PART II

The EPR Policy Challenge for the United States

Bette K. Fishbein
INFORM, Inc.

PART II

The EPR Policy Challenge for the United States

INTRODUCTION

In the global economy, economic upheavals at the national level reverberate around the world. Traditional geographic boundaries provide little insulation when one country's fortunes are inextricably linked to the economies of other countries. Similarly, environmental problems take on increasingly global significance, with such issues as resource depletion and air and water pollution no longer just national concerns.

While economies and environmental problems have become more global, the world's governments and political systems have not. Enforceable legislation and regulations must still be enacted by the individual nations themselves. And to a large extent, it is the unique environment of each country – its physical, social, and political conditions – that determine the climate in which key policy decisions are made.

With the largest and most powerful economy in the world, the United States is clearly an important factor in solving the world's environmental problems, including those associated with waste generation and disposal. However, these problems are often viewed differently in the US than in Europe and in industrialized Asian nations such as Japan.

The United States is a comparatively large country with low population density, a high standard of living, and abundant space and material resources. These factors color its approach to environmental issues. For example, there is far less pressure on landfill space in the US than in Europe or Japan, making this a much less

important driver of waste policy. Moreover, the strong US traditions of individualism and unfettered capitalism limit the types of government intervention that are acceptable politically. This has certainly been the case when attempts have been made to legislate extended producer responsibility (EPR) at the national level.

Prospects for EPR are further limited by the high risk of lawsuits in the United States. Companies worry about the liability they might incur in implementing take-back programs, particularly for products with hazardous or toxic constituents. Antitrust laws impose additional constraints on the possibility of cooperation and consensus among competing companies in the management of post-consumer products. Finally, political campaigns in the United States are very expensive and industry is a large contributor. This may partly explain why industry's opposition to EPR has been more effective in the US than in other parts of the world. In fact, the same companies that run EPR programs in Europe have lobbied heavily against their implementation in the United States.

For all of these reasons, the United States, unlike the industrialized countries of Europe and Asia, has not adopted a national EPR policy. This is not to say that EPR is not being implemented in the US. As described in the following chapters, EPR legislation has been enacted at the state level; there is one nationwide/industry-wide take-back program; and a number of companies have launched their own voluntary EPR programs. The five chapters in Part II will explore the following topics relating to the EPR challenge for the United States:

1. Why EPR is necessary
2. Waste generation, disposal, and recycling in the United States
3. Federal and state government waste policies, both EPR and non-EPR
4. Voluntary industry EPR initiatives
5. Prospects for EPR in the twenty-first century.

Part II makes extensive use of the terms reuse, recycling, and remanufacture. Reuse and recycling are defined by the National Recycling Coalition (NRC) as follows:

- **Reuse**. The reapplication of a package, used product, or material that retains its original form or identity.
- **Recycling**. A series of activities whereby discarded materials are collected, sorted, processed, converted into raw materials, and used in the production of new products. Recycling does not include the use of these materials as a fuel substitute for energy production.

Remanufacture is defined by the Remanufacturing Industries Council as follows:

- **Remanufacture**. The process of product disassembly whereby parts are cleaned, repaired, or replaced and then reassembled to sound working condition.

Part II also makes use of the word recovery. In Europe, "recovery" is used to describe a waste management strategy that employs waste-to-energy technologies. In this section, it refers not to any specific waste management strategy, but rather to the reclamation or recapture of used products and materials generally.

CHAPTER 1. WHY EPR?

Part I described the problems that arise as increasing environmental impacts hit up against the ecological limits of our planet. We began the twentieth century with a world population of about 1.5 billion. We begin the twenty-first century with a population of 6 billion that is likely to reach nearly 10 billion by mid-century. In addition, standards of living — and levels of consumption — are increasing around the world in both developed and developing countries. In such a world, more attention will have to focus on the earth's limits, both as a source of materials and energy and as a sink for our wastes.

The following equation is often used to illustrate and analyze this situation:

$$I = P \times A \times T$$

where I = environmental impacts; P = population level; A = affluence level (i.e., gross domestic product [GDP] per capita); and T = technology/resource efficiency.

Since increases in both P and A (population and affluence) are historical trends that are likely to continue, improvements in T (resource efficiency) must more than offset their combined effects if I (environmental impacts) is to be reduced.

This analysis has given rise to a debate over what resource efficiency factor is required for sustainability. In 1994, a group of scientists, economists, and business and government leaders, organized by the Wuppertal Institute in Germany, formed the Factor 10 Club, which called for a tenfold increase in resource productivity. Others argued for factor four increases. In the Netherlands, the National Environmental Policy Plan includes a factor 10 goal and works toward goals of factor 20 and factor 40.

Efficiency factors have been part of a larger debate on sustainability, a term that itself is subject to much debate. The commonly used definition of sustainability

is that of the Brundtland Commission: "...to meet the needs of the present without compromising the ability of future generations to meet their own needs." But this, too, is subject to interpretation. In a recent book, Paul Hawken, Amory Lovins, and L. Hunter Lovins discuss sustainability in terms of "natural capital," which they define as "the sum total of the ecological systems that support life." They argue that this capital provides income or services that constitute a valuable subsidy: "to maintain income (from natural capital), we need not only to maintain our stock of natural capital but to increase it dramatically in preparation for the possible doubling of population that may occur in the next century."[1] They also reason that investing in natural capital requires a change in patterns of production and consumption, which, in turn, requires a change in economic incentives. While there are disagreements on the efficiency factors and implementation strategies needed for sustainability, there is general agreement that strategies to protect the earth's ecological systems need to be economically viable and equitable with respect to the distribution of resources.

With the largest economy on the planet, the United States has a particular obligation to ask the question, How do we move from a throwaway society to a sustainable one? And what economic incentives could begin to propel us in the right direction?

One economic instrument that generates such incentives is "extended producer responsibility," or EPR – the subject of this report. EPR was originally defined by Thomas Lindhqvist, a Swedish professor of environmental economics, as the extension of the responsibility of producers for the environmental impacts of their products to the entire product life cycle, and especially for their take-back, recycling, and disposal. In practice, the term has mostly been used to describe take-back programs – producer responsibility for the "post-consumer" stage of products, after they have been discarded at the end of their useful life. As such, EPR shifts the responsibility for discarded materials that would otherwise be managed by government to private industry, thereby internalizing the costs of recycling or disposal into product price. The concept behind EPR is quite simple – producers that are required to pay for the recycling or disposal of their products

have an incentive to make less wasteful and more economically recyclable products. The concept's simplicity, however, does not extend to its implementation, which has proved extremely complicated.

First mandated in Germany for packaging in 1991, EPR is now being applied to packaging and other product sectors in most of the world's industrialized countries. A notable exception is the United States, where EPR sometimes refers to "extended *product* responsibility," a policy of shared responsibility that is less specific than extended *producer* responsibility (see pp. 74 to 75 in Chapter 3). Throughout this report, the term EPR refers to extended producer responsibility as described above.

EPR's most essential element is the extension of producer responsibility to the post-consumer, or end-of-life, stage. This entails a shift in physical and/or financial responsibility for waste management from government to private industry, which means that some or all of the costs of waste management become internalized. Most EPR policies also have mandated recycling targets, data collection and reporting requirements, and they define the technologies that count as recycling. Under EPR, it is not enough for producers to inform consumers, recycling managers, or waste officials about how best to recycle post-consumer products. EPR requires producers to either take back their products or pay to have this done by a third party such as a producer responsibility organization (PRO).

To create the most powerful incentives, EPR would make producers responsible for the products they actually produce. However, this is impractical for many product sectors. For example, it would not be economically feasible for every company that makes breakfast cereal to take back its own boxes. For this reason, PROs are often used to manage take-back of a particular product collectively for all producers, a system funded through a fee on each item put on the market. To further EPR's ultimate goal, it is important that PRO fees reward design changes that reduce materials use or facilitate recycling. In a packaging take-back system, for instance, a fee based on package materials and weight that reflects the actual costs of recycling creates an incentive to reduce packaging or design for recyclability because a company can benefit financially from doing so. A

standard fee based on the volume of the package contents, however, creates no such incentive.

By shifting responsibility for one stage in the product life cycle — i.e., the post-consumer stage — EPR produces environmental benefits over the entire life cycle. Unfortunately, this important attribute of EPR is not well understood. Critics question why the policy focuses downstream, on waste impacts, when a product's upstream impacts from extraction and production are far greater. In fact, the post-consumer stage is simply an intervention point. Of course, EPR does produce environmental benefits downstream by reducing the amount of materials that have to be disposed of in incinerators and landfills, and consequently the emissions associated with disposal. But its upstream benefits are much more important. A producer that responds to EPR by making a less wasteful and more recyclable product will reduce the huge environmental impacts of raw materials extraction that were outlined in Part I, as well as the impacts of materials and energy use associated with materials processing and the manufacture of new products.

Because EPR creates a closed loop of responsibility that includes the product's entire life cycle, it can also help close material loops, enabling waste materials to be used as raw materials in the manufacture of new products. By extending producer responsibility to the post-consumer stage, EPR forges a critical link between the end of life of products and product design. It puts end-of-life management on the radar screen of product designers, which is essential to developing sustainable products. When government pays for recycling and waste management, a business has little incentive to invest in making products less wasteful and more recyclable. Companies focus on the bottom line, and EPR builds product end of life into the bottom line. Under EPR, the company that designs a less wasteful, more recyclable product can gain a competitive advantage.

In the United States, industry has argued that the user of products — i.e., the consumer — should pay for waste management. In fact, the consumer usually does, to the extent that internalized costs are passed on in the form of product price increases. But even if the consumer always pays, how he or she pays creates

differing waste reduction and recycling incentives for individuals and industry (Table 1). In the US, waste management is typically funded by general taxpayer revenues, so neither the producer nor the consumer has an incentive to reduce waste. Some communities charge households by the amount of waste generated that requires disposal, which gives consumers an incentive to purchase less wasteful and more recyclable products. This, in turn, gives producers an incentive to provide such products, but the incentive is diluted and indirect. Under EPR, in contrast, the producer pays for recycling and disposal, which creates a direct and powerful incentive to provide less wasteful and more recyclable products. And since it is the producer that decides how products are designed, providing industry with a direct economic incentive seems the most efficient and effective approach.

