

**Recycling the Automobile:
A Legislative and Regulatory Preview**

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Automotive Plastics Recycling Project
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Preface

The Office for the Study of Automotive Transportation (OSAT), in cooperation with researchers from other units of the University of Michigan, is undertaking a multiyear program of research titled "Effective Resource Management and the Automobile of the Future." The first project focused on recycling automotive plastics and provides an independent evaluation and review of the issues and challenges that recycling pose for this class of materials.

The Automotive Recycling Project benefited from the financial support of numerous sponsors: The American Plastics Council; The Geon Company; Hoechst Celanese; Miles, Inc.; OSAT's Affiliate Program; Owens-Corning Fiberglas; and The University's Office of the Vice President for Research. In addition, representatives of each of the Big Three automakers graciously served on the Project's advisory board, as did Suzanne M. Cole.

The project reports provide an overview and analysis of the resource conservation problems and opportunities involved in the use of plastics, and describes the factors that are likely to influence the future of automotive plastics. We develop information on the economic, infrastructure, and policy aspects of these issues, identifying the barriers to and facilitators of automotive plastics use that is less constrained by resource conservation and recycling concerns. At the same time, the Vehicle Recycling Partnership, a precompetitive joint research activity of the Big Three, is devoting its resources to the technical issues raised by recycling automotive plastics.

The Recycling Automotive Plastics project yielded six reports:

Life Cycle Assessment: Issues for the Automotive Plastics Industry (UMTRI Report #90-40-1), by Brett C. Smith and Michael S. Flynn, an overview of the LCA approach and its implications for automotive plastics (15 pages). This paper includes, as an appendix, the EPA design manual by Greg Keoleian and Dan Menerey, *Life Cycle Design Manual: Environmental Requirements and the Product System*;

Economic Issues in the Reuse of Automotive Plastics (UMTRI Report #90-40-2), by Daniel Kaplan, a general consideration of the economic barriers and issues posed by recycling automotive plastics (42 pages);

Recycling the Automobile: A Legislative and Regulatory Preview (UMTRI Report #90-40-3), by Suzanne M. Cole, Chair, Society of Plastic Engineers, International Recycling Division, describes the likely developments on the federal regulatory and legislative front that will influence the future of automotive plastics use and disposition (26 pages);

Postconsumer Disposition of the Automobile (UMTRI Report #90-40-4), by T. David Gillespie, Daniel Kaplan, and Michael S. Flynn, a review of the issues and challenges over the different disposal stages posed by postconsumer automotive plastics (54 pages);

Material Selection Processes in the Automotive Industry (UMTRI Report #90-40-5), by David J. Andrea and Wesley R. Brown, an overview of the factors and issues in vehicle manufacturers' material selection decisions (34 pages);

Automotive Plastics Chain: Some Issues and Challenges (UMTRI Report #90-40-6), by Michael S. Flynn and Brett C. Smith, a report of the OSAT survey of the automotive plastics industry (27 pages), plus appendix on types of automotive plastics.

These reports are all available from:

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**Executive Summary:
Recycling Automotive Plastics**

Michael S. Flynn and Brett C. Smith

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The Recycling Automotive Plastics project provides an overview and analysis of the resource conservation problems and opportunities involved in the automotive use of plastics and composites, and describes the factors that are likely to influence their future. The project produced a series of six reports targeted to different aspects of the recycling challenges posed by automotive plastics. Combined with the technically oriented reports of the Vehicle Recycling Partnership, these reports should serve two purposes. First, they can serve as a broad introduction to the diverse and numerous dimensions of the recycling challenge for automotive managers whose areas of responsibility only indirectly or peripherally touch on recycling. Second, they can provide specialists with a broad panoply of contextual information, anchoring their detailed knowledge within the broad framework of recycling issues.

Automotive plastics possess numerous advantages for the automotive manufacturer and consumer. They contribute to lower vehicle weight, important for fuel conservation and emission reduction, while permitting the additional weight of new safety equipment. Plastics and composites are corrosion resistant, so their use can prolong vehicle life, and they are an important element in the paints used to protect other materials. They offer the designer greater flexibility, reducing the constraints that other materials often impose on shapes and packaging. If the difficulties of recycling automotive plastics present a potential barrier to their use, their advantages suggest that the barrier should be overcome, rather than deterring their continued automotive applications.

However, automotive plastics are visible and easily tied to the vehicle manufacturers. Hence, they may become targets for public opinion and government action out of proportion to their real role in solid waste disposal issues and potential for economic recycling.

I. The first report (Life Cycle Assessment: Issues for the Automotive Plastics Industry, UMTRI Report #90-40-1, by Brett C. Smith and Michael S. Flynn) provides an overview of the developing Life Cycle Assessment (LCA) approach and its implications for automotive plastics. An element of the emerging “design for the environment” method, LCA calls for an inventory,

impact assessment, and improvement analysis targeted to the environmental consequences of a product across its production, use, and retirement. While environmental costs are typically unavailable, LCA supports the inclusion and consideration of any such costs that can be estimated, particularly for some of the environmental factors often ignored in traditional product decisions.

A fully developed LCA for vehicles or even components presents numerous significant analytic challenges to the industry, and may never become practical. First, a full LCA would be extremely costly, and the human and financial resources it would consume may be simply unavailable. Second, the handling of the data in an LCA can critically determine its outcome. The data for factors in an LCA are often lacking, typically measured in different metrics, subject to variable weightings, and frequently aggregated in different, noncomparable ways. Third, LCAs are difficult to evaluate and compare because they often reflect differing assumptions, varying boundaries, and there are no commonly accepted standards for their execution. Finally, the comparison of environmental costs with more traditional cost factors is at best difficult and speculative.

Nevertheless, LCA offers industry a sensitizing tool, useful for ensuring consideration of some environmental effects, and consistent with an industrial ecology approach to resource conservation. Moreover, the LCA approach resonates with some other developments in the automotive industry. Thus the industry is moving to more system-based material decisions, while its accounting system is evolving to a form that would more readily provide input for an LCA. The growing emphasis on cost reduction and waste elimination is also philosophically consistent with LCA goals. The industry has gained experience in other analytic techniques, such as quality function deployment, that have value even if only partially executed.

The automotive industry must shift from a reactive to a proactive approach in the management of its environmental effects. The ability to move quickly and surely to develop environmentally acceptable products and processes will be critical to future success. Establishing environmental credibility will increasingly afford the manufacturers an opportunity to create a positive image and thus a competitive edge in the marketplace. LCA might become an important tool in the development of an environmentally friendly product. However, cost pressures in today's competitive environment will likely make the industry approach environmental issues in a cautious manner.

II. The second report (Economic Issues in the Reuse of Automotive Plastics, UMTRI Report #90-40-2, by Daniel Kaplan) presents a general consideration of the economic barriers and issues posed by recycling automotive plastics. The United States currently recycles roughly 75% of the automobile, although plastics constitute roughly one-third by weight of the landfilled residue. An important question facing the automotive plastics industry is whether a combination of economic and technical developments might occur that would permit plastics to repeat the recycling success story of automotive steel.

Recycling automotive plastics faces two major economic barriers. First, the labor cost to recover the materials in usable form is quite high, making it unlikely that recycled stock can compete with the price of virgin stock. The second is that recyclers cannot rely on a consistent and stable flow of plastic scrap, as retired automobiles vary greatly in the level and type of plastic content. This makes it difficult, if not impossible, to establish end markets. Other economic barriers to successful recycling include the costs of transportation and recovery.

There are nonrecycling options for automotive plastics disposal. The landfill option still exists, although current trends suggest that it may soon become expensive enough to promote the use of other options, such as pyrolysis. Incineration permits energy recovery, but faces some of the same undesirable side-effects as landfills.

Pressure for recycling may raise the likelihood of policy interventions, as the government tries to avert the negative consequences of automotive plastics content, such as landfilling, while preserving its benefits, such as reduced fuel consumption and vehicle emissions. Government efforts will likely focus on attempts to capture the environmental externalities in the price of materials. However, recycling may have an economic down side: at least some automotive plastics, if fully recycled, could damage the viability of both recyclers and resin producers by creating an oversupply of material.

The numerous policy tools that might be invoked by government have a predictably wide range of consequences, and these must be incorporated into a cost-benefit analysis before appropriate selections can be implemented. In any case, the industry must be prepared to respond to a wide range of possible policy developments that will shape the economic viability of recycling.

