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TAMING THE TOXIC THREAT

STRATEGIES TO REDUCE HAZARDOUS WASTE GENERATION IN THE NORTHWEST
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INTRODUCTION

Even in a complex society, there can be simple truths. The nation is generating staggering quantities of hazardous wastes that threaten the environment and public health. Existing governmental measures have been inadequate to address this toxic threat. Alternatives known as source reduction strategies, which focus on decreasing the initial generation of hazardous wastes, have been embraced as concepts but largely ignored in practice.

The Northwest retains the opportunity to do things differently. Problems in hazardous waste generation and disposal, though significant, are not nearly so severe as those in the industrial Northeast and Midwest. Even though source reduction efforts and other environmental management initiatives are growing, the region has not yet fully accepted the new environmental challenge.

Even if there is consensus that the Northwest shares these circumstances and faces these opportunities, the role of source reduction in addressing the toxic dilemma remains relatively uncharted. Taming the Toxic Threat is the Northwest Policy Center’s attempt to involve and energize this essential policy development process. Our analysis of present source reduction efforts within the Northwest reveals that those programs provide a base upon which the region can build. However, they have not achieved the comprehensiveness or the scale that even other regions of the country have accomplished. This report outlines several means through which these efforts can be enhanced, and ways in which citizens, governments, and companies now absent from this scene can and must make their mark.

In our first chapter, “The Hazardous Waste Dilemma,” we explore the national and regional dimensions of hazardous waste generation and disposal. We describe the present situation as a “pollution shell game” in which shifting laws and liability standards encourage the transfer of hazardous wastes from one medium (air, land, surface water, or ground water) to another with no decrease in their toxicity or environmental hazard. We outline how disposal of hazardous wastes into any of these media has increasingly been problematic, and how these disposal concerns are stimulating new interest in alternative environmental management strategies.

The states of Alaska, Idaho, Oregon, and Washington (EPA Region 10) generate over 200,000 tons of hazardous waste annually. Over 85% of regulated hazardous wastes is generated by only 287 firms, most located in western Washington and western Oregon. The chapter describes the primary waste streams with which the region has to contend. In several sectors, companies are facing serious problems in the cost and effectiveness of waste disposal.

Chapter two, “Source Reduction as a Critical Response,” demonstrates the application of source reduction strategies to the waste dilemma. Companies can and do modify production processes to decrease the volume and toxicity of wastes generated. In some instances, these process changes are made at little cost and with immediate benefit. But even when capital costs are high, such companies as 3M have
demonstrated those costs can be recovered in
two to three years through decreased disposal
costs or lower raw materials expenses. Govern-
ments and trade associations are establishing
programs to assure that more of these lessons
reach small businesses, which often do not have
the resources to pursue these techniques inde-
pendently. A number of state efforts much more
ambitious than those in the Northwest are
outlined in detail.

In addition, source reduction can be
achieved through substitution of less toxic
elements in the production process, ultimately
yielding less hazardous or toxic waste, as well as
decreased volumes of waste. The growing
interest in toxics use reduction is being driven by
new levels of citizen activity and response.
These citizen efforts range from opposition to
new landfills to pressure for more environmen-
tally benign products.

In Chapter 3, "The Regulatory Climate," selected Northwest companies present their own
perceptions of opportunities and barriers.
Interviews carried out by the Northwest Policy
Center with forty officials from companies and
trade associations reveal several instances where
companies feel the regulatory environment
constrains new source reduction investment.
Further, they claim that regulation often has no
relation to risk, forcing high costs in managing
wastes of little hazard and thus decreasing
resources available to invest in such strategies as
source reduction of highly hazardous wastes.

Finally, "New Levers for Source Reduc-
tion" provides one blueprint for where the
Northwest can go from here in realizing the
promise of source reduction. We review the role
of each of the central players, including citizens
and citizen organizations, small and large
companies, state and local governments, and
waste utilities.

One area stands out regarding the role of
governments throughout the region. Various
government agencies are carrying out their
individual missions to help small businesses re-
evaluate their production processes to make
certain that their products can remain competi-
tive in the international economy, to enable a
decrease in energy use and costs, and to reduce
the initial generation of hazardous wastes. Why
not find means to carry out these public purposes
in concert, thus guaranteeing that many more
small companies will be reached?

The promise of source reduction in the
Northwest remains before us. The region has not
fulfilled that promise, and will not unless efforts
are increased far beyond those already initiated.
The benefits are quite clear — a ton of waste not
generated is a ton of waste that will never exact
an economic cost or present an environmental
hazard. It is time that source reduction become a
primary element of environmental management.
It is time such strategies are recognized as a
central means to preserve the extraordinary
quality of life the region's citizens enjoy.

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this project.

— David Harrison
Executive Director
THE HAZARDOUS WASTE DILEMMA
The nation's citizens, businesses, and governments are increasingly considering the environment when making choices about products, policies, and leaders. The 1970s saw groundbreaking national legislation to protect the country's air and waterways. The legacy of the nation's environmental movement of the past two decades includes improved federal, interstate monitoring and regulation of industry to ensure some level of protection of the environment and human health through pollution control. Because of these efforts, air and water quality throughout the nation have improved substantially over the past decade. However, environmental problems related to pollution of air, land, and water have by no means disappeared. In selected cases these problems may even be getting worse. We are suffering the cumulative effects of our past practices; we have created new generations of toxics with uncertain health and environmental impacts; and we are burying ourselves under the tons of wastes that our consumer-focused society generates.