Table 1. Waste Management Funding Mechanisms and Incentives

How the individual pays	Funding mechanism	Waste reduction and recycling incentives
Taxpayer	General tax revenues	Almost nonexistent
System user	Per bin garbage fees	**Individuals**: Strong incentive to reduce costs by purchasing less wasteful and more recyclable packages and products **Industry**: Weak, indirect incentive to respond to consumer preferences
Consumer	Producer pays waste management costs, which may be passed on to consumers in product prices (EPR)	**Individuals**: Weak incentive to change purchase patterns as fee is a small percentage of purchase price **Industry**: Strong incentive to save by reducing materials and using more easily recycled materials

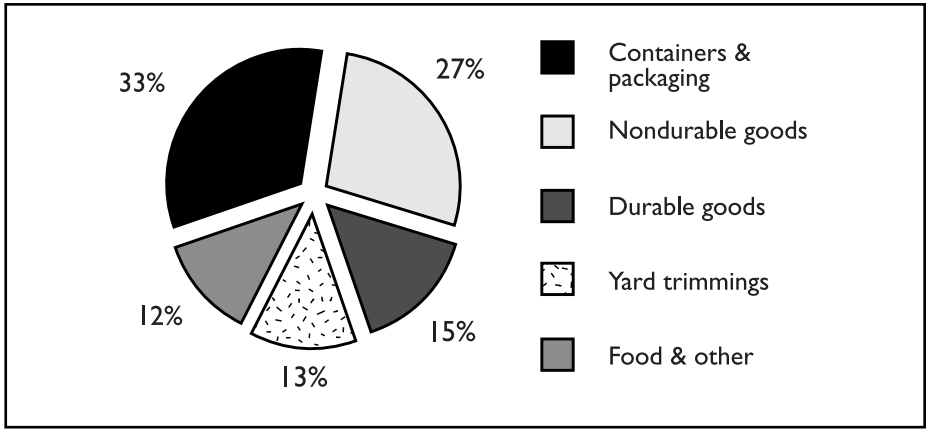
Source: Bette Fishbein, *Germany, Garbage, and the Green Dot: Challenging the Throwaway Society* (New York: INFORM, Inc., 1994), 177.

The United States has the largest economy in the world, uses a disproportionate amount of the world's raw materials, and generates a disproportionate amount of waste per capita. The nation's high level of waste generation is effectively subsidized by the funding of waste management out of general taxpayer revenues. EPR could change this situation by sending industry a powerful economic signal to provide products that reduce waste and facilitate recycling while leaving it free to innovate. So far, the US has not enacted any national EPR policy. But in today's global economy, no country or economy can remain isolated for long. Already, as described in the chapters that follow, EPR has been mandated by some states and is being undertaken on a voluntary basis by some companies. In the new millennium, the United States will continue to be affected and influenced by EPR programs implemented abroad.

CHAPTER 2. WASTE AND RECYCLING IN THE UNITED STATES

Municipal solid waste (MSW) is the waste stream that is the responsibility of local government in the United States and that is addressed by EPR programs abroad. It is but a small subset of the wastes described in Part I. As defined by the US Environmental Protection Agency (US EPA), MSW includes durable and nondurable goods, containers and packaging, yard trimmings, food scraps, and miscellaneous inorganic wastes from residential, commercial, industrial, and institutional sources. Municipal sludges, industrial process wastes, construction and demolition debris, automobile bodies, and combustion ash are not included within the definition of municipal solid waste.[2] MSW is the total waste generated – the amount recycled plus the amount sent to incinerators and landfills for disposal. Thus, any increase in the recycling rate will reduce the amount of waste sent for disposal but will have no impact on the amount generated. In the United States, composting is generally counted as recycling while waste-to-energy recovery is not.

Figure 1. Products Generated in MSW by Weight, 1997



Source: Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 11.

The composition of MSW in the United States is similar to that in most industrialized countries. Packaging accounts for the largest portion (about one third), by weight, of the products generated in MSW (Figure 1). In terms of materials, paper and paperboard is the largest category, making up almost 40 percent of total MSW in 1997.[3]

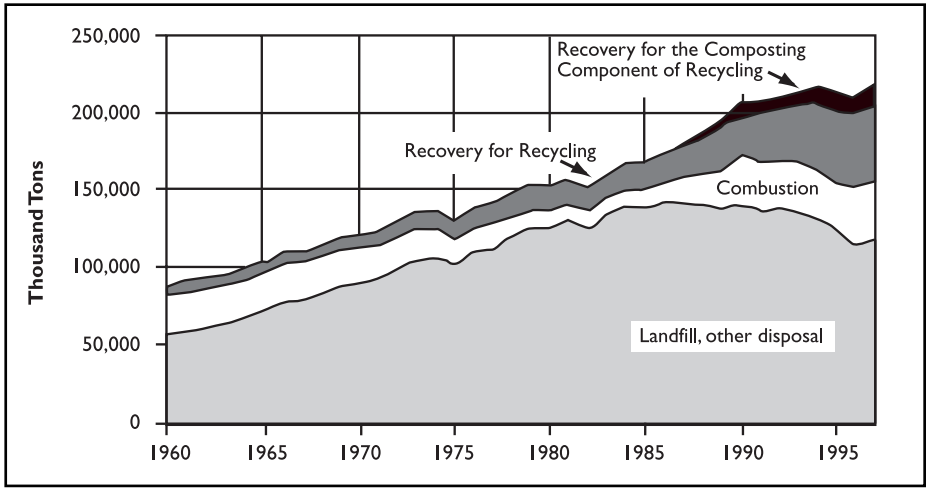
Historically, the trend in US municipal solid waste generation has been upward, from 88 million tons in 1960 to 214 million tons in 1994. MSW amounts then decreased for two years but turned upward again in 1997, reaching 217 million tons.[4] On a per capita basis, MSW generation grew from 2.7 to 4.5 pounds per person per day between 1960 and 1994, after which it declined slightly. The most current figures are for 1997, when total MSW generation stood at 217 million tons, or 4.4 pounds per person per day.[5] US EPA projects that total MSW generation will reach 240 million tons by 2005.[6]

In the 1960s, over 30 percent of US waste was incinerated and very little was recycled (Figure 2). Today, only 17 percent of MSW is burned, and its combustion almost always involves waste-to-energy recovery. In the 1980s, recycling increased dramatically but the nation's generation of waste continued to rise. As a result, the amount disposed of in landfills increased, reaching nearly 140,000 tons in 1990. Landfilling has declined since the early '90s but continues to be the dominant form of waste management in the United States. In 1997, over half the country's discarded waste ended up in landfills (Figure 3).[7]

Recycling in the United States

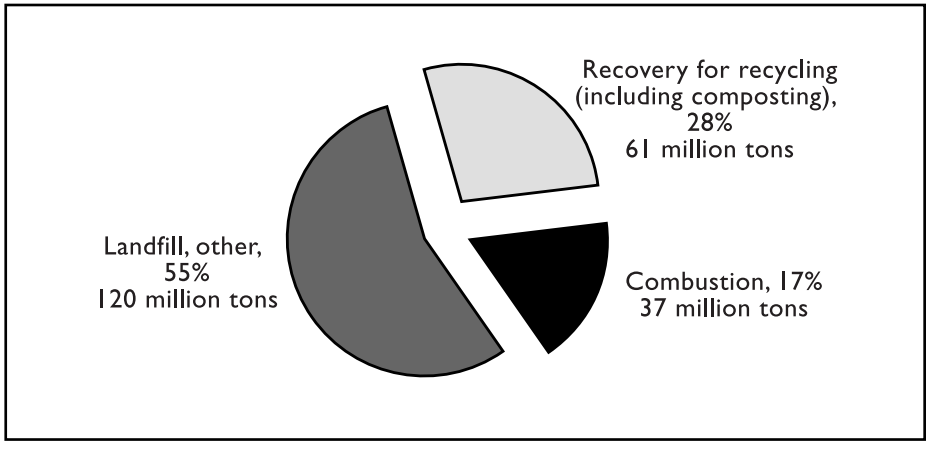
US recycling rates have increased dramatically in the past 25 years, from under 7 percent in 1970 to 28 percent in 1997, when 61 million tons were diverted from disposal.[8] The level of recycling that is achievable and desirable has been the subject of ongoing debate. J. Winston Porter, a former US EPA official, set the nation's recycling goal at 25 percent and believes that aiming for higher rates is not advisable.[9] On the other hand, Barry Commoner, a well-known environmentalist, has carried out demonstration projects showing the feasibility of 84 percent.

Figure 2. Municipal Solid Waste Management in the United States, 1960-1997



Source: Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 107.

Figure 3. Municipal Solid Waste Management in the United States, 1997 (total waste = 217 tons)



Source: Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 13.

Current concerns focus on stagnating recycling rates and diminished municipal funding sources for recycling programs. In fact, recycling rates for some materials are actually declining. For example, recycling of aluminum packaging declined from 53 percent in 1990 to 48 percent in 1997.[10] More dramatically, recycling of PET (polyethylene terephthalate) soda bottles declined from over 50 percent in 1994 to 36 percent in 1997. This is in part a reflection of the large increase in single-serve soft drink bottles, which are often consumed away from home and are difficult to recover.[11] Another major factor in the decline of PET recycling is the very low price of virgin resins.

Other problems are on the horizon. Miller Brewing Co., the nation's second-largest brewer, has test marketed tinted PET beer bottles, which could substantially increase recycling costs and decrease recycling rates for beer containers. In addition to being tinted amber, the new bottles have an oxygen barrier layer and use aluminum caps and paper-backed metallic labels – all of which interfere with recycling processes. Moreover, they contain no recycled content. Environmentalists have protested against use of the new bottles and the Los Angeles City Council has passed a resolution chastising Miller Brewing for introducing them before recyclability issues are resolved. Los Angeles plans to send the company a bill for any additional recycling costs the city incurs because of the bottles. A new blue-tinted PET water bottle from Coca-Cola threatens to further aggravate these recycling problems.

To address the problem of stagnant rates of recycling, the Clinton administration organized a conference at the White House in May 1998. The Workshop Summary stated that "...the rate of development and commercialization of new recycled products and recycling technologies has stagnated, and the infrastructure supporting recycling needs to be upgraded."[12] The purpose of the conference was to develop strategies to reinvigorate recycling initiatives and obtain the commitment of different stakeholder groups. The Clinton administration planned a major event to call attention to recycling and announce a new policy. Unfortunately, the presidential impeachment proceedings intervened and a major recycling initiative never materialized.

Recycling in the United States is generally the responsibility of municipal governments and is funded by taxpayer revenues. About 3500 communities have "pay-as-you-throw" systems in which households are charged based on the amount of waste generated. In most pay-as-you-throw programs, recyclables are picked up free of charge, which creates an incentive to both reduce the amount of waste generated and increase the amount recycled. However, only 8 percent of the US population is covered by such programs, which are common mainly in small communities.[13] For over 90 percent of Americans, the price paid for waste services is unrelated to the amount of waste they generate or recycle.

Packaging Recycling in the United States and Western Europe

It is extremely difficult to compare recycling rates in the United States and other countries because of differing definitions of waste and recycling and differing data collection methodologies. However, because EPR for packaging has been implemented throughout Europe, there is more data on packaging materials than on other product sectors. Table 2 (p. 70) presents some officially reported rates for the United States and Germany. The US data refer to total packaging and the German data to sales packaging only. Data for plastic recycling are not consistent in that "chemical recycling" is included in the German recycling rate but would not count as recycling in the United States. There may be other discrepancies as well, but it is clear that Germany's recycling rates are considerably higher than those in the United States. For example, even with chemical recycling excluded, Germany's mechanical recycling rate for plastics is over four times the US total of 9 percent.[14]

Recycling rates for packaging in other parts of Western Europe are also much higher than in the United States. For example, in 1998, Sweden, Switzerland, and the Netherlands, as well as Germany, had glass packaging recycling rates of over 80 percent; in contrast, the US recycling rate for glass packaging was 28 percent in 1997, the most recent year for which data is available.[15]

Table 2. Reported Recycling Rates in the United States and Germany, 1997

	United States Total Packaging	Germany Sales Packaging
Glass	28%	89%
Steel/Tinplate	61%	84%
Aluminum	48%	86%
Plastics	9%	69%
Paper/Paperboard	54%	93%
Composites	NA	78%
Total	**39%**	**86%**

Note: US data is for all packaging; German data excludes transport and secondary packaging.
Source: Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 70; "1997 Mass Flow Verification: No change in consumers' enthusiasm for collection," press release, Duales System Deutschland AG, Cologne, May 7, 1998.