III. The third report (Recycling the Automobile: A Legislative and Regulatory Preview, UMTRI Report #90-40-3, by Suzanne M. Cole) describes the likely developments on the federal regulatory and legislative front that will influence the future of automotive plastics use and disposition. Public policy often tries to incorporate social and environmental costs in the price of goods so that markets can achieve efficient use of energy and resources. The U.S. government has typically relied on regulatory actions to achieve this aim, but may now be moving more in the direction of market-based incentives. Moreover, many key legislators are persuaded that the model of extended producer responsibility, popular in Europe, offers a mechanism for encouraging producers to heed environmental costs in the design of their products. Legislation requiring producers to “take back” their products at the end of the life cycle make them ultimately responsible for its final disposition.

The new administration appears to be committed to a course of emphasizing environmental goals within a framework that permits rational trade-offs with the need for economic growth and development. Increased government R&D spending, much of it in cooperation with private industry, provides a foundation for the search for technical solutions to environmental problems. The Clean Car program is a major example of how this approach may affect the automotive industry.

EPA appears to lack the anti-business rhetoric that many feared, and is shifting to more of a pollution prevention approach rather than a pollution clean-up response. In addition, the director now has a credible staff in place. In spite of the fears of many, NAFTA is unlikely to have major adverse environmental consequences for the United States, and may actually improve Mexico’s capability to enforce its fairly stringent regulatory regime.

The give and take of politics will certainly determine exactly how the balance of environmental and economic considerations will be achieved in numerous specific decisions, from take back through recycled content legislation to the permit processes governing both new and old facilities.

IV. The fourth report (Postconsumer Disposition of the Automobile, UMTRI Report #90-40-4, by T. David Gillespie, Daniel Kaplan, and Michael S. Flynn) reviews the issues and challenges that postconsumer automotive plastics pose over the different disposal stages. The United States currently has an economically viable vehicle recycling industry, composed of dismantlers, shredders, and resin producers. Increased automotive plastics content and requirements for its recycling present enormous challenges to this industry. Developing

appropriate markets for recycled stock is a critical challenge. Mandated, rather than market-led, recycling could threaten the very existence of this recycling industry and doom recycling efforts.

Shrinking landfill capacity and rising prices threaten the recycling industry, which must dispose of superfluous material. Increased nonrecyclable plastic content threatens profits, as it often replaces material that can be sold and increases the volume of residual material for landfilling. For plastics to be profitable, the labor costs associated with recovery must be lowered and/or the price of recovered materials rise. Development of automated sorting, chemical and physical technologies for reduction, and pyrolysis all offer some hope, but the public opinion environment and automotive industry demands may force the pace of recycling beyond the infrastructure's capacity.

There are steps the industry can take to facilitate higher recycling rates for automotive plastics. First, plastic components and parts can be designed for easy disassembly and dismantling. Second, plastics can be clearly and consistently labeled, to avoid contamination in the recycle stock. Third, designers can try to limit the numbers and types of incompatible plastics in the vehicle and within any part or component. Fourth, further development of incineration and energy recycling could well support resource conservation, and ultimately higher reuse of nonplastic automotive materials. Fifth, techniques for recycling commingled plastics merit support.

V. The fifth paper (Material Selection Processes in the Automotive Industry, UMTRI Report #90-40-5), by David J. Andrea and Wesley R. Brown) discusses the factors and issues in vehicle manufacturers' material selection decisions. Material selection in the automobile industry is an artful balance between market, societal, and corporate demands, and is made during a complex and lengthy product development process.

Actual selection of a particular material for a specific application is primarily driven by the trade-off between the material's cost (purchase price and processing costs) and its performance attributes (such as strength and durability, surface finish properties, and flexibility.) This paper describes some thirty criteria used in material selection today. How critical any one attribute is depends upon the desired performance objective. The interrelationships among objectives, such as fuel economy, recyclability, and economics, are sufficiently tight that the materials engineer must always simultaneously balance different needs, and try to optimize decisions at the level of the entire system.

The vehicle manufacturers' materials engineer and component-release engineer play the pivotal role in screening, developing, validating, and promoting new materials, although initial consideration of possible material changes may be sparked by numerous players. These selection decisions are made within a material selection process that will continue to evolve. This evolution will largely reflect changes in the vehicle and component development processes to make them more responsive—in terms of accuracy, time, and cost—to market and regulatory demands. The balancing of market, societal, and corporate demands will continue to determine specific automotive material usage in the future.

VI. The sixth paper (Automotive Plastics Chain: Some Issues and Challenges, UMTRI Report #90-40-6), by Michael S. Flynn and Brett C. Smith) is a report of the OSAT survey of the automotive plastics industry (vehicle manufacturers, molders, and resin producers). This survey collected the industry's views on recycling, often contrasted with more general automotive industry views reflected in our Delphi series. This report covers four general topics: recycling and disposition challenges; regulatory challenges and responses; recycling in material selection decisions; and the future of automotive plastics.

The industry in general views a variety of economic, technical, and infrastructural recycling concerns as more important in the case of plastics than of metals. The automotive plastics industry, while perhaps viewing these concerns somewhat differently, sees a complex set of recycling challenges, varying over both the automotive plastics production chain and the stages of recycling/disposition. The manufacturers see these challenges as more severe than do molders or resin producers, and the industry generally views market development and disassembly as more critical stages. The automotive plastics industry generally favors more emphasis on open-loop recycling and the development of the disassembly infrastructure, while evidencing little support for disposal in landfills.

Government CAFE regulations are important drivers for automotive plastics use. However, government is also moderately committed to recycling. The various levels of government are somewhat likely to establish differing regulations to encourage recycling, but are less likely to impose outright bans on any current plastics/composites. Among the range of governmental incentives for recycling, tax incentives are generally seen as useful, but more restrictive and limited actions are seen as not particularly useful. The automakers are unlikely to restrict the total amount of plastics in the vehicle, although they will probably limit the use of unrecyclable plastics and restrict the number of types of plastics in the vehicle. They are also likely to pass through any recycling requirements to their suppliers, the molders and resin producers.

The recyclability of automotive plastics is not yet a major factor in automotive materials-selection decisions, ranking far below the traditional factors. Recyclability is viewed as, at most, of moderate importance to the customer and the industry. Moreover, there are concerns about the cost of recycling automotive plastics, and very real apprehension that there is little market for them, once recycled. These considerations are likely to drive up the cost of plastics, should they be recycled, and thus further discourage their use.

Our results present a somewhat mixed picture as to the future role of automotive plastics in the North American industry, although in general a promising one. There are clear drivers for their use, including their advantages for design flexibility, and these are likely to be buttressed by more stringent fuel-economy regulations in the future. However, there are concerns about their ultimate disposition when the vehicle is retired. These concerns reflect a different environmental priority, one that the automotive industry does not yet view as a customer demand, nor as a "heavyweight" materials-selection factor.

Our survey suggests that the automotive plastics industry and its vehicle producing customers are aware of and concerned about the environmental challenges that lie ahead. Moreover, they are seeking solutions to these challenges that are environmentally sound and responsive to the demands of vehicle purchasers and users. To be sure, their views are often influenced by their own position in the plastics value chain, and they reveal some tendency to prefer solutions that impose responsibility on other stages in that chain. However, they reject solutions that might relieve their own burden, but are environmentally problematic, such as landfilling.

These papers suggest that the automotive industry's adoption of plastics and composites is moving forward. The pace of adoption is responsible, and the industry treats the environmental effects of its material decisions neither lightly, nor as someone else's problem. However, that pace is cautious, reflecting many uncertainties. These include concerns that the industry may be disproportionately blamed by the public for problems in recycling disposed materials, and apprehensions that the industry may be disproportionately targeted by government to resolve such problems. Since plastics and composites confer a wide variety of benefits, including environmental advantages, the industry may be erring on the side of too much, rather than too little, caution.

Recycling the Automobile: A Legislative and Regulatory Preview

Suzanne M. Cole¹

INTRODUCTION

The information contained in this report is representative of interviews with legislators and administrators in Washington, DC, and material from federal studies and reports.² Taken together, these sources indicate that the administration, together with a group of legislators who have been outspoken on environmental issues, has begun to formulate a strategy to make producers of durable products more accountable for the environmental consequences of their industry.

Plastics will most likely receive significant attention under any proposal, and legislation has already been introduced that would single out the automotive industry. Legislative actions in Europe, particularly in Germany, may provide a preview of upcoming regulatory action in the United States.