The Clean Air Act of 1970 marked the beginning of a new era in which the federal government set binding national environmental standards rather than relying on individual states to protect environmental quality. According to the Conservation Foundation, the Act has helped the nation achieve a 30-40%
These successes are moderated by the continued discharge of toxic contaminants, fallout of air pollutants, and fecal coliform bacteria that continue to contaminate groundwater, surface water, and wetlands.

Addressing Public Health and Environmental Threats

Many threats remain despite these gains in environmental quality, monitoring, and enforcement. Much of the nation still faces regular air quality alerts. According to INFORM, a non-profit environmental education group based in New York, U.S., industries annually release billions of gallons of non-regulated hazardous wastes and chemicals into the nation’s air and waterways. And industry is not the sole culprit of this degradation. Routine burning of household woodstoves produces several cancer-causing chemicals, including the carcinogen benzo-a-pyrene.

Wastewater treatment plants have reduced the excess nutrients and other water contaminants. Yet these successes are moderated by the continued discharge of toxic contaminants, fallout of air pollutants, and fecal coliform bacteria that continue to contaminate ground water, surface water, and wetlands in many areas of the U.S., including the Pacific Northwest. Sources of this contamination range from use of agri-chemicals (pesticides and fertilizers) to leaking underground waste storage tanks. Every year, American crops are dusted and sprayed with about one billion pounds of herbicides, fungicides, insecticides, and other toxic chemicals - a tenfold increase since the end of World War II. Such suspected carcinogens as alar and dioxin are increasingly appearing in our nation's food and water supply.

The companies that manufacture chemicals used by agriculture and industry are continually creating new products and new chemicals that have undetermined environmental and health effects. Many of these chemicals have been linked to birth defects, nerve damage, cancer, and environmental damage. The wastes generated from the use of these chemicals annually totals over 70 billion gallons, or 265 million metric tons of hazardous waste in the U.S. alone.

While regulatory measures such as RCRA and the Toxic Substance Control Act (TSCA) provide oversight of the proper use and disposal of many hazardous and toxic materials and wastes, other chemicals and their uses remain unregulated. The dilemma is that as more chemicals become regulated, the chemical industry creates new, unregulated, and under-
evaluated substitutes. Of the thousands of chemicals used in the workplace, the Occupational Safety and Health Administration has devised safety standards for only 23. In fact, many of these newly-manufactured chemicals may be even more hazardous than their regulated predecessors. The nation's regulatory agencies simply have not kept up in the face of this chemical production. The core of this dilemma is that as new chemicals are developed and new uses are found for them, public health hazards can increase even as reported levels of regulated substances decrease.

Although the U.S. has begun to seek alternatives to the traditional land disposal of these wastes, this effort has come too late for the over 25,000 hazardous waste sites that EPA has targeted for cleanup. In fact, the U.S. Office of Technology Assessment of the U.S. Congress estimates that over 350,000 waste sites will eventually need some cleanup.

According to Warren Muir, Senior Fellow at INFORM, the wastes generated in the past and present represent a continuous economic liability for the companies generating them, as well as a regulatory concern. Industrial hazardous wastes will continue to require billions of dollars to clean up and manage properly. In addition, hazardous waste represents a lost economic investment to the company, as raw materials are continuously needed to replenish the supply wasted. "Industrial inefficiency," according to Muir, "is not only bad for individual businesses; it also weakens the U.S. competitive position in international markets." Clearly, a new strategy for dealing with industrial hazardous wastes is essential.

The wastes generated in the past and present represent a continuous economic liability for the companies generating them, as well as a regulatory concern.
Pollution incidents have resulted in growing public awareness and action regarding environmental and human health protection. An illustration of this increased citizen action is enactment of right-to-know laws that require companies to provide information to the public about specific chemical use and disposal practices. Right-to-know laws have resulted in a growing oversight of industry by citizens. Some communities, given information by these laws, have taken action when they found agency regulation and monitoring to be insufficient.

As citizen awareness and regulatory oversight of firms strengthens, so too come regulatory problems. Companies that use toxic materials and generate hazardous wastes must answer to public concern and comply with sometimes bewildering or even contradictory federal, state, and local government regulation. Small firms in particular may not have the financial resources or technical capacity to comply fully with regulations intended to meet stringent emissions standards. Other larger companies may be able to comply with pollution control laws, but are often unwilling to share their knowledge with other firms or go beyond specified standards of pollution control even when additional gains are easily achievable. This reluctance, however understandable, results in insufficient development and transfer of technology to allow smaller companies to fully comply with hazardous waste
management and pollution control laws. Without the necessary application of technology to eliminate, reduce, recycle, or treat hazardous wastes, many firms may resort to illegal dumping and emissions, go out of business, or simply continue to avoid the attention of regulators.

Analysts often cite the “pollution shell game” as a significant contribution to increased pollution by firms. In this scenario the regulatory system itself causes pollution to occur, rather than preventing it, by inadvertently providing ways for companies to continue to pollute. Companies may change their waste management practices for the worse if they are regulated by conflicting or poorly coordinated laws for separate land, air, and water disposal. For example, federal law has made more stringent industrial liability standards for land disposal. In the face of this change, many companies have turned to waste incineration, whether or not the threat of pollution is greater than land disposal.

Even under the best of circumstances, these alternative waste management practices often simply move the pollution from one environmental medium or “shell” to another. Current policies and regulations concentrate on removing pollutants from the media in which they are found, without adequately considering how these pollutants behave in the environment, interact with other substances, or change form and location over time. Many communities have found that prohibiting direct discharges of pollutants into water systems doesn’t necessarily keep the water pollution free, due to the precipitation of airborne pollutants. One of the most dramatic examples of this dilemma is acid rain, which originates from smokestack emissions but eventually enters surface water and ground water, causing significant environmental degradation. U.S. air, water, and land pollution laws focus on the separate regulation of pollutants, and often send conflicting signals to the waste generator.