Does the United States Have a Waste Problem?

Whether a "waste problem" exists in the United States has been the subject of heated debate. A 1996 cover story in *The New York Times Magazine* entitled "Recycling Is Garbage" argued that there is no waste problem, since America's "frontierland" is seemingly endless. At current waste generation rates, the author said, a single square landfill measuring 35 miles on each side by 100 yards in depth would suffice until the year 3000 — after which it could be converted into parkland.[16]

While land may exist that could hold the nation's waste, adequate landfill capacity is not the only problem. Waste is an issue in the United States because of opposition to interstate shipments of waste, to the siting of waste management facilities, and to pollution from waste transport vehicles. This is particularly the case in densely populated regions. New York City, for example, is closing its last remaining land-

fill in 2001 and plans to send 13,000 tons of residential garbage every day to other states, in addition to the commercial garbage it already exports.[17] There has been strong resistance to this plan in proposed recipient states such as Virginia, which could receive up to 2.2 million tons annually.[18] Although US courts have ruled that preventing waste from crossing state lines is unconstitutional – a violation of the Interstate Commerce Clause – the city's proposal has added fuel to the long-term debate over interstate shipments of waste. Congress has the authority to empower states to regulate and restrict waste flows but so far has failed to do so.

Waste management can be a contentious issue at the very local level as well. Citizen opposition makes the siting of landfills, incinerators, processing facilities, and transfer stations difficult. For example, when New York City announced it would ship its waste to landfills out of state, city residents quickly objected to the treatment and transfer stations to be built in their neighborhoods as part of the plan. The US Environmental Protection Agency is now conducting an inquiry into whether the siting of existing stations – and the polluting trucks that carry garbage in and out – reflects a racial bias against people who live nearby.

But the politics and logistics of waste disposal are not the main reasons why waste is a problem in the United States as well as in countries where landfill space is at a premium. Waste represents a squandering of resources. In contrast, reducing waste and recycling conserve resources by cutting down on the raw materials needed to make new products. This, in turn, reduces the huge environmental impacts of materials extraction (described in Part I), and of the processing and energy use associated with the manufacture of new products, which are far greater than the environmental impacts of waste disposal itself.

CHAPTER 3. GOVERNMENT WASTE POLICIES

There is limited waste policy at the federal level in the United States. Because managing waste is the responsibility of municipalities overseen by state government, most waste policy is initiated at the state and local levels.

Federal Waste Policies

Resource Conservation and Recovery Act

The major federal waste legislation is the 1976 Resource Conservation and Recovery Act (RCRA), which regulates active hazardous waste treatment and storage facilities and the transport (including the export) of hazardous waste. It also establishes requirements for state-level solid waste management plans; provides financial and technical assistance to states for their waste management programs; establishes minimum standards for the operation of solid waste facilities, including landfills and incinerators; authorizes the federal government to promote the development of markets for recovered materials; directs federal agencies to procure recycled-content items; and authorizes the Environmental Protection Agency (US EPA) to undertake various waste-related research, development, and information programs.

In 1992, an attempt was made to include an EPR provision for packaging in the RCRA reauthorization bill. This failed, ending efforts to enact EPR at the federal level. In 1994, the Republican Party gained control of both houses of Congress and a backlash against environmental programs ensued. The political climate since then has been hostile to the introduction of federal EPR legislation.

Procurement Guidelines

Government is the largest consumer in the United States – spending at the federal, state, and local levels accounts for 20 percent of the gross domestic product (GDP). In 1993, in an effort to use the spending power of the federal government

to promote markets for recyclables, President Clinton issued an Executive Order on procurement guidelines for executive agencies, contractors, and other entities receiving federal grant money. The order required the government to purchase paper with 20 percent post-consumer recycled content by 1994 and 30 percent post-consumer recycled content by the end of 1998. It also had provisions on the purchase of recycled products such as re-tread tires and re-refined motor oil, as well as other products designated as "environmentally preferable" by US EPA. In 1998, a new Executive Order was issued that toughened these "buy recycled" guidelines and improved compliance through fines and enforcement by federal auditors. While compliance remains an issue, both Executive Orders have helped develop the market for recycled products. Moreover, many state and local governments have adopted procurement policies consistent with the orders.

President's Council on Sustainable Development

A multi-stakeholder group comprising representatives from business, government, academia, and nongovernmental organizations, the President's Council on Sustainable Development (PCSD) was created by President Clinton in 1993 to recommend policies for sustainable development in the United States.[19] The subject of EPR was introduced to the PCSD by INFORM and immediately sparked a heated debate, with industry representatives strongly objecting to the idea of "producer" responsibility. Ultimately, the PCSD recommended a policy of "extended *product* responsibility," which differs from extended *producer* responsibility in the following respects:

1. Responsibility is for the environmental impacts of products over their entire life cycle, with no focus on the post-consumer stage.
2. Responsibility is shared by consumers, government, and all industry actors in the product chain, with no targeting of specific producers such as manufacturers or retailers.
3. Responsibility is not required to be physical or financial; for example, it may simply mean providing consumer education.
4. Responsibility is voluntary, not mandatory.

Clearly, the PCSD's definition of product responsibility is broader and less specific than the European definition of producer responsibility. One danger in this lack of specificity is that such a policy, in failing to focus on the post-consumer stage, may also fail to allocate any industry responsibility for this critical stage in the product life cycle. However, despite INFORM's argument that making everyone responsible for everything means no one is responsible for anything, the "product" responsibility recommendation prevailed at the PCSD. US EPA now uses the term EPR to refer to "extended product responsibility."

State Waste Policies

While industry has consistently argued that only market forces can ensure recycling's long-term sustainability, recycling is not completely market driven in the United States. In a number of states, legislation has had a considerable impact, and there has been a particular focus on "problem wastes" — those with toxic constituents that can leach from disposal facilities. Many states have also passed tax incentives to promote recycling.

- **Heavy metals in packaging**. In 1990, a model Toxics in Packaging Bill was drafted by the Coalition of Northeastern Governors. The bill includes a ban on lead, cadmium, mercury, and hexavalent chromium in packaging, and has been adopted by 18 states.

- **Recycled content of newsprint**. Over half the states have policies governing the recycled content of newsprint. Thirteen states have mandatory goals, generally ranging from 25 to 50 percent recycled content by 2000. Sixteen states have voluntary agreements.

- **Landfill bans**. Most states ban vehicle batteries, tires, and used motor oil from landfills. Some states also ban yard waste and white goods (appliances like refrigerators and washing machines). Currently, debate on landfill bans focuses on cathode-ray tubes (CRTs) used in TVs and computer monitors — a rapidly growing segment of the waste stream.

- **Tax credits for recycling**. Tax credits to promote or sustain recycling have been adopted by 26 states. Most apply to equipment used to collect, separate, and process recovered materials. Some states allow businesses to write off some or all of the cost of recycling equipment; others simply exempt recycling equipment from state sales tax.

Packaging Policies

Packaging legislation in the United States takes two forms: "rates and dates" and "bottle bills." Although structured very differently from take-back programs in Europe, these policies are related to EPR in that companies involved in the packaging chain have some involvement in collection or recycling.

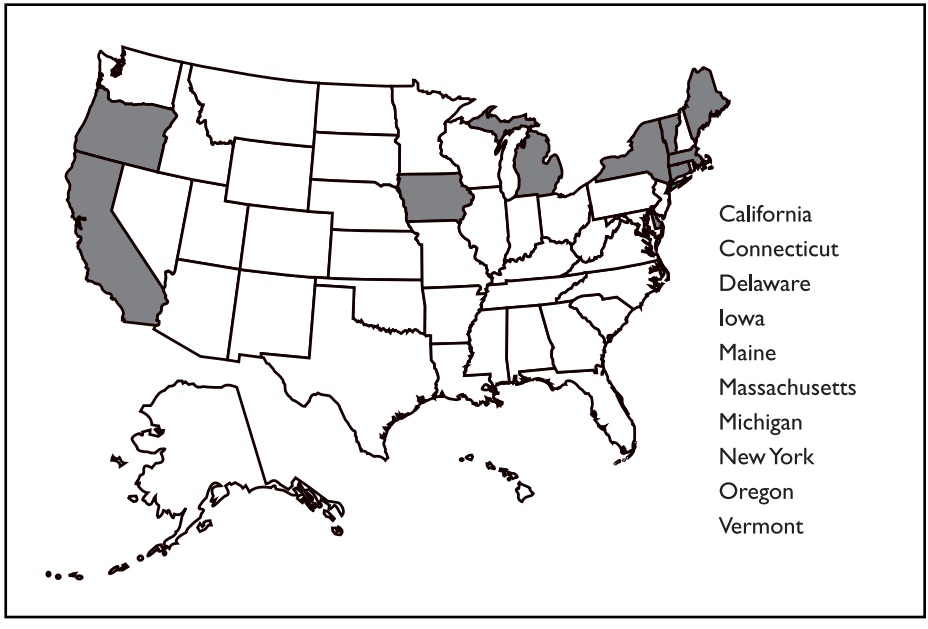
Rates and dates. This legislation requires packaging covered by state law to meet recycling targets within a given year. California and Oregon passed rates and dates laws in 1991, both setting a statewide annual recycling goal of 25 percent for rigid plastic containers. Companies that do not meet this goal in a given year must demonstrate that their own packaging has been reduced by 10 percent, has 25 percent recycled content, or is reused at least five times. Failure of a company to meet the targets can result in heavy fines.

So far, Oregon has succeeded in meeting the 25 percent annual recycling goal. California did not reach this target in 1996 and 1997, which caused a major debate on the reliability of its recycling data. The California Integrated Waste Management Board is negotiating compliance agreements with several companies and is pursuing enforcement against one company that has refused to comply with the audit process, but no fines have been imposed on any companies so far.

Other debates surrounding rates and dates laws relate to exemptions for certain product categories — food and cosmetics containers have been exempted in both states — and whether pyrolysis counts toward recycling targets. Oregon considered including this process as a form of recycling, but it has not been used to reach the state's recycling targets.

Bottle bills. Ten states have bottle bills that require deposit/redemption systems for certain beverage containers (Figure 4).[20] Bottle bills cover 30 percent of the US population and have had a major impact on recycling. In 1995, the average recycling rate for beverage containers was 76.3 percent in states with bottle bills and only 25.5 percent in states without bottle bills, for an average national rate of 40.2 percent.[21]

Figure 4. US States with Bottle Bills



Source: Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 98.

Repeated attempts to pass a federal bottle bill have all failed. Currently, efforts are under way to enact legislation that goes beyond traditional beer and carbonated beverage containers to include teas, fruit and sports drinks, and bottled water. California and Maine have both passed such bills.