DURABLE GOODS AND SOLID WASTE

Public concern over the environmental impact of solid waste has long been present in the United States. Recently this concern has intensified, as municipal and state governments find it increasingly difficult to obtain sufficient landfill space. Obstacles to new landfills include stringent environmental legislation and opposition from residents in communities where landfills are proposed.

In response to landfill scarcity and public pressure, local and state governments have developed legislation and programs that deal mainly with packaging, the most visible component of solid waste. Curbside collection and recycling programs tend to handle varieties of plastic, glass, paper, and metals that normally end up in household garbage cans.

More recently, environmental advocacy groups and legislators have begun to focus on the solid-waste issues related to durable goods, such as automobiles, appliances, and electronics. These items often contain toxic materials, such as heavy metals, which may lead to their being

¹ President, Cole and Associates, and Chair, Society of Plastic Engineers, International Recycling Division.

² These interviews were conducted at various times throughout the Winter and Spring of 1992/3. Material drawn directly from these interviews is presented in single-spaced, indented paragraphs, and is not specifically cited in this paper.

banned from landfills in the near future. For example, Quebec has already banned components of automotive waste from its landfills. However, recycling is problematic because durable goods are often difficult to disassemble, and the various materials are troublesome to recover and separate.

PUBLIC POLICY RESPONSE

As Congress weighs the various actions it may take in response to growing concern about the impact of durable products on the environment, members will balance the costs and benefits associated with various policies. Solid waste issues fit neatly into the area of economics concerned with "externalities," which many public policies are designed to minimize or to eliminate altogether.

Externalities Economists have long argued that a truly efficient use of energy and resources requires that the prices of goods and services reflect their true social and environmental costs. A major goal of public policy, therefore, is to use mechanisms such as health and environmental laws to make prices reflect these social costs. For example, emissions control technologies required by the Clean Air Act raise the price of electric power and automobiles; the extra money paid by consumers is meant to cover the externality created by auto exhaust and power generators. Nationwide, it is estimated that compliance with pollution control laws costs industry and consumers \$115 billion per year.

Two policy mechanisms often used to internalize environmental costs are regulations and economic instruments. Historically, the basis of environmental policy in the United States has been regulation. For example, table 1 displays some of the laws that affect just one area of manufacturing, product design. In recent years, there has been a growing interest in the use of market-based incentives such as pollution taxes, tradable pollution permits, and deposit-refund systems. The theory behind these newer types of policy instruments is that, by using market mechanisms to achieve public objectives, they provide the same environmental protection as regulations, but at a lower cost.

Table 1. Federal Health and Environmental Laws Affecting Product Design

Statute	Impact on design	Agency
Clean Air Act of 1970 (and Amendments of 1977 and 1990)	Encourages reduction in the use of solvents, volatile organic compounds, and phases out chlorofluorocarbons.	EPA
Clean Water Act of 1977 (and Amendments of 1987)	Encourages reduction in the use of toxic chemicals that become water pollutants.	EPA
Resource Conservation and Recovery Act of 1976 (and Hazardous and Solid Waste Amendments of 1984)	Encourages redesign of products and processes to reduce generation of hazardous solvent, pesticide, and metal-bearing wastes, and to avoid liability for cleanup of wastes improperly disposed.	EPA
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (and Superfund Amendments and Reauthorization Act of 1986)	Encourages reduction in use of listed hazardous substances to avoid reporting requirements for releases of these substances, and liability for cleanup of Superfund sites.	EPA
Federal Insecticide, Fungicide, and Rodenticide Act of 1972 (and Amendments of 1988)	Encourages reformulation of pesticides to ensure safety and efficacy of active ingredients (and to avoid inert ingredients of toxicological concern), through a registration program.	EPA
Toxic Substances Control Act of 1976	Requires manufacturers to obtain approval from EPA (which may require submission of test data) before producing new chemicals that may pose an unreasonable risk to human health or the environment.	EPA
Federal Food, Drug, and Cosmetics Act	Regulates allowable pesticide residues in food, as well as the formulation of various solvent-containing cosmetic products.	FDA
Consumer Products Safety Act of 1978, Federal Hazardous Substances Act, Poison Prevention Packaging Act of 1970	Regulate the use of hazardous substances in consumer products	CPSC
Occupational Safety and Health Act of 1970	Encourages manufacturers to avoid use of materials or processes that might expose workers to hazardous substances in the workplace.	OSHA

KEY: CPSC - Consumer Product Safety Commission; EPA - Environmental Protection Agency; FDA - Food and Drug Administration; OSHA - Occupational Safety and Health Administration.

SOURCE: Kerr and Associates, "Effect of Environmental Statutory/Regulatory Requirements on Product Formulation/Process Design: Information on Solvents, Agricultural Chemicals, Products Containing Heavy Metals, and Related Household Cleaning Products," a contractor report prepared for the Office of Technology Assessment, April 1992.

Table 2 displays an outline of regulatory and market-based incentives that have been proposed or, in some cases, enacted to internalize the environmental costs associated with the flow of goods and materials through the economy. These options are organized according to their point of greatest impact on the material's life-cycle.

Table 2: Policy Options That Could Affect Materials Flows

Life-cycle stage	Regulatory instruments	Economic instruments
Raw material extraction and processing	Regulate mining, oil, and gas non-hazardous solid wastes under the Resource Conservation and Recovery Act (RCRA).	Eliminate special tax treatment for extraction of virgin materials, and subsidies for agriculture.
	Establish depletion quotas on extraction and import of virgin materials.	Tax the production of virgin materials.
Manufacturing	Tighten regulations under Clean Air Act, Clean Water Act, and RCRA.	Tax Industrial emissions, effluents, and hazardous wastes.
	Regulate non-hazardous industrial waste under RCRA.	Establish tradable emissions permits.
	Mandate disclosure of toxic materials use.	Tax the carbon content of fuels.
	Raise Corporate Average Fuel Economy Standards for automobiles.	Establish tradable recycling credits.
	Mandate recycled content in products.	Create tax credits for use of recycled materials.
	Mandate manufacturer take-back and recycling of products	Establish a grant fund for clean technology research
	Regulate product composition, e.g., volatile organic compounds or heavy metals.	
	Establish requirements for product reuse, recyclability, or biodegradability.	
Ban or phase out hazardous chemicals.		
Mandate toxic use reduction.		
Purchase, use, and disposal	Mandate consumer separation of materials for recycling.	Establish weight/volume-based waste disposal fees.
		Tax hazardous or hard-to-dispose products.

SOURCE: Office of Technology Assessment.

Table 2: Policy Options That Could Affect Materials Flows (Continued)

Life-cycle stage	Regulatory instruments	Economic instruments
		Establish a deposit-refund system for packaging or hazardous products.
		Establish a fee/rebate system based on a product's energy efficiency.
		Tax gasoline.
Waste management	Tighten regulation of waste management facilities under RCRA.	Tax emissions or effluents from waste management facilities.
	Ban disposal of hazardous products in landfills and incinerators	Establish surcharges on wastes delivered to landfills or incinerators.
	Mandate recycling diversion rates for various materials	
	Exempt recycler of hazardous wastes from RCRA Subtitle C.	
	Establish a moratorium on construction of new landfills and incinerators.	

SOURCE: Office of Technology Assessment.

Policy Options Legislators currently seeking to increase product reuse and materials recycling will probably consider a variety of policy options, many of which have been compiled for Congress by the Office of Technology Assessment (OTA).³ The OTA summary includes:

- Elimination of subsidies to virgin materials (to promote the substitution of recycled materials)
- Grants and technical assistance for new recycling programs
- Government procurement guidelines requiring a minimum level of recycled and recyclable content in products purchased by government departments
- Funding for R & D efforts to improve the viability of scrap-processing equipment and the quality of recycled materials,
- A federal deposit-refund system for beverage containers, automobiles, and other recyclable products

³ U.S. Congress, Office of Technology Assessment, *Green Products By Design: Choices for a Cleaner Environment*, OTA-541, October, 1992; *Managing Industrial Solid Waste from Manufacturing, Mining, Oil, and Gas Production, and Utility Coal Combustion—Background Paper*, OTA-BP-0-82, February, 1992; *Facing America's Trash: What Next for municipal Solid Waste?*, OTA-0-424, October, 1989; and *Materials and Energy From Municipal Solid Waste*, OTA-M-93, July, 1989. All these publications are available direct from OTA, or, in most cases, from the U.S. Government Printing Office, Washington, D.C.

- A requirement that manufacturers, wholesalers, and retailers recycle the packaging used to deliver their products to market. The program could be extended to require that businesses collect and recycle their own products when they are ready to be discarded. Such a requirement would closely mirror Germany's nationwide packaging and durables take-back program.