The inadequacy of present hazardous waste management is not limited to the inconsistency of environmental regulation. The nation’s communities and companies are finding it increasingly difficult to ensure adequate disposal capacity to meet their needs. According to a recent study done by the New York Legislative Commission on Toxic Substances and Hazardous Wastes, the siting of hazardous waste landfills was one of the most controversial environmental issues of the 1980s, due to a growing awareness by citizens of environmentally destructive disposal practices. Community residents are consistently opposing development of hazardous waste landfills in their communities. While CERCLA was passed by the U.S. Congress in 1980 to first address landfill pollution problems, and the Superfund Amendments and Reauthorization Act of 1984 provides for expanded cleanup of the nation’s contaminated hazardous waste disposal sites, there remains little incentive for citizen groups to cooperate on siting of future hazardous waste disposal sites in their “backyard.” Substitutes for hazardous waste land disposal such as incineration will increasingly be relied on to provide greater capacity for disposal of hazardous wastes.
The Need for a New Response

The United States has fashioned an inadequate response to such hazardous waste management problems as cross-media pollution, landfill siting disputes, and regulatory inconsistency. Some have called for a new method of government oversight of hazardous waste management. William D. Ruckelshaus, former Director of the U.S. Environmental Protection Agency, argues that over the long run, economic development and environmental protection are complementary, rather than opposing goals. He believes that economic incentives can be more carefully shaped to induce actions beneficial to the environment. Many environmental engineers claim that better engineering and modification of production processes would result in fewer environmental problems over the long term. Others propose that imaginative approaches to foster cooperative activity between technical experts and the policymaking community are needed so that thousands of companies can be assisted in changing their waste generating practices. Still others maintain that policies that have addressed the activity of major polluters do little to alter environmental choices by individuals. These analysts claim that because many environmentally harmful activities take place on the individual, rather than corporate level, policies must aim to change individual behavior.

Whatever the strategy used, it is clear that a sharper and more intensive strategy for preventing and responding to hazardous waste management problems is needed for the nation, and for the Pacific Northwest. The region's extraordinary quality of life will ultimately depend upon the success of these initiatives.
The Northwest Dimension

Dealing with hazardous wastes generated by our society is a rapidly developing and important issue. The United States generates over 260 million pounds of hazardous waste each year. In the past, the most common method of disposing of hazardous waste has been to bury it in unlined landfills, or to dispose of it in hazardous chemical manufacturing areas, thereby causing pollution, and increasing environmental and health problems associated with this landfilling technique. The problem of hazardous waste management has stimulated the public to search for better means of hazardous waste management. Landfilling these wastes is not the only problematic way of disposing of them. Inadequate treatment plants, incineration sites, and ocean disposal of wastes have caused many environmental and health problems. This lack of alternatives is causing other regions to turn their attention toward ways to eliminate or decrease the initial use of hazardous materials and generation of hazardous wastes in industrial manufacturing and production processes.

The problems associated with hazardous waste generation are not yet intractable in the Pacific Northwest. A recently released federal government report, The National Toxics Release Inventory, reveals that Washington is the only Northwest state that ranks among the top twenty for toxic chemical releases. The Pacific Northwest has fewer hazardous waste treatment, storage, and disposal facilities than all other EPA regions except one.
This should not lead the region to a sense of complacency about pollution. The Northwest is experiencing increased industrial activity and rising populations. Reports of the environmental degradation that has accompanied this growth are increasing. One of the sources of environmental concern in the Pacific Northwest is the growing generation and disposal of hazardous waste by businesses, governments, and households. Examples of past mismanagement of hazardous waste include the 44 selected and 24 proposed Superfund sites in the region (Fig. 1).

Under the Resource Conservation and Recovery Act (RCRA), each company that generates over 100 kilograms of hazardous waste each month must report the types and amounts of hazardous waste generated. In Alaska, Idaho, Oregon, and Washington (EPA Region X) alone, over 2,000 companies reported generation of over 260,000 tons of hazardous waste in 1986, representing a 14% increase in generation over 1985. In addition, other wastes which are not regulated under RCRA, such as household hazardous wastes and wastes generated by small quantity generators, are either treated by wastewater treatment plants or disposed in landfills.

The most recent hazardous waste generation and management data for this region was collected by environmental agencies in each of the four states during 1986 (in Idaho, Oregon and Washington) and 1987 (in Alaska). This data can be used to depict generation and management patterns as they existed during this period. It is important to note that these hazardous waste generation and management patterns change from year to year. Yearly data provides
only a "snapshot" of activity at a particular moment in time. The database includes those hazardous wastes regulated under the Resource Conservation and Recovery Act (RCRA), state-regulated wastes for Washington and Oregon (other than RCRA wastes), and wastes from Superfund and state cleanup sites. The data used for this report does not include household hazardous waste or wastes generated by companies that generate less than 100 kilograms per month. Nor does it include wastes which typically go to local wastewater treatment facilities.

Of the four states in the Pacific Northwest, Washington collects the most comprehensive data on hazardous waste generation and management. The Washington Department of Ecology is examining ways that waste reporting requirements in Washington can be streamlined and modified to make the database more useful to the public. The results of this effort should prove useful for the other states in the region as well.

**The Waste Management Picture**

Regional hazardous waste management has emphasized land disposal and long term storage. In 1986, nearly 50% of the 471,262 tons of hazardous waste "managed" in the region was either landfilled or placed in surface impoundments. Usually the total amount of hazardous waste managed in a year is larger than the amount generated, because waste that was generated during another year, but stored, must later be managed (treated, disposed, incinerated).