Deposit/redemption systems in the United States differ from Germany's in not requiring recovered bottles to be refilled. Before 1960, almost all beer and soft drinks in the US were sold in refillable glass bottles, but the percentage has dropped to only about 6 percent.[22] Bottles recovered by US deposit/refund systems are usually recycled but not refilled.

EPR Policies

Despite the lack of a federal EPR policy, there has been considerable interest at the state level, where waste is a more immediate concern.

Battery take-back. Since 1989, 13 states have passed legislation requiring that batteries be properly labeled and easily removable from the products in which they are housed. Eight of these states included take-back provisions for nickel-cadmium (Ni-Cd) rechargeable batteries. Some, however, do not specify what should be done with the batteries after they are collected.[23] Exceptions are Minnesota and New Jersey, which have enacted the most far-reaching battery legislation. In these two states, rechargeable batteries must be labeled as to content and proper disposal and they must be easily removable (this is important because 80 percent of Ni-Cds are enclosed in products such as cell phones, cordless tools, and electronic devices); Minnesota and New Jersey ban Ni-Cds from the municipal waste stream and require manufacturers to take them back at their own expense for recycling or proper disposal.

In 1995, manufacturers of Ni-Cds and the products that contain them launched a nationwide battery collection and recycling program, in part to avoid having to comply with differing legislation in the states with mandated battery take-back. To administer the program, they formed the Rechargeable Battery Recycling Corporation, discussed in greater detail in Chapter 4.

EPR for mercury-containing products. Serious mercury pollution in Maine is contaminating the lakes, rivers, and marine life of that northeastern state. In 1998, Maine passed the Act to Reduce Mercury Use and Emissions, which contains an EPR provision mandating "the establishment of a collection system through which mercury-added products sold or offered for sale in the state can be returned for recycling to the manufacturer of the products." The state's Land and Water Resources Council was charged with the task of recommending implementing legislation. Although the council did endorse the concept of EPR, it was subject to heavy lobbying from opponents and did not propose any specific EPR legislation in its report of January 1999. The EPR issue remains under review.

Product stewardship in Minnesota. Minnesota has taken a greater interest in EPR than any other state. It was a leader in implementing battery take-back legislation and is now embarked on a product stewardship initiative that includes EPR.

Minnesota's Office of Environmental Assistance issued its Product Stewardship Policy Initiative in 1999. This is being pursued on a voluntary basis with the threat of legislation if sufficient progress is not made. The policy focuses on three priority products — paint, carpets, and CRTs — which are to be removed from the municipal waste stream at industry expense. As the draft policy states, "The costs of recovering resources and managing products at the end of life [should be] internalized into the costs of producing and selling products, so that those costs are not paid for by government."[24]

A multi-stakeholder task force has been formed for each of the three product categories. The task forces are to develop systems for removing these products from the waste stream and set specific goals and evaluation mechanisms. The door is open to the possibility of some government role in collection.

Advanced disposal fee for electronic products. South Carolina has been considering legislation that would impose a fee of 1 percent of the sales value on a broad range of electronic products such as computers, TVs, cameras, and VCRs. The fees would go into a state fund for the recycling of these products. Retailers and wholesalers would have to take back old equipment when they sell new equipment. The legislation has not yet passed.

Local and Grassroots Interest in EPR

Municipal governments across the United States are struggling with the responsibility of recycling and disposing of waste. They are particularly concerned about dwindling financing for recycling and the recent introduction of new packages, such as tinted and multi-resin plastic beverage containers, that are imposing a burden on recycling programs. For this reason, the US Conference of Mayors is a natural constituency for EPR.

In 1994, the organization passed a resolution endorsing the concept of EPR. Subsequently, it held forums on EPR and some conference members have toured Europe to learn how the policy is working there. The US Conference of Mayors

is expected to consider a new EPR resolution at its annual meeting in June 2000 that would spell out an action plan.

Finally, Raymond Communications publishes a newsletter on EPR and holds an annual "Take It Back" conference. In the firm's 1998 survey of state recycling managers, respondents from 30 out of 39 states expressed particular concern about discarded electronic equipment. When asked how this waste stream should be dealt with, they most frequently answered "producer responsibility."[25]

CHAPTER 4. "VOLUNTARY" INDUSTRY EPR INITIATIVES

EPR programs are often described as being either mandatory or voluntary, but they really fall along a continuum from mandatory to truly voluntary. Mandatory programs are those that are specifically required by laws or regulations. Truly voluntary programs are generally implemented as a way for companies to increase profits or gain a marketing advantage by taking back and recycling their products. There are numerous examples of such voluntary programs, including Xerox's Asset Recycling Management program and Kodak's take-back of single-use cameras, both discussed in this chapter. Many EPR programs, however, do not generate profits and in fact may increase costs, at least in the short term. Nonetheless, companies sometimes institute them on a "voluntary" basis for other reasons, such as to preempt pending or future legislation mandating EPR. This is true of EPR programs for vehicles in Germany and France, and particularly in the Netherlands, where companies have signed covenants for a number of product sectors to avoid legislative mandates. Such programs fall midway on the mandatory-to-voluntary continuum: while clearly not mandatory, they are driven by the threat of legislation and cannot be considered truly voluntary.

Industry invariably argues for voluntary rather than mandatory EPR. Often countries will begin with voluntary efforts and only opt for mandatory EPR if these do not achieve their goals. A voluntary approach to EPR for packaging was attempted in Germany and France, but both countries ultimately passed legislation. Voluntary EPR programs are popular in the United States, especially since the President's Council on Sustainable Development endorsed this approach in its 1996 report, *Sustainable America: A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future*.

Xerox: Asset Recycling Management Program

Xerox Corp.'s EPR program — instituted in 1990 as a cost saving rather than an environmental initiative — has likewise been effective in closing material loops through the integration of product design with end-of-life management. For years Xerox had been taking back leased equipment, which was piling up in warehouses, incurring storage and ultimately disposal costs. Eventually, the company realized that this material had considerable economic value that was being wasted. The Asset Recycling Management (ARM) program identified the savings that could accrue if the old equipment's residual value was maximized through product redesign and then recovered through reuse in new products.

Xerox leases 75 percent of the equipment it produces and accepts trade-ins on some of the products it sells. While many companies lease their products and therefore take them back from customers, Xerox is unique in using the following hierarchy to ensure the greatest possible recapture of the value of end-of-life products:[26]

1. Reuse
2. Remanufacture into the same product
3. Conversion into another product
4. Salvaging of parts for repairs and new products
5. Recycling of materials

In addition, Xerox uses life-cycle costing in product development so that residual value is factored into the model of total product costs. This means that a more expensive material may sometimes be used up front if it can increase recovery value at a product's end of life.

Around the world, industries faced with EPR legislation have changed their product designs to make recycling easier and more economical. To recapture maximum value, different types of plastic require different recycling processes, which in turn entail costly sorting. In the German auto industry, design changes have included reducing the number of plastic resins used, labeling plastics by type,

and using fasteners that facilitate disassembly. Xerox has implemented all of these design changes and more. Following are some of the ways in which Xerox has maximized recaptured value and minimized waste by linking product design to end-of-life management:

- **Reduced number of plastic resins**. The number of plastic resins used in the company's products has dropped from 500 to under 50. This has made recycling more economical by reducing both sorting costs and the number of processes required for recycling.
- **Labeled plastics**. Xerox now labels all plastics used in its products. It is also beginning to mold labels into the plastic casings of its equipment, eliminating labels and adhesives that interfere with recycling.
- **Innovative fasteners**. "Snap-fit" fasteners are replacing screws and bolts to facilitate disassembly.
- **Reduced use of hazardous materials**. Hazardous materials are eliminated whenever possible. When they must be used, designers ensure that detailed design plans record their location for easy removal and proper treatment at the product's end of life.
- **Design for remanufacturing/recycling**. The first Xerox product designed with environmental considerations in mind was the 265DC digital copier in 1997. To facilitate disassembly, the copier's replacement parts were reduced from 2000 to 250 — 84 percent are remanufacturable and 97 percent are remanufacturable or recyclable. The company uses 100 percent recycled plastic in its toner cartridges and is working on incorporating recycled plastic panels in new and remanufactured copier machines.
- **Design for commonality**. To facilitate reuse and remanufacture, parts are designed to be used across product lines — for instance, by copiers, printers, and scanners alike.
- **Reduced contamination**. Xerox has redesigned its inks to avoid contamination, which can significantly decrease the residual value of equipment. A powder-based ink used in toner cartridges can be easily cleaned out of equipment with soap and water. This is a good example of a design-based strategy that focuses on preventing a problem rather than ameliorating it after the fact.

Although problems related to recycling can often be solved through product redesign, few companies build end-of-life considerations into the design of new products. Moreover, there is little communication at most companies between

designers and those involved in recycling. Xerox is an exception. To develop products that can be easily disassembled and then reused, remanufactured, or recycled, the company's asset recovery engineers and design teams work together — identifying recoverable parts, determining how their value can be optimized, and estimating the useful life of each component to ensure a steady stream of feedstock for the company's remanufacturing and recycling operations (see Part IV, Chapter 4, for a discussion of design for engineering at Xerox).

The Asset Recycling Management program at Xerox is an example of a win-win voluntary EPR initiative. In 1997, it saved the company $40 to $50 million and resulted in the remanufacture of 30,000 tons of returned machines.[27] It is an approach that can serve as a model for many companies, though it may only be profitable for high-value products. Even Xerox has found that for lower-value equipment such as fax machines, the ARM program generates net costs rather than savings.[28]

Eastman Kodak: Take-Back of Single-Use Cameras

When Eastman Kodak launched the single-use Fling camera in 1988, the company was attacked by environmentalists and consumers for introducing a throwaway product that would only add to the country's waste pile. In response, Kodak renamed its product the Fun Saver and announced it would take back and recycle the used cameras. Clearly, this program was implemented for marketing reasons, to counteract severe criticism of a potentially profitable new product.

Fun Saver cameras are now recycled at facilities in the United States, France, and Mexico, and Kodak describes its take-back program as "extremely profitable" (there is even a "gray market" for used cameras).[29] Kodak reports that 250 million cameras have been recycled since the program's inception, resulting in the diversion of 41 million pounds of waste from disposal. The recycling rate is 70 percent in the United States and 60 percent worldwide. Kodak has also initiated an alliance with Fuji, Konica, and other camera manufacturers that allows them to collect each other's cameras and exchange them for recycling.[30]

Kodak's program has been facilitated by the fact that consumers do not have to participate directly. When a Fun Saver's film is used up, the customer brings the camera to a photofinisher for processing. Photofinishers receive 90 cents per pound (about 15 cents per camera) from Kodak to send the cameras to a company recycling facility. Shipping costs are also paid by Kodak, and the photofinishers avoid paying to dispose of the cameras as waste.[31]

Meanwhile, Kodak has found ways to reuse most of the Fun Saver's parts; materials it cannot reuse are recycled. Usually, only the lens and battery need to be replaced. When parts can no longer pass quality control, they are reground and used as raw materials in the manufacture of new cameras. The company claims that 86 percent of the camera by weight is recycled or reused. As a result of the take-back program, the Fun Saver's design has been linked to its end-of-life management — a primary goal of EPR. In fact, a camera originally designed to be used once and then thrown away can now, according to Kodak, be reused about 10 times.