Carol Browner, the current administrator of the Environmental Protection Agency (EPA), indicated during an interview with me that the EPA will be considering programs that would issue credits to industry for reaching goals for solid-waste and toxic-substance reduction. She also suggested that the Clean Air Act Credits structure would serve as an excellent model for such programs.

European Environmental Policies: A Possible Model The model established by Germany and other European nations is informative, as it demonstrates how a variety of these policy measures can be combined into an overall solid-waste reduction plan, and because it has been embraced by many U.S. legislators, who consider it "an excellent framework" for future environmental policy. European policy governing the disposal of durable products has focused on "Extended Producer Responsibility," an approach that makes producers responsible for the environmental consequences of the manufacture, use, and disposal of their products. The theory behind this approach is that producers are in a position to redesign their products for ease of reuse and dismantling; they can also eliminate toxic materials in order to make the product environmentally sound throughout its life-cycle.

Several European countries, and the European Community (EC) as a whole, have proposed or are considering regulations that apply this approach to the disposal of scrapped automobiles. In the Scandinavian countries these laws have been in effect for some time, and are similar to bottle-bills: consumers pay a deposit at the time of purchase, and are reimbursed when the car is disposed of according to set guidelines. More recently, some European regulators—particularly in Germany—have been considering legislation that would directly require the automaker to take the car back from its last owner. Such legislation would have tremendous implications for U.S. automakers who wish to compete in the global marketplace.

Germany has already proposed Europe's most far-reaching, solid-waste regulation affecting the automotive industry. The "Draft Regulation concerning the Avoidance, Decrease, and Recycling of Wastes from the Disposal of Automobiles" was issued by Germany's Environment Ministry on August 17, 1992. This regulation, commonly known as the Scrap Car Rule, falls under the authority of Germany's 1986 Waste Management Act, which gave the Environment

Ministry a mandate to develop regulations for managing the disposal of certain products. The Scrap Car Rule represents the culmination of five years of effort by the Environment Ministry, which first initiated discussions on automobile recycling regulation in 1987. The Ministry has also tried to further automotive recycling by promoting joint research projects by manufacturers, suppliers, and auto-dismantling companies.

Under the authority of the 1986 Act, Germany immediately began to set a course for "take back" legislation dealing with solid waste. The first ordinance passed under the Act was the 1987 Waste Oil Regulation, which specified the following order of preferences for the disposal of waste oil: 1) recycling, 2) recovery of energy, and 3) proper disposal (as a last resort). This ordinance established a precedent in Germany for encouraging the "taking back" of materials that had previously been sent to landfills. Other take-back ordinances that have been developed under the German Waste Management Act cover chlorinated solvents, chlorofluorocarbons (CFCs), plastic packaging used for soft drinks, and other types of packaging. Ordinances currently under consideration would extend the "take-back" approach to batteries, electronic products, construction and demolition rubble, excavation wastes, and wastepaper.

The Scrap Car Rule is designed to divert or decrease waste generated by the disposal of automobiles. It directs automakers to:

- 1) Develop, design, and produce automobiles and automotive parts and accessories that have as long a service life as possible, and that can be easily disassembled for reuse or materials recycling.
- 2) Use materials that are easily recycled and labeled according to a uniform system, so that they can be disposed of according to their composition, even if materials recycling is not feasible.
- 3) Reuse recovered parts (after disassembly), in automobile manufacture or as spare parts or, when reuse is impossible, recycle the materials for reuse in the production of new automobiles.

The Scrap Car Rule would apply to the makers of automobiles, spare and exchange parts, and automotive accessories. It would also affect makers of any parts used for the operation of an already registered automobile, and the last owner of any automobile.

The draft regulation sets out a number of "Withdrawal and Recycling Obligations." Withdrawal obligations include the following:

- 1) The automobile producer must take back its scrapped cars from their last owners,

"principally" free of charge. However, scrapped cars need not be taken back free of charge if they:

- have been wrecked and then exploited (meaning that parts necessary to the recycling operation have been removed)
 - carry or are contaminated by substances that impair materials recycling or disposal
 - have been involved in an accident rendering them unfit for disassembly
 - were registered before the regulation took effect, provided that the disposal cost exceeds the potential profits from valuable materials, and the producer has published the type, year of construction, and amount of each type of material
- 2) The company's withdrawal network must be at least as dense as the sales network, and must have one withdrawal place or one pick-up system for each area engaged in disposal, even where there are no marketing offices of the automobile brand concerned.

Similar requirements would apply to producers or sellers of spare and exchange parts, accessories, and other parts. The draft regulation allows producers or sellers of automobiles to use third parties to perform these functions on their behalf. Any company covered by the regulation must provide annual reports that show progress made toward recycling goals.

The proposed regulation requires the last owner of a car to leave it with the producer, a third party authorized to accept it by the producer, or a recycling company. Only by following this procedure will the owner receive a certificate of disposal, which must then be presented to the automobile registration office to relieve the owner of annual vehicle or road-use taxes.

LEGISLATION

In the United States, federal policy concerning solid waste from durables is expressed in the Resource Conservation and Recovery Act (RCRA). Revisions to RCRA currently under discussion include mandatory use of recycled materials in manufacturing, and environmental labeling to indicate to consumers that a product is recycled or recyclable. More extreme measures are also possible, since legislators who have been active on environmental issues now believe they are in an optimal political environment to legislate increased environmental responsibility for manufacturers.

A draft revision of RCRA currently contains a thirty-two page discussion of solid waste issues specific to the automotive industry. U.S. Senator Max Baucus (D-Montana) and former U.S. House Representative Al Swift (D-Washington) were part of a group of legislators who

visited BMW and Volkswagen in Germany last year, in order to observe automotive dismantling and recycling operations owned and operated by these manufacturers. The aforementioned and other legislators, as well as environmental advocates, appear to be interested in creating regulations that mirror those recently proposed and implemented in Germany.

Administration and Congressional Objectives In addition to a desire to follow in Germany's footsteps, the current administration has faith in the effectiveness of regulations as an instrument of environmental policy. During our discussion in April 1993, Vice President Gore expressed his view of the role of federal regulatory action. His response is indicative of the administration's attitude:

Regulations are the most direct method of changing industrial behavior. I believe—and if you examine EPA historical data you will find—that the most viable regulatory options for influencing industry's use of energy and raw materials include: equipment efficiency standards, pollution permits, reporting and targeting requirements, utility oversight, mandatory toxic use reduction targets, and credits for voluntary waste minimization.

During our interview, Carol Browner, Administrator of the Environmental Protection Agency, indicated that she has a preference for measures that foster recycling:

Product reuse and materials recycling have received considerable attention because of their role in reducing the need for additional landfills and incinerators. A less publicized benefit is that reuse and recycling conserve energy. For energy-intensive products, reusing them—for example, refilling beverage bottles and reusing automotive bumpers—or producing them from recycled materials—for example, reprocessed plastics, steel, aluminum, and paper—usually consumes less energy than producing them from virgin materials.

When asked whether she foresees legislation focusing on durables recycling, she indicated that there have been some "discussions" on the Hill regarding the European model for producer responsibility. She described legislators, particularly those who visited European automakers last year, as very interested in replicating this model domestically.

One of these legislators was Senator Baucus, who has been particularly outspoken on the issue of solid waste from durable products. In a recent interview conducted with the senator, he outlined his position, which is reproduced at some length here, both because of its comprehensive delineation of the issues, and because of the senator's key role in shaping Congressional action.

Over the years, I've had the opportunity to work closely with the National Association of Manufacturers (NAM) on many important trade issues, from opening Japanese markets to improving compliance with trade agreements. In fact, some of these

plastics manufacturers and automobile companies you mention are members of NAM. Anyway, NAM and I haven't always agreed, but we have always tried to communicate and find common ground.

Now that I've become chairman of the Senate Environment and Public Works Committee, I look forward to developing the same kind of relationship with producers and manufacturers on environmental issues.

It's very timely on your part to meet with me--not simply because tomorrow is Earth Day, but because we are on the brink of an extraordinary new era in environmental policy.

We face new challenges, and our success will be determined, in large part, by whether we can break old patterns of mistrust and misunderstanding; whether we can end the "religious wars" between the business and environmental communities; and whether, as your 1992 Environmental Management Forum in Detroit suggested, we can build "new partnerships" that promote economic and environmental progress.

Let me step back for a moment, to try and put things in perspective. Up until now there have been two eras of modern environmental policy.