Storage of hazardous waste for ultimate disposal was the second most prevalent management practice in the region, as it accounted for 41% of the total waste "managed." The remaining 9% of the region's hazardous waste was treated either chemically, physically, or by incineration (Fig. 2).

This emphasis on land disposal and long term storage is likely to change, however. In 1984, Congress passed the Hazardous and Solid Waste Amendments to RCRA, which established a schedule that will eventually prohibit the land disposal of certain hazardous wastes unless they are treated by employing "best demonstrated available technology" in order to reach a standard for acceptable land disposal. The Superfund Amendments and Reauthorization Act (SARA) calls for every state to assure the federal government that it has adequate capacity to handle its hazardous wastes for the next twenty years. This law has increased costs and liability associated with hazardous waste management, and has led industrial plant managers and policy makers to reassess traditional hazardous waste generation and management practices. An increasing number of states (including the states of the Pacific Northwest) have adopted a hierarchy of preferred hazardous waste management methods that establishes source reduction as the most preferred option, followed by waste recycling, treatment (either chemical, physical, or biological), incineration, stabilization, and land disposal.

![FIGURE 2: NORTHWEST HAZARDOUS WASTE MANAGED](image)

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**Movement of Wastes**

One critical aspect of regional waste management is the interstate transport of hazardous wastes. Collectively, the four states in the Pacific Northwest import over 14,000 more tons of hazardous waste than they export to areas outside the region. Alaska produces a very small portion of the region’s waste, all of which is shipped out of state for treatment, storage, and disposal. In contrast, Idaho imports more hazardous waste to its large treatment, storage, and disposal facility than it generates, most of which comes from outside of the region.

Arlington, Oregon is the site of the only other treatment, storage, and disposal facility in the region. These sites are certified for receipt of hazardous wastes and, unlike solid waste landfills, serve groups of states rather than municipalities or individual states. Because of the location of its facility, Oregon receives the largest volume of hazardous waste of any state in the region. Washington, on the other hand, exports more hazardous waste than any other state in the region. In fact, Washington is responsible for about 99% of the wastes exported to Oregon.

The scale of Washington’s waste exports to other states raises the question of whether the state can or should continue to export its hazardous wastes instead of building and maintaining its own hazardous waste management facility. The requirement for the region to assure EPA that it has sufficient hazardous waste disposal capacity will focus additional attention on Washington.

Source reduction will play an important role in decreasing the region’s need for additional disposal capacity by reducing the total amounts of hazardous waste being generated, transported, and disposed in the region. In its 1989 Annual Report, the Pacific Northwest Hazardous Waste Advisory Council recommends that the Pacific Northwest increase its reliance upon hazardous waste reduction as a source of “capacity.” The Council endorsed a goal of 50% reduction in Pacific Northwest hazardous waste generation by 1995.

**Hazardous Waste Generation Patterns**

In 1986, approximately 260,000 tons of hazardous waste were generated in the states of Alaska, Idaho, Oregon, and Washington. This waste generation tends to be concentrated in metropolitan areas with high levels of industrial activity such as Seattle and Portland. Areas with lower population levels, where agriculture or other non-manufacturing sectors represent the predominate economic activity, generate significantly smaller amounts of hazardous waste. This is the case in most of Idaho and Alaska, and non-urban areas of Oregon and Washington.

**State Hazardous Waste Generation**

Washington generates over 89% of the Pacific Northwest’s reported hazardous wastes. Oregon is responsible for about 9% of the...
region's annual hazardous waste generation, while Alaska and Idaho account for the remaining small amount (Fig 3). This state breakdown can be misleading. Washington's high percentage is due in part to the fact that Washington chooses to regulate and report the generation of additional hazardous wastes over those that must be reported under federal regulations. Over 51% of the Northwest's hazardous waste generated is RCRA-regulated waste, however, and Washington is responsible for over 75% of that waste. The high amounts generated make Washington an ongoing focus of source reduction efforts, and demand from the state a strong role in shaping future hazardous waste management policy.

Hazardous Waste Generation By Industry

In 1986 over 2,100 firms in the region, representing over 195 industries, indicated to federal and state environmental agencies that they generated reportable amounts of hazardous waste. However, the majority of hazardous waste reported is generated by only a small number of businesses. Approximately 85% of all wastes generated in the region in 1986 were generated by only 287 firms - only 13% of those reporting hazardous waste generation.

Manufacturing sectors, including all firms that manufacture goods for consumption, were responsible for 64% of the region's hazardous waste. Primary and secondary metals manufacturing, transportation equipment, and chemical

**FIGURE 4: 1986 NORTHWEST MANUFACTURING SECTOR HAZARDOUS WASTE GENERATION**

Non-manufacturing sectors were responsible for about 36% of the region’s hazardous waste in 1986. Government, trade, and service establishments accounted for 24.3% of the total hazardous waste generated in the region. Examples of generators in this group include laundry, cleaning and garment services, auto repair shops, waste management firms, and the U.S. Department of Energy. Transportation-related activities such as trucking, courier services, and railroads generated 7.8% of the region’s hazardous waste, while the defense operations generated 3.4%. Various other categories such as mining and oil production accounted for less than one half of one percent (Fig. 5).

