Packaging Associations

EUROPEN
European Organization for Packaging and the Environment
Le Royal Tervuren
Avenue de l'Armée 6 Legerlaan
1040 Brussels
Belgium

Tel.: +32 2 736 3600

Web www.europen.be

EUROPEN voices industry's views about packaging and the environment. Its recently-launched bulletin gives news about packaging legislation in Europe (available on the web at

<http://www.europen.be/bulletin.html>).

Working Party on Packaging and the Environment (AGVU)

Arbeitsgemeinschaft Verpackung und Umwelt e.V.

Bonner Talweg 64

D-53113 Bonn

Germany

Tel.: + 49 228 949290

Web www.agvu.de

The AGVU is an association of the packaging, retail trade, consumer goods, and recycling industries in Germany. Its statement regarding the quota is available on the Internet at

<http://www.agvu.de/reports/r970612e.htm>. The results of a study on one-way packaging is available at <http://www.agvu.de/reports/r970805.htm>.

Informations-Zentrum Weißblech e.V.

Fürstenwall 99

D-40217 Düsseldorf

Germany

Tel.: +49 0211/38659-0

Web www.izw.de/englisch

The Informations-Zentrum Weißblech e.V. provides news and information about the tinplate industry and has issued three press releases that demand the abolition of Germany's beverage container laws and argue against refilling. The press releases are available on the web at

http://www.izw.de/englisch/journalisten/frame_j_prs4.htm.

Duales System Deutschland AG
Frankfurter Straße 720-726
D-51145 Köln-Porz-Eil
Germany
Tel.: ++49-2203-937-0

Web www.gruener-punkt.de/en

Duales System Deutschland is a non-profit organization that oversees and coordinates the collection, sorting, and recycling of packaging waste in Germany. To see the results of a poll that measures German attitudes about energy and packaging consumption, go to <http://www.gruener-punkt.de/en/home/top/top001227.php3>.

Life-Cycle Analysis

Society of Environmental Toxicology and Chemistry (SETAC)
1010 North 12th Avenue
Pensacola, FL 32501-3370
Tel.: 850-469-1500

Web www.setac.org

SETAC is an independent, nonprofit professional organization of individuals and institutions engaged in the environmental sciences. Its web site lists its publications about life-cycle analysis (LCA). The SETAC LCA Advisory Group endeavors to advance the science of environmental life-cycle analysis.

Centre for Environmental Science Section on Substances and Products
P.O. Box 9518
2300 RA Leiden
The Netherlands
Tel.: +31 71 5277477

Web www.leidenuniv.nl/interfac/cml/ssp

This institute of Leiden University is working with SETAC and the International Organization for Standardization (ISO) to develop standard methodologies for life-cycle analysis.

PRé Consultants BV
Plotterweg 12
3821 BB Amersfoort
The Netherlands
Tel.: +31 33 4555022

Web www.pre.nl

PRé Consultants develops and sells life-cycle analysis (LCA) software and provides consulting services in LCA and in the development of environmentally-friendly products. Its web site has three pages that explain what LCAs are and how they are conducted.

Institut für Energie und Umweltforschung Heidelberg
Wilckensstraße 3 D-69120 Heidelberg
Tel.: +49 (0) 6221 / 47 67 - 0

Web <http://www.ifeu.de>

This independent environmental research institute at Heidelberg University in Germany conducted the recent life-cycle analysis study for the German Federal Environment Ministry. Its web site briefly describes some of its other LCA projects.

End Notes

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