The first era was the "Golden Age" of environmental protection. It began about 23 years ago on Earth Day, 1970. The first Earth Day demonstrated that people were tired of lethal lakes and rivers, smog-blackened skies, and toxic waste dumps. They wanted change. Over the next decade Congress responded by passing the Clean Water Act, the Clean Air Act, the Endangered Species Act, Superfund, and RCRA.

Then came the second era. Call it the "Dark Ages." President Reagan tried to turn back the clock, and Congress fought him every step of the way. Consensus disappeared. The business and environmental communities squared off. Both sides were convinced that they were playing a zero-sum game, pitting the economy against the environment. Both sides became mistrustful. Both sides became shrill. It was gridlock, plain and simple.

Now we are on the verge of a third era: an environmental "Renaissance." The most telling evidence of this new era is the refreshing search for common ground--e.g., Bruce Smart's book, *Beyond Compliance*; the recent *New York Times* series on the economics of environmental policy; the work of such business and environmental leaders as Frank Popoff and Jonathan Lasch, who are exploring "win-win" solutions that protect the environment and create jobs.

The same message keeps coming through: we don't have to remain locked in a zero-sum game. Economic progress and environmental progress don't have to remain at odds. In fact, it is becoming increasingly clear that we can't have one without the other. The National Commission on the Environment, chaired by Russell Train, recently put it this way:

Economic and environmental well-being are mutually reinforcing goals that must be pursued simultaneously if either is to be achieved. Economic growth cannot be sustained if it continues to undermine the healthy functioning of the Earth's natural systems or to exhaust natural resources. By the same token, only healthy economies can generate the resources necessary for investments in environmental protection.

To put it another way, we must pursue a long-term strategy of sustainable development. This doesn't mean living in tents in the forest. It means achieving progress in a way that protects the environment and, by doing so, broadly improves the prospects for future generations.

The linchpin is technology. By the year 2050, both population and per capita output are expected to more than double. And environmental technology will be very much in the picture. Environmental technology doesn't mean a new black box at the end of a pipe. Environmental technology means the broad application of science to the entire population process. It means new ways to make products that waste less; new products that run cleaner. It means pollution prevention and life-cycle planning. It means, in short, a new way of thinking.

Environmental technology makes good economic sense. After all, pollution is waste; increasingly, we see evidence that "thinking green" helps keep a company in the black. But there is another dimension-- an international dimension. There is a worldwide trend towards stricter environmental protection. Companies that get ahead of the curve and develop environmental technology will have the edge in an international market that already has reached \$200 billion and is growing by 10 percent a year. The federal government spends about 4 billion dollars a year on things that could be categorized as environmental technology -- but the work is not coordinated and priorities are not set.

The second step is to create a regulatory program that stimulates the development of cutting-edge environmental technology by the private sector. This is where flags go up. To some in the business community, the best environmental regulation seems to be the weakest one. That's not what I'm talking about. If we truly are going to find common ground, we have to get beyond this obstructionist approach. The regulatory program that I'm talking about has two elements. It's aggressive and it's flexible.

An aggressive regulatory program is one that addresses, rather than ignores, environmental problems. It seeks out more than just the conventional problems. We have to face and deal with the grave new threats that previously had been beyond our range of vision: climate change; the loss of biodiversity; and the cumulative effects of minute concentrations of toxic pollutants. At the same time, we have to be flexible. We have to set high goals, but then give businesses the freedom and the incentive to find new, creative, efficient, cost-effective ways to achieve those goals. That way, we can harness the power of the marketplace.

Let me give you an example. When we toured BMW (Europe) last year, and I think you share these thoughts with me, it wasn't a typical automotive plant. They don't build the 535i -- they tear it down. Then they separate the parts for recycling. The engineers we spoke with said it was part of their effort to comply with a new law that requires many products, including automobiles, to be recycled. They are redesigning their cars so they can be recycled more easily.

The aggressive German recycling law is driving the development of new environmental technology. BMW is taking advantage. When the law takes effect, BMW will still have an edge. And when other countries enact similar recycling laws, BMW will have an international edge.

Some U.S. companies are also looking ahead and making changes now: e.g., Dow Chemical; and the Big Three automakers, who are banding together to develop a clean car to comply with the Clean Air Act. But every American company should be looking for ways to get ahead of the environmental curve. That's the only way we're going to invent

the technology we need to achieve sustainable development. And that's the only way we can hold our own with the Germans, the Japanese, and other competitors with the foresight to include environmental technologies in their strategic planning.

The Senate Environment and Public Works Committee is about to review the Clean Water Act, the Endangered Species Act, and Superfund. In each case, I plan to work with the business and environmental groups to find common ground; that is, to find new approaches that enhance environmental protection, promote the development of environmental technology, and create new economic opportunities.

What does this mean? Among other things--

- It means a Clean Water Act that shifts towards pollution prevention.
- It means a recycling law that encourages product life-cycle planning.
- It means a law that encourages producer responsibility for the products it manufactures.
- It means a Superfund revision that sets priorities and encourages the development of new cleanup technologies.

The new environmental era will test us all. We face tough problems. The stakes are high. We sometimes will have sharp disagreements. But we must communicate. And we must continue to search for common ground. We must look to other countries who have successfully implemented long-term environmental programs, such as Germany's durables take-back program. To find a common ground, we must build new partnerships and find new solutions.

Proposed Legislation During the 102nd session, Senator Baucus proposed amendments to the RCRA reauthorization, which would direct the EPA to conduct a study on opportunities for recycling automotive components. The amendments were passed by the Environment and Public Works Committee on June 16. Since then, RCRA has been placed on the back burner, and may stay there while CERCLA (Comprehensive Environmental Response and Liability Act) or Superfund is reauthorized. But some key backers of RCRA say they will do everything they can to push RCRA through the Congress during this session.

Senator Frank Lautenberg (D-New Jersey) introduced a bill in the Senate (S1908: Automobile Recycling Study Act) which would mandate the setting of design standards to eliminate hazardous and nonrecyclable materials in automobiles. Lautenberg's colleague, Representative Robert Torricelli (D-New Jersey), introduced the same bill in the house as HR 3369. According to his staff, Torricelli plans to reintroduce the bill soon, and Lautenberg may follow his lead. However, Lautenberg's reintroduction may be delayed because of his involvement with the Superfund reauthorization.

Not to be outdone by the Germans, these and other lawmakers were becoming increasingly serious about passing an automotive recycling bill during the last session, but the issue was put on hold during the presidential election. Several key legislators indicated in conversations this April that a resurgence of interest in automotive recycling is inevitable, and should occur very soon.

This effort will be part of a general legislative movement, at the local, state, and federal levels, toward stricter environmental regulations, and toward greater producer accountability for the solid waste generated from their products. Implementation of tougher emissions standards under the Clean Air Act amendments of 1990 will increase pressures on companies to reduce their use of hazardous solvents and other volatile organic compounds. New regulations requiring liners and leachate collection systems in landfill construction will increase the costs of solid waste disposal, providing further incentive for waste prevention. More states will respond by passing legislation regulating the environmental attributes of products and waste streams. And as consumers become more attuned to environmental concerns, they will demand that manufacturers be more proactive on environmental issues.

Several members of Congress indicated that the trend will be towards environmental policies that more accurately account for the environmental impacts of products throughout their life cycle. They recognize that providing better information to designers and consumers on the environmental impacts of materials and processes is important, but they are not willing to rely completely on voluntary measures. They expect that unless regulations are imposed, even well meaning companies will allow environmental concerns to be overwhelmed by other design requirements and demands.

In addition to seeking legislation directly affecting industry, members of Congress have proposed legislation that would increase the power and influence of the EPA, which oversees industry's compliance with environmental regulations. Senator Baucus, Representative Torricelli and Representative Henry Waxman (D-California) have supported legislation that would create a cabinet-level position for the EPA's administrator, and would empower the administrator with veto authority over laws and regulations introduced by other cabinet agencies.

If enacted, the legislation will allow the EPA to play a major role similar to the recently deceased White House Council on Competitiveness, which during the Bush administration blocked cabinet actions that it considered unfair to business. Under the Clinton Administration, it would be environmentalists rather than business advocates who would be granted an extra opportunity to question (and possibly block) the administration's actions.