Types of Hazardous Wastes Generated

There are a number of ways to analyze the composition of the 260,000 tons of hazardous waste generated in 1986. One way is to distinguish between recurrent and non-recurrent wastes. Recurrent wastes that are produced as a result of the on-going activities of the region’s companies, industries, and governments comprised the major portion (82%) of the waste stream. Their future volume will depend on source reduction efforts, attempts to bring more generators into compliance with reporting regulations, and growth in the sectors that produce...

wastes. Another important factor affecting future recurrent waste stream volumes is any addition of hazardous wastes to the list of wastes that must be reported by companies under the Resource Conservation and Recovery Act. This list will continue to grow as federal and state governments identify new substances, processes, or wastes that are hazardous to human health and the environment. For instance, of the four states in the region, only Washington currently regulates spent potliners, which are generated during the manufacture of aluminum. However, spent potliners are likely to be added to the federal (RCRA) hazardous waste list in the near future, as are wood preservative wastes and waste oils. Individual states may also choose to add additional wastes to their own reporting standards and thereby expand the wastes and amounts reported.

Non-recurrent wastes, or those associated with contaminated waste sites, one-time-only spills, and cleanups at various other facilities, make up the remaining 18% of the region’s waste stream. For the most part, this portion of the waste stream is not amenable to waste reduction efforts as it is comprised of wastes that have already been generated and either disposed of or stored. While these wastes pose a contamination threat, it is possible that some of them could be recovered, recycled, and eventually reused in industrial manufacturing processes, thus decreasing the total amount of non-recurrent wastes which eventually would have to be landfilled, incinerated, or treated in any way. As waste management practices become more sophisticated and as source reduction is more widely practiced, the number of hazardous waste cleanup sites should begin to decline.

By considering and analyzing the specific hazardous substances that enter the waste stream, the Pacific Northwest will begin to understand what industries and processes are responsible for specific hazards to human health and the environment. Wastes reported only in Washington are the single largest component of the region’s regulated hazardous waste stream, consisting of almost one half of the total wastes generated (Fig. 3). These include substances defined as moderately toxic by Washington State law including: waste treatment sludge; inorganic solids; contaminated rags, soil, and sand; paint sludge; solutions containing heavy metals; oily waste water; and, detergents and soaps. The extremely toxic wastes include solids such as spent potlining, and liquids such as petroleum cleaning solvents. The third category of wastes reported only in Washington includes polychlorinated biphenyl-contaminated oils and transformers.

Metals such as cadmium, copper, chromium, lead, aluminum, and nickel make up the largest portion of federally regulated wastes in the Pacific Northwest at nearly 58,000 tons, or 22% of the regional total (Table 1). Corrosives make up the next largest category and include such substances as black liquor from vanillin manufacturing, high chrome wastes, alkaline waste mixes, waste acid mixes, and wastes produced as a result of etching and plating processes. Corrosives are common in manufacture of industrial organic chemicals and electronic components and accessories. The third largest category is ignitable wastes, produced primarily during the manufacture of paints and varnishes and by various businesses in the service sector, including waste management firms. Electroplating sludges are the fourth largest federally regulated waste. These five categories of hazardous waste comprise over 87% of the Pacific Northwest regulated hazardous waste stream.

Further Considerations

The waste management and generation patterns presented in this chapter still contain some unknown variables. For instance, hazardous wastes generated by households and by small companies that generate less than 100 kilograms per month are not included in the above analysis. These hazardous waste generators are not required to report their annual hazardous waste generation. While there is no reliable regional data base that tracks the generation of these wastes, one study estimates between 35,000 and 65,000 tons are generated in the Northwest each year. Due to the development of local hazardous waste programs by a variety of government and private organizations, many household hazardous wastes are now being collected and properly disposed. In addition, several state environmental agencies and public interest organizations are informing consumers about toxics use reduction, source reduction, and recycling of household hazardous wastes.

Despite these household hazardous waste education and collection programs, it is possible
that a significant amount of toxic products used in the home end up being disposed of in environmentally harmful ways. For example, many household cleaning agents contain toxic ingredients which, when the cleaning job is done, either evaporate into the atmosphere or are washed down the drain, ultimately ending up in sewers, wastewater treatment plants, or ground and surface water. Containers that contain residue of hazardous materials (spray cans, paint cans, cleaning rags, etc.) are commonly placed in garbage cans and taken to solid waste landfills not equipped to handle hazardous wastes. While individual releases of these toxics may be minimal, when they are combined they represent a substantial threat to the region's communities and environment.

Northwest states must focus on identifying the industrial sectors, waste types, and business practices that offer the greatest potential for source reduction. In addition, they must increase their understanding of household and small business toxic product use and hazardous waste management practices. These efforts will facilitate the design and implementation of programs and policies that will make source reduction work.

### TABLE 1: 1986 NORTHWEST HAZARDOUS WASTES BY TYPE

<table>
<thead>
<tr>
<th>Type</th>
<th>Tons</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>57,854</td>
<td>22.3</td>
</tr>
<tr>
<td>Corrosives</td>
<td>23,329</td>
<td>9.0</td>
</tr>
<tr>
<td>Ignitables</td>
<td>10,468</td>
<td>4.0</td>
</tr>
<tr>
<td>Electroplating Sludges</td>
<td>10,078</td>
<td>3.9</td>
</tr>
<tr>
<td>Chlorinated Solvents</td>
<td>7,271</td>
<td>2.8</td>
</tr>
<tr>
<td>Steel Emission Control Dust</td>
<td>6,832</td>
<td>2.6</td>
</tr>
<tr>
<td>Non-Chlorinated Solvents</td>
<td>5,107</td>
<td>2.0</td>
</tr>
<tr>
<td>Petroleum Residuals</td>
<td>5,092</td>
<td>2.0</td>
</tr>
<tr>
<td>Misc. Inorganics</td>
<td>2,473</td>
<td>1.0</td>
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<tr>
<td>Misc. Organics</td>
<td>2,428</td>
<td>0.9</td>
</tr>
<tr>
<td>Pesticides</td>
<td>1,110</td>
<td>0.4</td>
</tr>
<tr>
<td>Other Halogenic Organics</td>
<td>1,091</td>
<td>0.4</td>
</tr>
<tr>
<td>Steel Spent Liquor</td>
<td>885</td>
<td>0.3</td>
</tr>
<tr>
<td>Reactives</td>
<td>278</td>
<td>0.1</td>
</tr>
<tr>
<td>Aluminum Coating Sludge</td>
<td>80</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total RCRA Wastes</strong></td>
<td>134,376</td>
<td>51.7</td>
</tr>
<tr>
<td><strong>Washington-Only Wastes</strong></td>
<td>125,629</td>
<td>48.3</td>
</tr>
<tr>
<td><strong>Regional Total</strong></td>
<td>260,005</td>
<td>100%</td>
</tr>
</tbody>
</table>
Source Reduction
As a Critical Response
Source reduction is also known as waste reduction. The United States Congress Office of Technology Assessment offered this definition of source reduction in 1986:

"In-plant practices that reduce, avoid, or eliminate the generation of hazardous waste so as to reduce risks to health and environment. Actions taken away from the waste generating activity, including waste recycling or treatment of wastes after they are generated, are not considered waste reduction. Also, an action that merely concentrates the hazardous content of a waste to reduce waste volume, or dilutes it to reduce degree of hazard is not considered waste reduction. This definition is meant to be consistent with the goal of preventing the generation of waste at its source rather than controlling, treating, or managing waste after its generation."
### TABLE 2: DEFINITIONS OF HAZARDOUS WASTE SOURCE REDUCTION

<table>
<thead>
<tr>
<th>Agency or Organization</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFORM</strong></td>
<td>Waste reduction at source: source of waste altered to reduce or eliminate waste before generation (does not include recycling or treatment). Explicitly includes hazardous wastes covered under the Clean Water Act and Clean Air Act, as well as the Resource Conservation and Recovery Act.</td>
</tr>
<tr>
<td><strong>Environmental Defense Fund</strong></td>
<td>Source reduction: Any technique that reduces amount of hazardous substance that society's waste management system must handle (includes recycling but not incineration or de-watering). Pertains mainly to Resource Conservation and Recovery Act wastes.</td>
</tr>
<tr>
<td><strong>U.S. Office of Technology Assessment</strong></td>
<td>Waste reduction: In-plant practices that reduce, avoid, or eliminate generation of hazardous wastes to reduce risk to health and environment (does not include recycling). Pertains to all non-product hazardous outputs from an industrial operation into all environmental media even within permitted limits. Includes corrosive, flammable, explosive, infectious, toxic and hazardous wastes.</td>
</tr>
<tr>
<td><strong>Office of Solid Waste</strong></td>
<td>Waste minimization: Activity that reduces (1) total volume or quantity, (2) toxicity, or (3) both. Includes recycling but not dilution or concentration. Pertains to Resource Conservation and Recovery Act wastes.</td>
</tr>
<tr>
<td><strong>National Governor's Association</strong></td>
<td>Source reduction: Reduction of elimination of waste generation at the source, usually within a process. May include treatment and recycling within a process. Pertains to those hazardous wastes reported under Resource Conservation and Recovery Act requirements.</td>
</tr>
<tr>
<td><strong>National Governor's Association</strong></td>
<td>Waste minimization: the reduction of hazardous waste that is generated or subsequently treated, stored, or disposed. Includes any source reduction or recycling activity that results in (1) the reduction of total volume or quantity of hazardous waste, (2) the reduction of toxicity of hazardous waste, or (3) both, as long as the reduction is consistent with the goal of minimizing present and future threats to human health and the environment.</td>
</tr>
<tr>
<td><strong>National Governor's Association</strong></td>
<td>Source reduction: the reduction or elimination of waste at the source, usually within a process. Source reduction measures include process modifications, feedstock substitutions, improvements in feedstock purity, housekeeping and management practices, increases in the efficiency of machinery, and recycling within a process. Source reduction implies any action that reduces the amount of waste exiting from a process.</td>
</tr>
</tbody>
</table>

Other source reduction definitions include such actions as recycling and waste minimization (Table 2). This report will address the issues and problems caused by household as well as industrial hazardous waste generation, therefore the term source reduction will also apply to individual (or household) practices that reduce, avoid, or eliminate the generation of hazardous waste.

Many environmental organizations propose source reduction as a solution to hazardous waste management and pollution dilemmas caused by traditional waste management approaches such as treatment, storage, disposal, and incineration. Source reduction as a waste management priority has been advocated by such environmental and citizen organizations as INFORM, the Citizen's Clearinghouse for Hazardous Wastes, Institute for Local Self-Reliance, as well as by the U.S. Congress Office of Technology Assessment and the U.S. Environmental Protection Agency.

**The Source Reduction Argument**

Source reduction practices are at the top of the waste management “hierarchy” for an important reason. No other waste management option (including the full range of treatment and disposal techniques) can do as much to address the pollution dilemma. All too often, treatment and disposal of hazardous wastes merely delays environmental impacts and consequences, or transfers those impacts from one medium (air, land or water) to another. Source reduction
practices such as manufacturing process modification and product materials reformulation or substitution eliminate the environmental and pollution impacts of hazardous waste generation, management, and disposal. These actions ensure that lower volumes of hazardous materials, processes, and wastes are used or generated at the source (the initial stages of hazardous materials use and waste generation), or that their toxicity is reduced or eliminated altogether.