Kodak has received many prizes for its take-back /recycling program, including the International Corporate Environmental Achievement award from the World Environment Center in 1999. The company reports that single-use cameras are its fastest-growing product line and that recapturing materials in a closed-loop system has enabled it to reduce costs.[32] However, the ultimate environmental impacts of the Fun Saver are not so clear. Even when taken back, reused, and recycled, single-use cameras consume far more resources than traditional cameras, which can last a lifetime or more. On the other hand, reusing and recycling such products is certainly preferable to disposing of them.

Take-Back of Ni-Cd Batteries: An Industrywide Initiative

The only nationwide and industrywide EPR program in the United States is a program to take back and recycle nickel-cadmium batteries (Ni–Cds).[33] Industry launched this "voluntary" initiative after eight states mandated take-back of Ni-Cds. It was undertaken as an alternative to establishing separate systems in the states with mandated take-back as well as to preempt future legislation in other states.

The battery program is voluntary in that there is no nationwide law requiring take-back of Ni-Cd batteries. Because it was motivated by legislation, however, it must be considered to fall midway on the mandatory-to-voluntary continuum. The program does have one truly voluntary component. The eight states with battery take-back laws require industry to either recycle or properly dispose of spent Ni-Cds. It was industry's decision that all collected batteries would be recycled.

It took six years for industry to implement the Ni-Cd take-back program. Because of federal hazardous waste regulations in effect before 1996, shipping and handling the batteries would have been very costly and handlers would have been exposed to substantial liability. In May 1996, federal legislation was finally adopted that eliminated these obstacles in the case of batteries sent to recycling facilities.

Battery Collection and Recycling

The Ni-Cd take-back program is very similar to Germany's Green Dot system, administered by Duales System Deutschland (DSD). To implement the collection and recycling of batteries, industry established the Rechargeable Battery Recycling Corporation (RBRC). Like DSD, RBRC is a nonprofit company that licenses its logo to manufacturers of Ni-Cds and the products that contain them.

Figure 5. Logo of the Rechargeable Battery Recycling Corp.

Licensing fees are used to fund the take-back program and are based on battery weight — typically about 5 cents for the battery in a cellular phone, 10 cents for the battery in a portable computer, and 4 to 12 cents for the battery in a power tool. Licensees have the right to display the RBRC logo on their batteries or on products that contain them (Figure 5). Companies that choose not to

become licensees must implement their own programs in states mandating take-back of Ni-Cd batteries.

RBRC has set up three separate collection systems for the different generators of used Ni-Cds: retailers, communities, and businesses and public agencies. RBRC pays all recycling costs; it pays shipping costs for retailers and communities but not for businesses and public agencies. RBRC also runs a public education program, Charge Up to Recycle! Its spokesperson, TV star Richard Karn, appears in public service announcements and has toured the country on behalf of the program.

Ni-Cd recycling costs represent about 1 percent of the battery price; 80 percent of Ni-Cds are housed within products, however, and recycling costs as a percentage of product price are much lower. Batteries are recycled by International Metals Reclamation Co. (INMETCO), the only recycler in North America able to perform the high-temperature process required to reclaim all the component raw materials of a Ni-Cd battery. For many years, INMETCO has been reclaiming nickel from Ni-Cds for use in the production of stainless-steel products such as sinks. Under its contract with RBRC, the company had to expand to provide adequate cadmium smelting capacity. Its $5 million cadmium recycling plant opened in January 1996. Reclaimed cadmium, which is 99.95 percent pure, is used in the manufacture of new Ni-Cd batteries.

RBRC's Track Record

A voluntary system to take back batteries can have little effect unless a substantial number of producers agree to become licensees. RBRC seems to have cleared this hurdle: as of 1999, 265 companies, accounting for over 80 percent of the Ni-Cd batteries sold in the North American market, had become licensees. However, since RBRC recycles all Ni-Cds that enter its collection system, regardless of whether they bear its logo, there are continuing concerns about "free riders" — companies that benefit from the program but do not contribute to its funding. Since about 80 percent of North American battery producers have joined the RBRC program, the remaining 20 percent are potential free riders.

Table 3. Ni-Cd Battery Recycling in the United States and Canada

Calendar Year*	Total Recyclable Pounds Entering Waste Stream	RBRC Market Penetration	RBRC Program Pounds Entering Waste Stream	RBRC Program Pounds Recycled	RBRC Program Recycling Rate
1993	14,221,000	-	14,221,000	284,000	2%
1994	15,760,000	-	15,760,000	630,000	4%
1995	17,921,000	-	17,921,000	2,703,000	15%
1996	20,542,000	-	20,542,000	3,078,000	15%
1997	22,454,000	75%	16,840,500	3,782,000	22%
1998	23,231,000	80%	18,584,800	4,646,200	25%
1999	26,330,000	81%	21,327,300	6,398,190	30%
2000	27,917,000	82%	22,891,940	8,012,179	35%
2001	28,242,000	83%	23,440,860	9,376,344	40%
2002	28,199,000	84%	23,687,160	11,843,580	50%
2003	28,032,000	85%	23,827,200	14,296,320	60%
2004	28,035,000	86%	24,110,100	16,877,070	70%
2005	28,027,000	87%	24,383,490	19,506,792	80%

* Numbers for 1998 to 2005 are projected; numbers for 1997 are under review by RBRC.
Source: Rechargeable Battery Recycling Corp., "Charge Up to Recycle," Fall 1998.

RBRC reports that the Ni-Cd recycling rate in 1997 was 22 percent, up from 2 percent in 1993 (Table 3). The rate for 1999 is estimated at 30 percent. RBRC originally set a recycling goal of 70 percent by 2001, but this has been revised downward to 40 percent. However, RBRC now projects an 80 percent recycling rate for 2005. RBRC calculates recycling rates as a percentage of licensed batteries entering the waste stream. Rates based on total batteries entering the waste stream would be lower.

RBRC has expanded its program into Canada and may expand into other countries as well. It is also considering including other types of rechargeable batteries in the program, such as nickel-metal hydride, lithium-ion, and sealed lead-acid batteries.

Lessons of the RBRC

The reported increase in Ni-Cd recycling from 2 percent in 1993 to 22 percent in 1997 is impressive, but whether RBRC will be able to meet its goal of 80 percent recycling by 2005 depends on the cooperation it gets from consumers and the three collection sectors. It is still easy for consumers to throw used Ni-Cds away with their regular garbage and many are confused about how to distinguish Ni-Cds from other battery types. Finally, despite RBRC's publicity campaign, many people are still unaware of the program.

Nevertheless, this industry initiative could become a model for other product sectors of a system in which a third party handles take-back on behalf of many participating companies. Obviously, different systems will be needed for different products, but RBRC's program shows that such initiatives are possible in the United States and can be designed to be compatible with environmental and other laws. Contrary to the predictions of some critics of EPR, the battery take-back program did not run afoul of US antitrust laws.

The way in which the battery program was conceived and implemented, with a few states providing the impetus for a nationwide program, may also serve as a model. Currently, legislators in several states are considering EPR for other products, particularly those with toxic or hazardous constituents such as cathode-ray tubes (CRTs) and mercury-containing products.

A major goal of EPR programs is to influence product design. In the case of Ni-Cds, the hazardous material, cadmium, is fundamental to product function and cannot be designed out. (In contrast, mercury has been designed out of most batteries.) Since the take-back program internalizes the costs of collecting and recycling used batteries, it provides an incentive to develop alternatives that do

not have hazardous constituents — products that cause less environmental damage and are cheaper to recycle or dispose of properly. In fact, Rayovac is already marketing a "renewable" battery that is rechargeable and nontoxic; however, it cannot replace Ni-Cds in many applications.

The shift in responsibility for end-of-life Ni-Cds from municipal government to industry has the potential to drive innovation in battery design, recycling technologies, and collection systems. Despite attempts (mainly in Europe) to ban them, Ni-Cds will probably continue to be widely used in the near term. RBRC's program to collect and recycle them at industry expense is therefore an important step forward. At the same time, however, it is important that the program not be used to justify unnecessary battery use, especially in light of the dramatic increase in the use of Ni-Cds in recent years.

EPR in the Carpet Industry: A Diversity of Programs

The carpet industry is unique in the United States in acknowledging its responsibility for the post-consumer stage of its products. Over 2 million tons of carpet are discarded each year in the United States, about 1 percent of municipal solid waste by weight.[34] While this amount may not seem large, discarded carpet in fact accounts for more of the waste stream than other products that have raised many more public concerns, such as magazines, aluminum cans and packaging, and paper bags and sacks. The major carpet makers and fiber producers are making serious investments in recycling technologies, and these have the potential to significantly reduce the amount of carpet sent for disposal. In 1997, however, less than 1 percent of discarded carpet was recycled.[35]

Numerous companies at different points in the carpet product chain have voluntarily implemented take-back programs. These include nylon resin and fiber producers such as AlliedSignal, BASF, and DuPont and carpet mills such as Interface, Milliken, Collins & Aikman, and Shaw (all discussed below). Although most of these programs have not generated a profit so far, companies are actually competing with each other for used carpet. In contrast to the Ni-Cd battery take-back program, these carpet recycling initiatives are not driven by state laws mandating EPR.

The economics of carpet take-back are different for different companies. Some of the reasons for launching these initiatives in the carpet industry include the following:

- **Profits**. Some take-back/recycling programs hold the promise of profitability — for example, as a way to replace virgin materials with lower-cost recycled nylon.
- **Marketing**. Take-back/recycling programs are viewed as a strategy for increasing market share in a competitive industry. For example, an important customer base is architects and designers, who are demanding increased recycled content and recyclability.
- **Increased demand for recycled-content parts**. Some auto manufacturers are setting ambitious recycled-content goals for auto parts. The large nylon producers are important suppliers (automotive products account for about one-third of nylon's end uses) and can provide parts made from recycled carpet.[36]
- **Preempting legislation**. As EPR mandates proliferate around the world, the industry is worried about take-back legislation and landfill bans at the state level.
- **The example of Interface**. This company's highly publicized efforts to move toward leasing and closed-loop recycling of carpet have garnered a great deal of attention — though some competitors deny that Interface has been the catalyst for their own initiatives.

The recycling programs of AlliedSignal, BASF, and DuPont target nylon face fiber.[37] Face fiber is the most valuable component of carpet, accounting for one-third to one-half its weight (the rest is backing, filler, and adhesives). Sixty percent of face fiber is nylon, of which the two types used in carpet — nylon 6 and nylon 6,6 — may require different recycling processes depending on the end product. Nylon 6 resin is made by AlliedSignal and BASF and is extruded into fiber by these companies or by the carpet manufacturers. Nylon 6,6 is made by DuPont and Solutia and is sold as fiber. Currently, nylon 6 and nylon 6,6 account for 45 and 55 percent of the nylon carpet market, respectively, but the gap is narrowing.