The principal purpose of the legislation is to transfer statutory powers to the EPA previously held by the Council on Environmental Quality, which the President has eliminated. Under the bill, the EPA administrator would be given the power to review legislation, regulations, and newly authorized federal construction projects proposed by any federal department or agency. If any were found to be unsatisfactory from the standpoint of public health, welfare, or environmental quality, the EPA administrator could immediately and unilaterally veto them. Such a veto could only be overridden by a written order from the president, submitted within 45 days of the veto to the Senate Committee on the Environment and Public Works (which is chaired by Senator Baucus), and to the House Committee on Merchant Marine and Fisheries, (currently chaired by Representative Henry Waxman).

Virtually every other developed country in the world has an environmental minister with authority similar to the empowerment granted to the EPA administrator under this proposed legislation. One reason for the administration's support of the bill is the lack of influence the United States has at international environmental conferences, where global environmental policies are discussed and shaped. Historically, the United States has been viewed as an environmental lightweight, whatever its claims to superpower status in other arenas.

The draft bill is an indication that Vice President Gore will be persistently involved in forging the administration's environmental policies. In addition, Katy McGinty, who heads the White House environmental office and has participated in the drafting of the bill, was formerly a member of the vice president's senate staff. Carol Browner, the current EPA director, has also worked with the vice president, as a congressional aide.

THE FUTURE OF THE EPA

Ms. Browner, the former director of Florida's Department of Environmental Regulation, intends to expand and modify the EPA's mandate regardless of the fate of this legislation. She has expressed an intention to improve the agency's scientific capabilities, in order to encourage more well informed permitting decisions for everything from smoke- stack emissions to wetlands development. She also intends to involve the EPA in monitoring the enactment and enforcement of the Clean Air Act. Ms. Browner's general approach will be to shift the agency's focus from pollution control and cleanup to pollution prevention. She has made it clear that she considers EPA representation on the cabinet very important. In June she urged Congress to pass the legislation, calling it "necessary to ensure that the environment is fully engaged and integrated into this

country's examination of, and decisions on, national issues." Although she demonstrates, in statements like this, a firm belief in the importance of environmental issues, Ms. Browner is not prone to the antibusiness rhetoric that sometimes accompanies a pro environmental message; in our conversations, she was eager to stress that she will involve industries in decisions that will affect them, and does not see environmental protection as inconsistent with economic development. She noted that industry has rarely been involved in the modification of environmental regulations.

The EPA will remain a major force in the nation's environmental policy regardless of the fate of legislation, especially as the next levels of appointments are made. The Clinton administration's selection of key Environmental Protection Agency (EPA) officials has been widely praised by EPA staff, industry, and environmentalists, who say the new choices create a strong team to assist Carol Browner in implementing her mission. While most sources are—first and foremost—relieved that Ms. Browner finally has political program assistants in place, they also say the White House has chosen an extremely capable team. The lack of political appointees at EPA until now has hurt Ms. Browner's performance. However, several Capitol Hill veterans are hopeful the newly named team will give Ms. Browner's administration a badly needed boost.

The following individuals comprise the new EPA team; some have been appointed, while others will undergo Senate confirmation hearings, expected to be completed by mid-October. Individuals with an asterisk by their names will need to be confirmed.

***Jonathan Cannon, Assistant Administrator for Administration and Resources Management.** Mr. Cannon is a long-time EPA staffer who has held several positions at EPA, including serving as former EPA Administrator William Reilly's advisor during the last two years of the Bush administration. He has also served as an advisor to Carol Browner until she named Robert Sussman as deputy administrator. Mr. Cannon has also served as acting deputy administrator, and acting assistant administrator of the Office of Policy Planning and Evaluation. He is widely respected within the agency, and his knowledge of several EPA offices is raising expectations among EPA staff that he will have a firm understanding of program offices during budget formulation activities. A senior EPA staffer said that Mr. Cannon "has the ear and the respect of the 12th floor," referring to Ms. Browner's staff, adding that this will be important in discussions concerning contract management—one of the toughest issues that Mr. Cannon will have to confront. Mr. Cannon was a partner in the law firm of Beveridge & Diamond P.C., Washington, D.C., and has extensive experience in environmental law. He was a speaker at the 1992 Environmental Management Forum in Detroit.

***Elliott Laws, Assistant Administrator, Office of Solid Waste and Emergency Response.** Mr. Laws is currently a partner in the Washington, D.C. law firm of Boggs, Blow, & Elliott, which has close ties to the Democratic party. He served as a trial attorney at the Department of Justice in the mid-1980s, when he defended the EPA on a case involving the Bevill exemption from RCRA. He also worked in EPA's office of Enforcement and Compliance Monitoring. Mr. Laws is a graduate of St. John's University and Georgetown University Law Center. He is a good lawyer who understands bureaucracy, and his EPA background will afford him credibility at the agency.

***Mary Nichols, Assistant Administrator, Office of Air and Radiation.** Ms. Nichols has been a senior attorney at the Natural Resources Defense Council in Los Angeles since 1989. She was formerly in private practice with the law firm of Hufstедler, Miller, Carlson, & Beardsley. She served as California's secretary for environmental affairs and as California Air Resources Board chairman from 1979-1982. While several industry sources applaud Ms. Nichol's apparent orientation toward consensus building, some wonder whether her environmental background will bias her against industry. One Congressional source stated that "industry could be in for rough times." Environmentalists and state air officials have been very supportive of her candidacy. Overall, Ms. Nichols is known for being very capable, but her roles as head of CARB and with NRDC are not necessarily comforting to business.

***Robert Perciasepe, Assistant Administrator for Water.** Mr. Perciasepe has been Maryland's secretary of the environment since 1990, and played a key role in what many see as the nation's premiere watershed protection initiative—the Chesapeake Bay Program. Many sources familiar with his work expect him to continue to emphasize the same approach to protecting ecosystems. Obviously, his selection is being widely praised by environmentalist and state wastewater officials. His experience with the State Revolving Loan Fund program and his knowledge of the state-federal relationship will blend well with Ms. Browner's experience at the state level. His overall experience should afford him a fast start in what has become an increasingly difficult area for EPA, particularly in relation to the Safe Drinking Water Act. He is viewed as very ethical and is noted for his sense of humor.

Shelly Metzenbaum, Associate Administrator for Regional Operations and State and Local Relations. The daughter of Senator Howard Metzenbaum (D-Ohio and Senate Environment and Public Works Committee member), Ms. Metzenbaum served as undersecretary for management and budget at the Massachusetts Executive Office of Environmental Affairs. She also served as director of the Office of Capitol Planning & Budgeting from 1987-

1989 in Massachusetts. She directed the office of former Boston Mayor Kevin White from 1980-1981, and served as an economic development specialist in Arkansas for then-Governor Clinton.

***Jean Nelson, General Counsel.** Ms. Nelson is the nominee for general counsel and has served as Tennessee's deputy attorney general since 1989, where she was responsible for environmental and consumer issues. When she was in private practice in Nashville from 1975-1988, she worked on then-Senator Gore's presidential campaign. Most recently, she was chief of staff to Tipper Gore in the Clinton/Gore campaign.

Carol Browner's staff is already in place and includes: Robert Sussman, formerly with the Chemical Manufacturers Association, as deputy administrator; Kathy Aterno, chief of staff; Sylvia Lowrance, with the EPA, as associate deputy administrator; Mike Vanderbergh, as associate deputy administrator; and Dana Minerva, as special counsel to the deputy administrator.

Overall, Carol Browner, with the assistance of Vice President Gore has assembled an extremely capable and competent team at EPA. After a period of organization and adjustment, they are likely to unveil a comprehensive, nationwide, environmental enforcement-and-compliance program targeted at industry. The team is also likely to revisit programs such as Pesticides Registration, to review pesticides and herbicides used in the United States for health effects. They may also impose a moratorium on the export of pesticides, herbicides, and chemicals that have been deemed unsafe for use in the United States.

New EPA programs will cost about \$130 billion per year. EPA will also oversee a national cleanup effort that is expected to cost \$200 billion by the end of the decade. These figures can be put in perspective by considering that the U.S. auto industry averages about \$160 billion in annual sales, and the U.S. gasoline industry's sales come to about \$120 billion annually. Even under the Bush administration, generally considered much less proactive on environmental issues than the current one, the former EPA assistant administrator for air and radiation, William G. Rosenberg, established an aggressive agenda for clean-air legislation, and received significant support from Bush, EPA Administrator William Reilly, members of Congress, and industry representatives. The EPA under Bush achieved passage of amendments to the Clean Air Act that are credited with 47.5 billion pounds of pollution reduction each year.