Source reduction prevents hazardous waste generation. Hazardous wastes do not get generated because the hazardous materials and processes that generate these wastes are not used in the first place. Source reduction practices ensure that all media (land, water, air) are protected from the pollution and degradation that these wastes would have caused. Thus source reduction addresses pollution from a cross-media perspective. In addition to ensuring improved environmental and pollution conditions, source reduction also ensures safer working conditions as well as reduced risk to workers over the long term.

Source reduction of hazardous wastes results in economic benefits as well. Many hazardous waste generating companies that practice source reduction save significant amounts of money from reduced costs of raw materials and lower environmental handling costs. Companies that practice source reduction of hazardous wastes may also reduce or eliminate their regulatory compliance or permitting costs. By choosing to reduce their hazardous materials and wastes at the source, companies can reduce their long term liability for environmental problems caused by hazardous waste generation, thereby decreasing or eliminating the associated clean-up costs and fines. Because basic source reduction strategies involve minimal application of technology, many companies can reduce their hazardous waste generation substantially without investing large capital on high-cost technologies.

Experts stress that source reduction can also decrease the government’s waste management costs. Through source reduction, companies reduce their ultimate generation of hazardous wastes, and the state and federal governments will subsequently spend less money on end-of-the-pipe pollution controls and cleanup. Source reduction as a pollution prevention strategy can also function as an economic development and modernization strategy for businesses who wish to remain competitive. As source reduction becomes more accepted, and its benefits become more widely known, the reduced costs and liability associated with source reduction can also improve individual companies’ competitive stance. In order to remain competitive, many hazardous waste generating businesses will be compelled to incorporate these strategies into their waste management programs. In addition, source reduction of hazardous wastes may provide the common ground necessary for similar types of companies to jointly invest or share information in order to ensure that they meet waste management standards.
Source Reduction Techniques

Hazardous wastes can be reduced through a variety of fundamental strategies and techniques. Companies, governments, and individuals can engage in source reduction through such low-cost, low-technology methods as product or material substitution and good housekeeping. Some hazardous materials, previously considered irreplaceable in the initial stages of production or use, can often be replaced with less hazardous or non-hazardous materials that perform just as well. Companies can reformulate the makeup or ingredients of products to ensure that less hazardous materials are needed and/or generated during the manufacturing process. Inexpensive measures can be taken to eliminate solvent evaporation, for example, by covering containers on the production line.

Other source reduction techniques are very successful at addressing hazardous waste reduction, but often require more investment, research, and technology to be incorporated into the company’s production system. These techniques include process modification and in-process recycling. Process modification addresses source reduction by redesigning the manufacturing process (either on a small or a large scale) to reduce or eliminate the parts of the process that result in the formation and generation of hazardous wastes. Redesign may involve retrofitting new technologies onto an old process, or utilizing technical consultants to audit the company’s existing processes for additional hazardous waste reduction potential.

Several industrial sectors have been targeted for source reduction information and technical assistance by state governments and public interest organizations. These include the electroplating/metal finishing, drycleaning, electronics, and automotive services industries. The nature of these sectors’ production processes allows the minor process readjustment needed for substantial reduction of hazardous wastes. Several studies documenting the source reduction successes of firms around the country prove that source reduction is an effective means of achieving environmental compliance and pollution control, as well as economic gains. The Institute for Local Self-Reliance in Washington, D.C. has compiled hazardous waste source reduction case studies in its book, *Proven Profits from Pollution Prevention: Case Studies in Resource Conservation and Waste Reduction*. Two other such compendiums, INFORM’s *Cutting Chemical Wastes* and *Profit from Pollution Prevention*, from the Pollution Probe Foundation, also outline how firms can and have put source reduction practices to work to avoid liability as well as save on materials and disposal costs.

Technical assistance has helped many individual companies develop source reduction methods and technologies that can be widely used throughout their industry. In many cases, these companies share this information with other companies in their industry in an effort to bring the industry as a whole into environmental compliance.
Clearly, source reduction has found a place in the waste management system. Companies such as 3-M, Monsanto, and DuPont have publicly declared their support for source reduction as a means to reduce the amounts of hazardous waste they generate, and have provided extensive descriptions of their source reduction programs and methods in an effort to gain public support and trust. Many states have passed laws adopting a waste management hierarchy with source reduction and recycling at the top. Such states as Massachusetts, Oregon, North Carolina, California, and Washington have recently passed toxics use reduction laws that place strong toxics use requirements on companies using these materials. And finally, there are scores of independent citizen efforts underway to enhance public and private sector source reduction information services, as well as to address such issues as source reduction technology transfer among companies.

Although all of these efforts underscore the increasing role of source reduction in reducing the nation’s hazardous waste management problem, source reduction’s great potential to decrease pollution has not been fully realized. There is still a staggering amount of hazardous waste being generated by companies and households alike throughout the United States, and the amount grows yearly. Thousands of companies have not accomplished the most easily achievable source reduction gains, and public and private sector programs often fail to reach the companies that need assistance to get started. There has been little done to address the unknown amounts of hazardous wastes coming from households, as most efforts to date have concentrated on companies. There is a need to integrate the various government and independent education, assistance, and regulatory efforts.
3-M was one of the first large companies to publicly support pollution prevention. The company practices pollution prevention as a means to better comply with hazardous waste regulations, to save money, and to become more environmentally responsible. According to a report presented at the Governor's Conference on Pollution Prevention Pays in Nashville, Tennessee:

"The combined total of almost 1,900 3-M projects has resulted in eliminating annually the discharge of almost 110,000 tons of air pollutants, over 13,000
tons of water pollutants, and over 260,000 tons of sludge of which over 18,000 tons are hazardous, along with the prevention of approximately 1.6 billion gallons of wastewater. Cost savings to 3-M total more than $292 million. These costs are for pollution control facilities that did not have to be built; for reduced pollution control operation costs; for reduced manufacturing costs; and for retained sales of products that might have been taken off the market as environmentally unacceptable."