AlliedSignal: Nylon into Nylon

AlliedSignal is the second-largest nylon producer in North America, trailing only DuPont. It produces a billion pounds of nylon 6 per year, half of which is used in carpet. To recycle this material, Allied formed a partnership with DSM (Dutch

State Mines Chemical Co.) and established Evergreen Nylon Recycling LLC, which in November 1999 opened a large facility in Augusta, Georgia. This plant has the capacity to process over 200 million pounds of used commercial nylon 6 broadloom per year into new nylon of the same quality as nylon 6 made from virgin materials. Nylon 6 carpet fiber made from the recycled material, which is fully recyclable indefinitely, will be marketed under the Infinity trademark.[38]

Allied and DSM have invested $85 million in this project. Their primary motive is economic. With the market for nylon 6 increasing in recent years, the two companies concluded that reprocessing post-consumer carpet is a less costly way to meet the demand for nylon 6 feedstock. According to Allied, its patented depolymerization process is unique in eliminating the need for expensive mechanical separation of face fiber from the carpet's backing.[39] It also claims that the 200 million pounds of nylon 6 it plans to use in place of virgin feedstock every year will reduce oil use by 700,000 barrels, energy use by 4.4 trillion Btus, and greenhouse gas emissions by 67 percent.[40]

Ultimately, the system's economic viability will depend on reclaiming large amounts of used carpet. Allied is working with retailers, dealers, waste haulers, and recyclers to build its collection network for used carpet. By 2002, it expects to have 150 suppliers in 120 metropolitan areas, up from 40 suppliers in 33 metropolitan areas in 1998.[41]

Allied has also developed a handheld infrared device for identifying the composition of face fiber. Companies involved in Allied's collection network can rent the CarPID for $200 per month and use it to determine whether a carpet is made from nylon 6. Allied will take back any nylon 6 carpet, even if it is made by a competitor such as BASF.[42] The Carpet and Rug Institute (an industry trade association) recently implemented an identification system for carpet materials (see p. 100), but this will not be effective until carpet manufactured today has been discarded — about a decade from now. At present, Allied's CarPID device is playing an important role in identifying carpet composition.

BASF: Carpet into Carpet

In 1994, BASF introduced the 6ix Again Recycling Program to handle post-consumer commercial carpet made from the company's nylon 6 fiber. Commercial carpet that meets specifications is recycled through depolymerization into new Nylon 6ix yarn, into other products, or is disposed of properly by independent companies. BASF guarantees that no Nylon 6ix fiber reclaimed from carpet submitted to the program will be landfilled or incinerated. There is no fee to participants (except for shipping), and eligibility does not require that the replacement carpet be a BASF product.

Early in 1998, the company introduced the 6ix Again Expansion Program. BASF will now take back commercial carpet of any fiber or backing type made by any manufacturer, as long as the replacement carpet is a Nylon 6ix product. If a viable recycling method is available, the returned carpet is recycled. Otherwise, it is incinerated (preferably as a substitute fuel), but not landfilled. In addition to shipping costs, participants pay 40 cents per square yard to cover the costs of the program. While no quantitative data is available, BASF reports that the rate of take-back by both programs is increasing.

DuPont: Carpet into Other Products

In 1991, North America's largest nylon producer, DuPont, initiated the Partnership for Carpet Reclamation with carpet dealers, carpet mills, designers, and end users. Intended to find new ways to utilize old carpet, the program collected all commercial carpet for a fee, as long as the replacement was 100 percent nylon 6,6 from DuPont. The used carpet was recycled into new resins to be used in the automotive industry. In six years, approximately 30 million pounds (15,000 tons) were recycled through this program.

In 1997, DuPont renamed and changed the structure of its carpet recycling program. Now called the Carpet Reclamation Program, it is administered by DuPont Flooring Systems, a wholly owned subsidiary of E.I. duPont de Nemours and Co. The Carpet Reclamation Program still collects commercial carpet, but the replacement carpet no longer has to be made of DuPont fiber. Most of it still

is, however, because this is mainly what DuPont Flooring distributes through its dealers. Reclaimed fiber and carpet tiles are demanufactured or recycled for use in automotive and other applications.

All of DuPont Flooring's 80 US dealers participate in the program, collecting approximately 20 million pounds (10,000 tons) of carpet per year. Used commercial carpet is collected when new carpet is installed, regardless of manufacturer, fiber type, or construction. The Carpet Reclamation Program receives a fee from DuPont Flooring dealers based on the cost of landfilling the used carpet — a cost ultimately passed on to the customer. The combined revenues from these fees, and from the sale of recycled materials, are used to offset the costs of the reclamation program. A basic principle is that no carpet removed by DuPont Flooring Systems will be landfilled. Materials are collected, remanufactured, and recycled as follows: [43]

- Nylon 6,6 broadloom accounts for 31 percent of collected materials and is demanufactured into pelletized resins. These are sold to automotive companies, which mold the resins into air-cleaner housings and other under-the-hood parts. Over three million Ford vehicles now on the road include such parts. The non-nylon by-products are used for soil enhancement by local nurseries.
- Non-nylon 6,6 broadloom accounts for 40 percent of collected materials and is made into fiber used in padding, soundproofing, and sod reinforcement. Another application is Hummer Turf, used in sports stadiums and golf driving ranges. Here, real grass is planted in remanufactured fiber mixed with compost.
- Vinyl-backed carpet tiles account for 21 percent of collected materials and are recycled into flooring tiles used in applications from warehouses to dance floors.
- Miscellaneous contaminated materials account for 8 percent of collected materials and are used as a coal substitute in the production of electricity.

With the parent company manufacturing nylon 6,6 carpet fiber and its subsidiary engaged in selling, installing, maintaining, and reclaiming carpet, the only link in the chain in which DuPont is not involved is carpet manufacturing. DuPont claims that its Carpet Reclamation Program is the largest carpet recycling project in

the world. It has not yet made a profit, but DuPont is confident that this will change. The company anticipates that its flooring systems subsidiary will eventually expand to as many as 300 facilities and that the take-back program will serve as a model for other DuPont products.

DuPont is also testing a patented depolymerization process that allows mixtures of nylon 6 and nylon 6,6 to be made into nylon 6,6 fiber. The new fiber, with up to 50 percent post-consumer recycled content, can be recycled repeatedly. DuPont has invested over $15 million in this new technology and will open a demonstration plant in Maitland, Ontario (Canada), in 2000. This plant will be able to process 2 million pounds of nylon per year. If the operation is successful, a commercial plant with 10 to 20 times the capacity of the Maitland plant could be launched by 2002.[44]

Finally, DuPont is working on mechanical methods to incorporate recycled content into its carpet fibers. Its goal is "a fully sustainable closed-loop system where every nylon carpet made will have the opportunity to be collected and reprocessed into another new high-value product."[45]

Interface: Closing the Loop

Interface, Inc., in Atlanta, Georgia, is the fifth-largest carpet company in the world, with annual global sales of over $1 billion. It has been a leader in incorporating sustainability goals into company operations and in working toward a closed-loop flow of materials (see Part IV, Chapter 4, for a discussion of Interface's commitment to sustainability). The following quote from the company's "Sustainability Report" reflects its thinking on these issues:[46]

> Interface is redesigning its processes and products into cyclical material flows...We are reducing use of raw materials and working to get the most value out of the materials that we employ. This includes careful recycling of synthetic materials so that waste materials in society become valuable raw materials in industry...[M]anufacturers must design and create their products with components that will retain value when they return, and not just when they leave the factory.

As a result of these efforts, Interface chairman Ray Anderson was named co-chairman of the President's Council on Sustainable Development in 1997.

Interface reclaims and recycles used carpet through its Interface Americas division. In 1998, it reclaimed 4 million pounds of used carpet from sites where new carpet was being installed.[47] Interface guarantees that no reclaimed carpet will be land-filled and pursues the following alternatives:

- Repurposing – making used carpeting useful again through cleaning and refurbishment
- Recycling (closed loop) – turning used carpet back into new carpet
- Downcycling – separating used carpet into its components and making these into products of lesser value.

Interface is best known for the Evergreen lease program launched in 1995. This was an attempt to transform a durable commercial product – carpet tiles – into an ongoing service. Customers were offered a long-term operating lease under which the producer owned the end-of-life carpet. Rather than buying the carpet itself, the customer "bought" the service of keeping the space carpeted. The producer was responsible for purchasing, maintaining, and replacing the carpet tiles over the period of the lease and recycling them at the end of life. This created an incentive to produce a long-lasting product requiring minimal care that would not end up in a waste disposal facility. Like product take-back, the Evergreen lease was a way to extend producer responsibility to the post-consumer stage and move manufacturing toward a closed-loop model of materials use.

The original Evergreen program was not economically competitive and very few leases were signed. In 1999, Interface launched a new lease program in which the lessee owns the carpet at the end of the lease. The program also includes a take-back provision under which Interface will recycle used carpet. It is not yet known whether the new program will succeed, but Ray Anderson's promotion of leasing as a mechanism to promote producer responsibility has attracted a lot of attention and is being considered in other product sectors.

Interface is also designing new products for take-back and recycling. In the spring of 1999, the company launched its Solenium floor covering, which Interface describes as "resilient-textile flooring" — a new category in between carpet and hard-surface flooring. Solenium uses 30 percent fewer raw materials than traditional carpet and is 100 percent recyclable. After reclamation, 100 percent of the product can be recycled for use in new Solenium. The company is also researching new materials, such as polymers made from plants, that can be used in carpet production without depleting nonrenewable resources.

Milliken: Refurbishing Carpet

Milliken's Earth Square program, formerly called Earthwise Ennovations, or E^2, allows modular carpet tiles in commercial applications to be cleaned, retextured, repatterned, and sent back into use. After the carpet has been refurbished, Milliken will return it to the same customer or resell it to someone else if the original customer does not want it. In 1997, over 30,000 yards of material were sent back to Milliken in about 20 projects. In addition to keeping discarded carpet out of the landfill, the program claims to make refurbished carpet available at about half the price of new.[48] A drawback is that decorative patterns can be added but not removed. As a result, pattern options are limited and carpet tiles become darker every time they are refurbished.

Milliken stresses that its carpet is "renewed" and thus recaptures higher value than recycled products.[49] In 1998, the US General Services Administration, the federal government's procurement arm, selected the Earth Square program to receive its first Evergreen Award, which recognizes environmentally sensitive engineering, design, products, and processes.

Collins & Aikman: Carpet into Carpet Backing

Collins & Aikman recycles face fiber and backing into new carpet backing. Its Infinity Initiative covers both commercial carpet and industrial flooring. The policy is "to take back all Collins & Aikman carpeting ever produced" at no fee except for shipping, the cost of which is shared. The company will also take

back any other company's carpet as long as the backing is a vinyl of "similar configuration" to its own. Again, there is no fee except for the shared cost of shipping.

Collins & Aikman claims to be the only company to provide a written guarantee that a carpet will never be landfilled or incinerated. Since 1997, 100 percent of reclaimed carpet and carpet tiles have been manufactured into a 100 percent recycled-content carpet backing called Environmentally Redesigned, Reused, Recycled, or ER^3. The company claims that since this backing contains nylon from the face fiber of used carpet, it is more stable than traditional, all-virgin backing material. Additionally, the ER^3 backing lasts longer than regular backing (it is guaranteed for 15 years) and costs the same. The company has announced that as of the end of 1999, no virgin material will be used in its backing for carpet tiles. Ultimately, ER^3 could become the standard backing for all Collins & Aikman products.