NAFTA AND ENVIRONMENTAL ACTIVITY

A potential wild card in the outlook for U.S. environmental legislation is the North American Free-Trade Agreement (NAFTA). NAFTA is closely identified with a variety of environmental public policy issues; however, its effects on the environment and economy are as yet unknown. This 2,000-page treaty will eventually allow goods and services to move between the United States, Mexico, and Canada without quotas, import taxes, or other bureaucratic restrictions.

Negotiated by former President Bush, former Prime Minister Brian Mulroney, and President Carlos Salinas de Gortari, NAFTA merges the three national economies into one of the world's richest markets, comparable in scale to the European Community. The new North American market would have more than 360 million consumers, and annual output in excess of \$7 trillion. NAFTA took effect on January 1, 1994.

In the U.S. House of Representatives, however, opposition to NAFTA was severe, and Representative Richard Gephardt, the majority leader, and Representative David Bonier (D-Michigan), the House whip, opposed it. Several other powerful members are concerned about the possible migration of industrial jobs to Mexico; others fear an increase in pollution caused by companies operating in Mexico, where environmental enforcement of strong regulations is comparatively weak. In an attempt to defuse these issues, President Clinton negotiated side agreements which mandate minimal health and safety enforcement standards, in order to reduce the wage and regulation disparities between the United States and Mexico.

House Majority Leader Richard Gephardt (D-Missouri) stressed the danger of environmental degradation caused by NAFTA. Congressman Gephardt led a group of legislators on an unannounced inspection of the heavily-industrialized *Maquiladora* strip along the U.S.-Mexican border in early March, 1993. The group returned expressing grave doubts about the future of NAFTA. Among the deficiencies mentioned were lax standards in Mexico governing workplace safety and environmental impacts. Congressman Gephardt described a visit to a neighborhood near a Sanyo television assembly plant where, "when heavy rains came, as they did just a few weeks ago, industrial waste flowed down the hill through the streets." He also spoke of an abandoned U.S.-owned lead recycling facility, which appears to have caused several cows from a nearby dairy to develop fatal cases of lead poisoning. Based on these observations, as well as those made on four previous trips to Mexico, Mr. Gephardt concluded that "the current NAFTA will do nothing to stem the tide of pollution that endangers the health, safety, and welfare of the citizens on both sides of our border."

Mr. Gephardt's comments were echoed in a twelve-page open letter to President Clinton submitted by a group of environmental advocacy organizations. Calling on the president to strengthen NAFTA's environmental enforcement standards, these groups proposed that a commission be created, representing the three nations, and empowered to investigate complaints of pollution violations and recommend sanctions where appropriate.

The proposed North American Commission on the Environment would have included equal representation from the three countries, and the authority to investigate environmental violations would be shared equally. The letter also asked President Clinton to grant its authors a permanent role as advisors on trade issues. The fact that representatives of these organizations met with White House advisors to lobby for their proposals is a sign of the clout that environmental groups have with this administration. These meetings were with Kathleen McGinty, director of the White House Office of Environmental Policy, and a few members of the White House Science Office.

Although environmental issues fueled a great deal of the opposition to NAFTA, many other arguments were made against the agreement. Some opponents maintained that it will entice U.S. companies to relocate their factories in Mexico, to capitalize on low wage rates and loose environmental enforcement. Many believed that Mexico's environment, particularly in the border towns, has been irreparably damaged by polluting industries.

President Clinton is clearly under pressure to demand tighter environmental controls in Mexico, putting him in a difficult diplomatic situation. President Salinas will not be eager to give the appearance that Mexico's domestic policies can be dictated by the United States. At the same time, Mexicans in general—and President Salinas in particular—are counting on NAFTA and the foreign investment it is expected to stimulate, to support their country's bold and controversial economic reform program. Already, President Salinas has tried to demonstrate that he takes environmental concerns seriously, although U.S. politicians are not yet convinced. An indication of President Salinas's commitment was his appointment last year of Santiago Onate Laborde as the environmental attorney general for Mexico; Laborde has made environmental enforcement his top priority, padlocking several companies that had been known as blatant polluters.

Even if Mexico accedes to demands for more stringent environmental regulations, enforcing them will be no easy task. Mexico is a developing country, and cannot easily afford the added costs of environmental enforcement. The budget of Mexico's environmental agency is only \$39 million, of which a mere \$4.27 million is used for enforcement. Some relief will be available when the

World Bank begins to distribute the \$465 million it has earmarked for a three-year cleanup of the U.S.-Mexico border. However, these funds can only be used only in the 20,000 square miles of border area—10 percent of Mexico's land area and only 3 percent of its population. The gigantic problems of Mexico City's air pollution and the expanding refineries of Vera Cruz are among the challenges they must address with the limited funds available from other sources.

Mexican Environmental Secretary Rejes Lujan has suggested that effective planning can enable Mexico to achieve satisfactory environmental enforcement without a major increase in funding. Mr. Lujan's plan is to ratchet up environmental standards gradually through 1994, while decentralizing the enforcement structure, increasing staff, and expanding training programs.

The political controversy surrounding NAFTA contained a few interesting ironies. First, the outcry from U.S. environmentalists for increased enforcement standards in Mexico coincided with pressure from local officials within the United States to water down some of our own more inflexible environmental regulations. Congress is already feeling the heat from local governments demanding that they delay the implementation of the Clean Water Act and the Safe Drinking Water Act. Recently, a bipartisan group of 114 mayors sent a letter to President Clinton, Vice President Gore, and every member of Congress warning of an "impending fiscal crisis" that will result unless cities are relieved of excessive unfunded federal mandates, many of which are environmental regulations.

The second irony is the fact that most of the attention the treaty received was focused on the U.S.-Mexico border, ignoring the profound restructuring of the heartland of each country that is already underway, as the North American economy has become increasingly integrated. The most significant effects of NAFTA would not be felt in Monterey, Phoenix, San Diego, or Tijuana, but in Detroit, Toluca, Chicago, and Guadalajara—deep in the interior of the two countries. With NAFTA, the economic integration of North America is well under way. It may be safe to assume, therefore, that the signing of this treaty will not have a substantial effect on the course of environmental legislation in the United States. In fact, any adjustment of the administration's environmental policies is more likely to be motivated by internal opposition, such as the objections of the nation's mayors, than by foreign treaties.

RESEARCH

Federal government activity addressing solid waste and recycling is not confined to regulations and legislation. Both directly and through grants to outside organizations, the government is also heavily involved in research projects focusing on solid waste issues.

There is a consensus among environmentally concerned legislators that solid-waste legislation must be guided by research identifying the materials that pose the greatest threats to human health and the environment. Senator Lautenberg indicated that he would like the EPA and DOE to identify a short list of high-priority materials, components, and waste streams about which the government has insufficient knowledge. Lautenberg hopes that these agencies can develop quantitative models showing how these high-risk materials flow through the economy.

He emphasizes, as does Representative Waxman, that research is also needed to develop techniques for measuring environmental impacts of automotive materials and systems, and to develop an understanding of the ways in which the business climate and corporate culture affect product design decisions vis-a-vis the environment. They would also like to have a better understanding of the costs and benefits of various policy options.

Research projects relevant to the disposal of solid waste from durable products are being carried out and planned by government departments, the administration, and industry.

The Department of Energy The federal government's principal research project focusing on minimization of solid waste and energy consumption for manufacturing industries is administered by the Office of Industrial Technologies, which is part of the Department of Energy (DOE). The stated mission of this office is (1) to increase energy end-use efficiency and to promote renewable-energy use in industrial applications; (2) to reduce industrial and municipal waste-stream volume and the associated environmental impact; and (3) to identify, support, and transfer the results of its research.

Potential projects are identified in collaboration with private industry, and selected for funding based on their ability to improve energy efficiency and waste minimization in the private sector. The research is carried out under contract with university and government laboratories, and costs are shared on a 50-50 basis by private industry. The Department of Energy has a technology

transfer role, but much of the information dissemination and technology promotion is left to the organizations that perform the research.

In fiscal year 1992, the appropriation for DOE's industrial R&D program was \$97.5 million; the money was applied towards projects addressing industrial waste, cogeneration, materials processing, separation techniques, sensors and controls, bioprocessing, enabling materials, and improved combustion efficiency.⁴ The appropriation included \$17.7 million earmarked by Congress for a metals initiative directed at technologies for the steel, aluminum, and metal-casting industries.⁵ From 1976 through 1990, DOE spent \$534 million on industrial R&D.⁶

The Environmental Protection Agency Another federally funded demonstration effort is the National Industrial Competitiveness through Efficiency: Energy, Environment, and Economics program (NICE). This grant fund, administered by DOE and EPA, supports new technologies that can significantly reduce solid waste volume, conserve energy, and improve cost-competitiveness in industry. It is designed to demonstrate the new processes and equipment available to the industry, identify barriers to industrial-pollution-prevention techniques, and develop and implement strategies to overcome these barriers. The costs of the demonstration projects are shared by industry, states, and the NICE office. NICE was funded at \$1.4 million in FY 1992.