Shaw Carpet

Shaw Industries Inc. is the largest carpet manufacturer in North America. The company's dealer network, Shaw Contract Group, will reclaim any used carpet from customers who buy a new Shaw product and opt to have their old carpet recycled. Although customers who choose to recycle must pay the costs, Shaw points out that recycling old carpet allows them to avoid paying for disposal. Recycling still represents a net cost, however, and most customers choose disposal over recycling. Shaw assures customers who do participate in the recycling program that no returned carpet will be landfilled and provides a recycling certificate to back up its claim.[50]

Shaw works with a number of recyclers (including Wellman, Inc., and Star Recycling) and recycling partners (including AlliedSignal). It sends used nylon 6 carpet collected from customers to the Allied/DSM recycling facility in Augusta, Georgia (see p. 92). The company is an active partner in Allied's recycling project – as a collector of used carpet, which provides Allied with feedstock, and as the major user of Allied's recycled nylon 6 output. Shaw sends used nylon 6,6 to recyclers, which generally downcycle it into injection-molded automotive parts.

Carpet backing is mainly sent to disposal facilities, although some is ground into powder and used as filler in new backing.[51]

Shaw has developed a new backing called EcoWorx — a thermoplastic polyolefin that is an alternative to polyvinyl chloride (PVC). EcoWorx has no chlorine or plasticizer content, costs no more than PVC, and is 100 percent recyclable into new EcoWorx backing. Shaw intends for the product to ultimately have 100 percent recycled content, but it will be 10 to 15 years before sufficient quantities of used EcoWorx are available to meet this goal. The new backing can be used with different face fibers in both tiles and roll carpet. According to Shaw, when EcoWorx backing is combined with the company's new EcoSolution nylon face fiber, the result is "the most environmentally sophisticated and responsible carpet system available today."[52]

Lessons of Voluntary Carpet Take-Back Efforts

The carpet industry is distinctive in the number of companies that have initiated take-back programs. It demonstrates a concern by producers for the post-consumer stage of their products that is a very positive development. Despite their efforts, however, the recycling rate for carpets is very low. This is in large part due to the high costs of collection, transportation, sorting, and recycling relative to the cost of virgin resins. Unlike mandatory programs, the success of voluntary programs depends on their economic viability. Purchasers of new carpet will continue to send their old carpet to landfills as long as disposal is cheaper than recycling. While the economics may well improve as the volume of carpet recycling increases, the success of current and future programs also depends on changes in carpet design.

Changing design. A basic goal of EPR is to link end-of-life management with product design. Changes in carpet design that could facilitate carpet recycling and reduce its costs include reducing the number of materials used, using easily removed adhesives, and even making carpet from a single resin. According to an analysis performed at Carnegie Mellon University, design changes such as these could make carpet recycling an "attractive business."[53]

One problem is that companies such as AlliedSignal and DuPont, which are making large investments in recycling facilities, are not carpet manufacturers. Thus, while they incur costs that result from design decisions, they have no input into those decisions. Carpet manufacturers, however, have no incentive to design for recycling as long as they are not the ones to ultimately bear its costs. Unlike EPR programs in Europe, most US carpet manufacturers with recycling programs do not promise to take back the carpet they sell at end of life. Rather, they will take back replaced carpet upon installation of their own product. This provides no incentive to design for recycling. (Of course, carpet manufacturers do have such an incentive when they recycle their own carpet.)

Another difficulty is that carpet lasts about 10 years, so design changes made now will not have an impact within the short payback period that companies often demand. As a result, there is much more focus on new recycling technologies than on design changes that could make recycling more economical.

Labeling materials. The Carpet and Rug Institute has developed the Carpet Component Identification Code to facilitate the recycling of used carpet by labeling its component materials. The system is similar to the one developed by German automobile manufacturers and other industries in response to (or in anticipation of) take-back legislation. Implementation of the US system only began in 1996, which means that labeled carpets will not be entering the recycling stream for about another 10 years. In the meantime, face fiber can be identified by means of AlliedSignal's CarPID device.

Preempting legislation. One of the motivating forces for voluntary company take-back programs is the fear of impending legislation. Although there is no mandated EPR at the state or federal level in the United States, industry remains concerned because EPR policies are spreading rapidly around the world. In the United States, Minnesota has sent a warning signal to the industry by pressing for producer responsibility for carpet under its product stewardship program. State landfill bans on carpet also remain a threat. Finally, state procurement

guidelines in Delaware, Washington, and Oregon require that contractors take back used carpet for reuse or recycling whenever they install new carpet.

Voluntary Versus Mandatory Take-Back

A voluntary take-back program, by definition, is not required. In such a program, a customer purchasing new carpet can choose to have the old carpet sent to a landfill or taken back and recycled. Either way the customer pays for waste management, and since disposal is currently cheaper than recycling, most still opt for the former. Major differences between the voluntary efforts of the US carpet industry and most mandated EPR programs are that take-back usually is not free and there are no guidelines for end-of-life treatment. While keeping carpets out of the landfill is a general goal of these programs, some companies are sending collected carpets to waste-to-energy facilities, which would not be permitted in many mandatory EPR programs. Since these programs are voluntary, they are not required to meet any specific recycling targets.

Unlike EPR programs in Europe, where take-back is usually handled by a third-party producer responsibility organization, voluntary carpet initiatives in the United States are being undertaken by individual companies — both carpet manufacturers and the large chemical companies that produce the resins from which carpet is made. The competition this fosters has had the positive effect of driving companies to implement their own programs. But it has also resulted in redundancy and inefficiency.

The new AlliedSignal/DSM recycling facility, for instance, has the capacity to process 200 million pounds of used nylon 6 carpet a year into new fiber, but only if a steady stream of old carpet is guaranteed. Unfortunately, Allied has been forced to compete for this feedstock with the take-back programs of much smaller companies, and the economic viability of its program remains to be seen. But if cooperation instead of competition were the rule, all nylon 6 carpet could be sent to Allied and all nylon 6,6 carpet could be sent to DuPont — or to whichever company has the best technology for recycling each material. Overall,

greater cooperation among fiber and carpet companies in the collection and sorting of used carpet, and in its transport to the appropriate facilities, could greatly facilitate recycling and reduce its costs.

US carpet take-back initiatives are also unique in being undertaken without major debate on who is responsible for this product's end of life. Both carpet manufacturers and resin producers are taking back carpets, and most programs appear to be driven, at least in part, by marketing concerns. In contrast, EPR programs outside the United States (and the RBRC in the US) have resulted from debate and negotiations over who is responsible for the post-consumer stage of a specific product (packaging, batteries, electronics, etc.), and the conclusion has varied from country to country. For example, in Germany the primary responsibility for packaging waste is borne by the filler of the package, while in the United Kingdom a portion of the financial responsibility is allotted to each actor in the industry chain.

Whether the US or the European model in the end proves most effective, the growing numbers of voluntary take-back initiatives for carpet are clearly a positive development. They have made companies focus on the waste generated by their products and have led to the development of new recycling technologies and some design changes. Hopefully, they will ultimately lead to enough design changes to make the overall system of collection and recycling more efficient and economical.

CHAPTER 5. PROSPECTS FOR EPR IN THE UNITED STATES

The future of materials policy in the United States, and of EPR in particular, is likely to be affected by three major factors: the political climate, the nation's ability to learn from the experience of EPR elsewhere in the world, and the opportunities for alternative approaches.

Political Climate

So far, the political climate has not been conducive to legislating EPR in the United States, particularly since the Republican Party took control of both houses of Congress in 1994. The 1990s have been characterized by great prosperity and by extremely pro-business political sentiments. Most business leaders are adamantly opposed to EPR mandates and their will has prevailed at the federal level and, in most cases, at the state level as well. There are only a few instances of states moving forward on EPR. While some companies have launched voluntary take-back programs, they too are usually opposed to EPR mandates.

It is important to keep in mind, however, that there are far fewer physical pressures in favor of EPR in the United States than in a country such as Germany, where population density is eight times greater and land is at a premium. Open space for landfills in the US is plentiful, so concern about waste usually relates to local issues such as opposition to the siting of waste transfer and disposal facilities, to the trucking of waste through residential areas, or to the export of waste from big cities like New York to facilities in other states.

With business firmly against it, EPR needs a political constituency to move forward at the national level. This has failed to materialize. Environmental groups have supported EPR in theory but have not pushed for legislation, which they view as hopeless in the current political climate.

Local governments bear the burden of managing waste and may be starting to take a more assertive position through the US Conference of Mayors. However, local waste managers appear to have mixed feelings about EPR. Some are very anxious for help from industry, particularly for recycling. They are concerned about the introduction of new packaging that is incompatible with recycling processes, about dwindling budgets for recycling programs, and about rapidly growing streams of waste such as computers. On the other hand, some waste managers feel that their jobs are threatened by EPR. They want to maintain control over waste management and object to any shift in responsibility to industry, which they do not necessarily trust.

While generous government spending might seem to follow naturally from economic prosperity, the reverse has been true in the United States. The 1990s were a decade of budget caps, containment of healthcare costs, reductions in economic support for the needy, and scaled back environmental initiatives. The nation's prosperity has mainly fueled increasing levels of consumption and the conviction that people have a right to keep what they earn rather than pay higher taxes. While a great deal of lip service is paid to the importance of sustainability, resistance has grown to the economic measures that could bring it about.

Another prevalent idea is that the nation's prosperity is due to the success of American business. Therefore, any policy that could threaten business growth is to be avoided. Since EPR can impose additional costs on industry, it has been a victim of such thinking. In addition, there is general opposition to adopting policies from abroad — with the US economy the strongest in the world, many believe that other countries should be emulating the United States, not the reverse. Nonetheless, political climates can change, sometimes very rapidly. Prevailing sentiments in the twenty-first century are likely to be very different from those of today, although it is impossible to predict when change will come or the direction it will take.

Learning from EPR Around the World

EPR programs are proliferating around the world in sectors such as packaging, electronics, automobiles, and batteries. Regardless of whether or not EPR is adopted at the national level, these programs are likely to have an impact in the United States. Moreover, to the degree they succeed in reducing waste and increasing recycling at a reasonable cost, pressure for similar EPR initiatives in the US could grow.

In response to EPR mandates abroad, US industry is likely to make changes in its own packaging and product designs. In a globalized world in which multinational corporations are affected by the EPR mandates of different countries, many changes in product design may well be adopted in the United States, even in the absence of EPR legislation. This will certainly be true of design changes that produce cost savings as well as environmental benefits. And as EPR is implemented abroad, US industry will no doubt adopt initiatives that seek to preempt mandates at home by demonstrating the effectiveness of voluntary programs. For example, the US auto industry has formed the Vehicle Recycling Partnership through which the major automakers are cooperatively addressing recycling issues, including design.

A major barrier to learning from existing EPR programs is the lack of standardized definitions, data, and reporting mechanisms. For example, program costs are often compared by looking at the costs to industry only. But since costs are allocated differently in different programs, this can be very misleading. In Germany, all the costs of packaging take-back are borne by industry, whereas in France industry bears only a portion of those costs. It is therefore important to look at total costs — those borne by government as well as by industry — when comparing take-back in these two countries. And in cases where consumers pay directly for take-back (as in Japan's electronics take-back program), those costs must be included as well.

The extent to which EPR programs abroad prevent waste and increase recycling will also impact policy in the United States. At present, these programs are very

difficult to evaluate and compare, in part because terms such as "waste" and "recycling" can mean different things in different countries. The US, for example, counts all discarded items as waste, but in Germany and some other countries, materials collected for recycling are not counted as waste. Likewise, whether recycling rates should include chemical recycling and waste-to-energy recovery is a decision that varies from country to country. The solution may be to develop data that is sufficiently disaggregated to make comparisons possible. For example, if the amounts of end-of-life materials that are processed mechanically, through chemical recycling, and through waste-to-energy recovery were reported separately, systems with different definitions could be more easily compared.

Although the United States has resisted the trend toward EPR mandates, it is obviously very much a part of the global economy. The success or failure of EPR programs abroad will undoubtedly influence future policy in the US. It is important to bear in mind, however, that success and failure are subject to different interpretations, depending on the goals of a particular program and of the country that implements it.

Alternatives to EPR

With the US political climate so hostile to EPR mandates, interest is growing in alternative ways to achieve the policy's objectives. The carpet manufacturer Interface has gained high visibility through its promotion of leasing as a method of closing material loops and moving toward sustainability. INFORM is currently studying whether and how various forms of leasing create incentives for companies to design less wasteful and more economically recyclable products, and to implement systems that increase reuse and recycling.

Capital leases give the lessee ownership of the product at the end of the lease and do nothing to further the goals of EPR. Under an operating lease, however, the lessor generally owns the product at the end of the lease, which can generate incentives similar to those of take-back. It was this type of leasing that led Xerox to develop its Asset Recovery Management program, which has been effective in integrating product design with reuse, remanufacturing, and recycling. The large

amounts of equipment the company took back at the end of its leases led it to focus on the value that could be recaptured from post-consumer products.

Leasing, especially of personal computers, is expanding rapidly in the United States. The US Postal Service, for example, is considering requiring that its computers be leased rather than purchased. Some states and school districts are considering similar policies. If leasing is found to accomplish the objectives of EPR, it could be promoted by government procurement policies at the federal, state, and local levels.

Preliminary results from INFORM's study indicate that, compared to outright purchases of computer equipment, leasing appears to further the goals of resource conservation and recycling. It can return equipment more quickly to product reclamation channels and increase opportunities for reuse — for example, by giving manufacturers better access to their own equipment for use in remanufacturing or spare parts programs.[54] Resale and reuse of equipment and parts have become common practice, particularly for later models, but computer manufacturers are not currently engaged in major remanufacturing efforts. This may change as designs become more standardized and reclamation volumes increase.

It is important to note that not all leased equipment comes back to the lessor. In some cases, it is purchased by lessees at the end of the lease, which does nothing to further the goals of EPR. Also, the benefits of leasing may not extend to the product's end of life. For example, a product sold through a remarketing channel will exit the reclamation loop built into the leasing process. Remarketing does extend product life, however, and is therefore preferable to the common practice of putting replaced computers into storage.

INFORM's research also suggests that leasing of personal computers is increasing the focus on product end-of-life management, recapture of value, and product design.[55] The design changes being implemented, which are similar to those fostered by EPR, include reductions in the number of plastics used, labeling of plastics, and fasteners designed for ease of disassembly.

One major difference between leasing and EPR is that the latter usually includes mandated recycling targets. In leasing arrangements, even a producer that takes its products back can choose how to dispose of them. At Xerox, leasing provides incentives to reclaim assets because the products are of high value. For low-value products, however, producers might opt for incineration or landfilling instead. At the same time, leasing could create incentives to make more durable products, since revenues continue to accrue over a product's useful life.

Other possible alternatives to EPR include selling a function rather than a product and selling a product as a service, or "servicizing."[56] For example, some chemical companies are selling the service of keeping equipment clean rather than the chemicals to clean it. Pitney Bowes sells the service of operating copy centers and mailrooms rather than selling copiers, fax machines, and postage meters. And DuPont is paid by Ford UK for painting its cars rather than for the paint itself. Under these arrangements, the producer is paid not for the amount of product used but for the result, so profits are maximized by using less. Also, the producer maintains ownership of the product at the post-consumer stage, encouraging the recapture of value through reuse, remanufacturing, and recycling. These mechanisms may create industry incentives similar to those that result from EPR, and could begin to move the United States toward sustainability even in the absence of EPR mandates.

Notes

CHAPTER 1. WHY EPR?

1 Paul Hawken *et al.*, *Natural Capitalism* (New York: Little, Brown, 1999), 158.

CHAPTER 2. WASTE AND RECYCLING IN THE UNITED STATES

2 Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 7.

3 *Ibid.*, 9, 11.

4 *Ibid.*, 29.

5 *Ibid.*, 141.

6 *Ibid.*, 112.

7 *Ibid.*, 106.

8 *Ibid.*, 30.

9 Sarah Smith, "Recycling Requiem?" *Plastic News*, March 8, 1999, 23.

10 Franklin Associates, *Characterization: 1998*, 70.

11 "Container and Packaging Recycling Update" (Arlington, VA: Container Recycling Institute, Summer 1998), 2.

12 "Recycling: Looking Toward the Next Century," Draft Workshop Summary, White House Council on Environmental Quality, May 1998, 2.

13 US Environmental Protection Agency, http://www.epa.gov/epaoswer/non-hw/payt/index.htm.

14 "Packaging Recycling," Duales System Deutschland AG, Cologne, January 1998, 38.

15 "European Packaging and Waste Law," Agra Europe, London, November 1999, 9.

16 John Tierney, "Recycling Is Garbage," *The New York Times Magazine*, June 30, 1996, 28.

17 Dan Barry, "Giuliani Says Trash Remarks Got Twisted," *The New York Times*, January 20, 1999, B6.

18 Blaine Harden, "Trade Trash for Culture? Not Virginia," *The New York Times*, January 18, 1999, B1.

CHAPTER 3. GOVERNMENT WASTE POLICIES

19 The PCSD used the Brundtland Commission's definition of sustainability: "...to meet the needs of the present without compromising the ability of future generations to meet their own needs." See *Sustainable America, A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future* (Washington, DC: President's Council on Sustainable Development, February 1996), front matter.

20 Nine states (Connecticut, Delaware, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont) have enacted deposit/refund legislation. California has its own, complicated version of a bottle bill.

21 Container Recycling Institute, "Beer/Soda Container Sales and Recycling Rates – 1995," http://www.igc.org/cri/page25.htm.

22 David Saphire, *Case Reopened: Reassessing Refillable Bottles* (New York: INFORM Inc., 1994), 126.

23 The eight states with take-back required for Ni-Cds are Connecticut, Florida, Iowa, Maine, Maryland, Minnesota, New Jersey, and Vermont.

24 "Product Stewardship Policy Initiative," Minnesota Office of Environmental Assistance, February 8, 1999.

25 Raymond Communications, *State Recycling Laws Update*, year-end edition, 1998, 38.

CHAPTER 4. "VOLUNTARY" INDUSTRY EPR INITIATIVES

26 Jack Azar, "Asset Recycling at Xerox," *EPA Journal*, July-September 1993, 14-16.

27 "1997 Environment, Health & Safety Progress Report," Xerox Corp., Webster, NY, 10.

28 *Ibid.*, and Azar, "Asset Recycling at Xerox."

29 James Blamphin, Manager, Corporate Media Relations, Eastman Kodak Co., Rochester, NY, personal communication, October 28, 1999.

30 Eastman Kodak web site, http://www.Kodak.com.

31 *Ibid.*

32 James Blamphin, Eastman Kodak Co.

33 This section draws heavily on Bette Fishbein, "Industry Program to Collect and Recycle Nickel-Cadmium (Ni-Cd) Batteries" (New York: INFORM Inc., 1997), available at http://www.informinc.org/battery.html.

34 Franklin Associates, *Characterization of Municipal Solid Waste in the United States: 1998 Update* (Washington, DC: US Environmental Protection Agency, July 1999), 146.

35 *Ibid.*, 146–147.

36 Frank Esposito, "AlliedSignal to Boost Nylon Compounding," *Plastic News*, May 3, 1999, 18.

37 This section will not address Monsanto's "thermoplastic composition" recycling process, which recycled nylon 6,6 carpet into low-value products, such as a wood substitute for telephone poles, with no prior separation of materials. This process was a commercial failure. See *Environmental Building News*, June 1997, 11. Also omitted is Solutia's Partners for Renewal Program (Solutia was formerly a part of Monsanto), which in partnership with Ogden-Martin, a leading operator of large-scale waste-to-energy facilities, is "recycling" carpet by means of this process. INFORM and other environmental organizations do not consider waste-to-energy recovery to be a form of recycling.

38 Edward A. Duffy and Heather L. Sheehan, "From Carpets to Cars: Recovering Nylon 6," paper presented at the "Take It Back" conference, Alexandria, VA, May 13-14, 1999, 2.

39 *Ibid.*, 7.

40 *Ibid.*, 8.

41 "Closed Loop Recycling," promotional materials, AlliedSignal Inc., Morristown, NJ.

42 Christopher LaGullo, Manager, Collections Marketing, Carpet Recycling, AlliedSignal Inc., Morristown, NJ, interview, April 8, 1999.

43 "The DuPont Carpet Reclamation Program, Program Update 4-1-99," promotional materials, Safety, Health and the Environment, E.I. DuPont de Nemours and Co., Wilmington, DE.

44 Joseph Pryweller, "DuPont Kicking Off Pilot Recycling Plant," *Plastic News*, May 24, 1999, 20.

45 "The DuPont Carpet Reclamation Program."

46 "Sustainability Report," Interface, Inc., Atlanta, GA, 1997.

47 Interface web site, http://www.ifsia.com.

48 Janet Herlihy, "Carpeting — environmental manufacture, installation and disposal," *Environmental Design and Construction*, March/April 1998, 34.

49 Bill Blackstock, "Earth Square — A Renewal Process for Modular Carpet," press release, Milliken and Co., Spartanburg, SC, no date.

50 Steve Bradfield, "Environmental Developments in Contract Carpet," Shaw Industries, Inc., Augusta, GA, June 1999; "Post Consumer Recycling Program Guidelines," fact sheet, Shaw Contract Group; conversation with Rudy Wofford, Senior Process Engineer, Shaw Industries Inc., December 23, 1999.

51 *Ibid.*

52 Bradfield, "Environmental Developments in Contract Carpet."

53 Lester Lave *et al.*, "Recycling Postconsumer Nylon Carpet: A Case Study of the Economics and Engineering Issues Associated with Recycling Postconsumer Goods," *Journal of Industrial Ecology*, vol. 2, no. 1 (1998), 126.

CHAPTER 5. PROSPECTS FOR EPR IN THE UNITED STATES

54 Patti Dillon, "Computer Leasing: Improving End-of-Life Management?" draft mss., INFORM, Inc., December 1999.

55 *Ibid.*

56 Allan White *et al.*, *Servicizing: The Quiet Transition to Extended Producer Responsibility* (Boston: Tellus Institute, May 1999).