The EPA has requested funding in 1993 to establish a pollution-prevention demonstration program called Waste Reduction Innovative Technology Evaluation (WRITE). These demonstration projects will be carried out to encourage the transfer of technical information among industries.

The EPA will also be expanding its research activities through increased access to data on the effect of product-design choices on industrial waste streams. In the Pollution Prevention Act of 1990, Congress required that manufacturers reporting their releases of toxic chemicals to EPA for inclusion in the Toxic Release Inventory (TRI) must also report how these releases were affected by waste prevention activities, including product and process redesign. These data are expected to become available in late 1993.

⁴ Total appropriations for the energy conservation RD&D program for all sectors are 29 percent higher in FY1993 than in FY1992.

⁵ These programs are mandated by the "Joint Resolution Mandating Further Continuing Appropriations for the Fiscal Year 1986" (P.L. 99-190); the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 (P.L. 101-425); and the Department of the Interior and Related Agencies Appropriations Act, 1991 (P.L. 101-512).

⁶ Personal Communication, U.S. Department of Energy.

Clinton's Technology Plan The Clinton Technology Plan is not a full-blown industrial policy like those that link business and government in Europe or Japan. Nevertheless, it is a significant change from the Reagan-Bush "less is more" approach to government involvement in the business world. The plan is designed to give the U.S. government a more prominent role in commercial research and development, particularly for critical next-generation technologies too expensive for any one company to underwrite.

President Clinton's \$17 billion initiative would shift billions from pure military research to commercial research and development, and would encourage the nation's defense labs to work with industry on "dual-use" technologies. It would also fund a national high-speed computer information super highway, which the administration views as critical to America's economic security, and would increase the nation's network of manufacturing extension centers, which help small and medium-sized companies obtain access to the latest technologies.

Washington sources familiar with the plan suggest that an estimated \$7 billion would be allocated to the environmental impact of the auto industry. The section of the plan dealing with automotive products (the "Clean Car Technology Plan") focuses on power-plant aspects, including electric cars and alternative fuels; it does not address total, life-cycle, technology analysis.

The technology plan is part of President Clinton's larger effort to increase interaction and communication between government and industry. A technology czar will soon be appointed to lead this initiative; he or she will report to Vice President Gore, who will oversee the implementation of the plan. U.S. Representative Dale Kildee (D-Michigan) now chairs the Automotive Caucus, which was created to facilitate this sort of communication between the House and the automotive industry. The Caucus holds meetings in Washington, which typically involve legislators, automobile industry original equipment manufacturers (OEMs), and automotive parts suppliers. The Caucus also arranges industry site visits for legislators.

Industry Research The use of certain materials, as well as the use of hazardous or toxic chemicals, must be understood by government and industry as involving risks and benefits. Clearly, the environmental risks of some materials are so great that they outweigh any possible benefits, and they must be banned from landfills—these include heavy metals and possibly CFCs. For most chemical substances, however, more flexibility is appropriate. Many products that use toxic materials perform socially useful functions, and some produce social benefits (positive externalities).

On the other hand, we must recognize that there is considerable uncertainty about the health and environmental impacts of hazardous or toxic materials. Information on the toxicity and long-term health effects of most chemicals is sketchy at best, and the environmental risks to ecosystems are not well understood. Because of this uncertainty, it may be wise for industry to implement precautionary policies, by encouraging product designers to avoid the excessive or unnecessary use of hazardous materials.⁷

This practice would be consistent with federal legislative and regulatory objectives, and may serve to head off restrictive legislation. Voluntary research by industry into waste minimization, energy conservation, and elimination of toxic or hazardous materials makes good sense both economically and environmentally.

Automotive companies interested in working together with government to meet recycling objectives can turn to the Office of Technology Assessment (OTA) for assistance. The OTA has identified a number of ongoing federal activities that can help the industry make greener cars. For example, the EPA Office of Research and Development has supported development of a manual providing guidance for life-cycle design, which explores how designers can incorporate life-cycle assessment into their designs.⁸ Table 3 lists a number of such federally funded programs targeting "green design." Automakers can also contact pollution-prevention centers at major universities, to assist them in developing environmentally friendly designs.

⁷ See Daniel Kaplan, "Economic Issues in the Reuse of Automotive Plastics," (University of Michigan Transportation Research Institute report no. 93-40-2, 1993), 40-42, for a game theoretic analysis of industry's interest in minimizing waste. Research, of course, may be a necessary component of any realistic efforts to do so.

⁸ Gregory A. Keoleian and Dan Menerey, "Life Cycle Design Manual: Environmental Requirements and the Product System," EPA, 1993.

Table 3: Federally Funded Programs Related to Green Design

Agency/office	Program/activity	Comments
Department of Energy Office of Industrial Technologies	Industrial Waste Reduction Program	This research and development program aims to identify priority industrial waste streams, assess opportunities for addressing these waste streams through redesigning products and production processes, and technology transfer from national laboratories.
Environmental Protection Agency Office of Research and Development	Environmental Resource Guide	Contracted to the American Institute of Architects, this project will provide information to architects on the life-cycle environmental impacts of construction materials.
	Dynamic Case Studies on Environmentally Advanced Product Design	Contracted to the Resource Policy Institute in Los Angeles and the Product Life Institute in Geneva, this project will explore case studies involving green product design.
	Life Cycle Assessment Methodology	Contracted to Battelle, this project will develop standard methodologies for conducting product life-cycle assessments.
	Clean Products Case Studies	Contracted to INFORM Inc., this project will provide case studies of green design, especially the reduced use of toxic substances in products.
	Safe Substitutes	Contracted to the University of Tennessee, this project will identify priority toxic chemicals and evaluate possible substitutes.
	Life Cycle Design Guidance Manual: Environmental Requirements and the Product System	Contracted to the University of Michigan, this manual will explore how designers can incorporate life-cycle information into their designs.
	National Pollution Prevention Center	Located at the University of Michigan, this center is developing waste prevention information modules for industrial and engineering design courses.
	American Institute for Pollution Prevention	In association with the University of Cincinnati, the Institute serves as a liaison to a broad cross-section of industry, with projects involving four aspects of waste prevention: education, economics, implementation, and technology.
Office of Pollution Prevention and Toxics	Design for the Environment	Proposed program to gather, coordinate, and disseminate information on green design.
National Science Foundation	Engineering Design Research Center	Located at Carnegie Mellon University, the center is organizing a program to explore methods for green design.

SOURCE: Office of Technology Assessment.

LOOKING TO THE FUTURE

William G. Rosenberg, former assistant administrator for air and radiation at the EPA, spoke in Ann Arbor, Michigan on Earth Day, 1990. Rosenberg suggested that auto companies that anticipate environmental regulations by selling cleaner products would be rewarded with increased market share. For this, he was roundly criticized in papers published by the Society of Automotive Engineers.

Times have changed, and Rosenberg's suggestion seems much less radical now. In 1993, Ford announced that its cars are meeting the California emissions standards earlier than required by regulations. Oil and ethanol companies are talking about clean-air gasoline, and advertising environmentally friendly products. DuPont ran a television advertisement in which seals were shown applauding their decision to use double-hulled tankers. Corporate environmental responsibility is now viewed as conferring a double benefit: it not only serves to deter government regulation (or at least prepare companies for compliance), but it also enables them to tap into a wave of environmentally directed consumer buying behavior, which was originally set in motion by environmental advocacy groups.

It is worth noting that the combined U.S. membership of the Sierra Club, World Wildlife Foundation, and Audubon Society is greater than the number of members in the democratic and republican parties.⁹ In Canada, there are more members of Greenpeace than of all of the political parties combined. It is no accident that more progress has been made in the environmental arena than on any other social issue, by far, over the past ten years. At the same time, the environmental movement has become sufficiently mainstream that it no longer qualifies as a "movement." Companies that understand that public concern for environment is neither temporary nor reversible will be in the best position to meet the challenge of environmental responsibility over the next decade.

⁹ This estimate is based upon party membership as measured by declared party membership plus voters who participate in the presidential primaries of the two parties. These lists, as well as the environmental groups' membership lists, were carefully screened to eliminate duplicates.