One of the many examples of 3M's commitment to source reduction is their replacement of a chemical process with a mechanical process to clean flexible metal electronic circuits.

INFORM'S *Cutting Chemical Wastes*, and *Proven Profits from Pollution Prevention*, by the Institute for Local Self Reliance, highlight several encouraging company source reduction efforts. For example, a DuPont plant making freon has eliminated its hydrochloric acid waste by installing a $16 million conversion unit to change anhydrous hydrogen chloride into chlorine (which is then recycled back into the manufacturing process) and hydrogen (which is used to fuel the plant). A Union Carbide facility in Connecticut has achieved up to 99% recovery of solvents using a process that has paid for itself in about two years. And Dow Chemical has reduced wastes and costs in their crude product drying system by installing a computer and on-stream analyzer to adjust the concentration of drying agent in the process.

Successful hazardous waste reduction and minimization initiatives by Northwest companies are not as well known as those nationally recognized case studies discussed above. However, several companies and consortia of companies in the region have taken the lead in using source reduction strategies to achieve environmental compliance and pollution prevention. One such company, the Preservative Paint Company in Seattle, Washington, has developed a waste reduction plan, an employee recognition program for hazardous waste source reduction strategies, and has achieved substantial gains through improvements in their paint manufacturing process.

The Boeing Company, the region's largest company, has shown initiative in the research and development of new source reduction and waste minimization strategies. Boeing has created a Comprehensive Chemical Reduction Program within their Office of Environmental Affairs that includes such projects as hazardous waste surveys, solvent usage reduction, chromate reduction, waste minimization, and new facilities planning. Over 16 such projects were undertaken in 1988 to develop and implement source reduction and waste minimization strategies in the company's various facilities.

One of Boeing's projects in 1988 was a solvent distillation still that has resulted in a 90% reduction of methyl ethyl ketone, a wash solvent used in a painting process. According to Boeing, this reduction resulted in an annual savings of $43,000 in disposal and material costs, since the waste solvent is distilled and then used in the process again. In another case, one of Boeing's subcontractors substituted a non-cyanide copper stripping process for a cyanide-based one, which resulted in a toxicity reduction.

Several business associations in the region help member companies implement source reduction and waste minimization strategies to decrease their costs of hazardous waste disposal. The Automotive Services Organization is currently working under a Public Information and Education Grant from the Puget Sound Water Quality Authority to educate automotive businesses about hazardous waste issues.

Unfortunately, there is little data available on the individual source reduction accomplishments by companies in the Pacific Northwest, or the collective effects of these education and technology transfer efforts on total industrial source reduction. New toxic use reduction reporting requirements in Oregon and Washington will provide a better understanding of the effect of source reduction strategies on the region's waste stream. Ultimately, these source reduction data needs can be addressed on a regional level through collaboration on collection and analysis of waste generator information.

The Institute for Local Self Reliance's *Proven Profits from Pollution Prevention* and INFORM's *Cutting Chemical Wastes* also outline specific waste reduction strategies utilized and gains achieved by industrial sectors and companies throughout the United States. Estimates of waste reduction potential for certain wastes and descriptions of source reduction measures appropriate for each sector can
increase understanding of which industrial sectors in the Northwest have the greatest immediate source reduction potential. This targeted approach emphasizes waste streams in which source reduction efforts are most critical or where the greatest immediate gains are possible. Technology transfer and research efforts can then be tailored to these waste streams, thus enhancing the quality of the technical assistance and the utility of the research.

Some industrial sectors have been able to reduce significant amounts of hazardous waste through product substitution, process modification and good housekeeping practices. These strategies are often inexpensive to implement. According to a study conducted by the National Governor's Association, industrial sectors that most readily benefit from these basic approaches include automotive servicing, oil and gas extraction, fabric manufacturing, wood processing, wood finishing, printing, paint manufacturing, industrial chemicals manufacturing, electroplating and metal finishing, computer and electronics manufacturing, and film processing businesses. The specific strategies for source reduction will vary from company to company, depending on the production process and the hazardous materials used during the manufacturing process. The common goal is to reduce as much as possible using as little money, effort, and resources as possible.

According to INFORM, one Monsanto plant reduced its hazardous waste lost to evaporation and resultant air emissions by 99% by changing a polystyrene process from a series of

<table>
<thead>
<tr>
<th>TABLE 3: SOURCE REDUCTION STRATEGIES</th>
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<tbody>
<tr>
<td><strong>Company</strong></td>
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<tr>
<td>Waterhouse Motors</td>
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<tr>
<td>Tacoma, WA</td>
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<tr>
<td>Tektronix</td>
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<tr>
<td>Beaverton, OR</td>
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<tr>
<td>Alexander's Chrysler-Plymouth</td>
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<tr>
<td>Portland, OR</td>
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<tr>
<td>Intel Corporation</td>
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<tr>
<td>Hillsboro, OR</td>
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<tr>
<td>East-Side Plating Company</td>
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<td>Portland, OR</td>
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</table>

(continued next page)
**TABLE 3: SOURCE REDUCTION STRATEGIES (continued)**

<table>
<thead>
<tr>
<th>Company</th>
<th>Strategy and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hewlett Packard</td>
<td>Employ large scale recycling of copper sulfate and alkaline etch, as well as installing a metals recovery unit to reduce sludge waste.</td>
</tr>
<tr>
<td>Boise, ID</td>
<td></td>
</tr>
<tr>
<td>One-Hour Fireweed Drycleaners</td>
<td>Have incorporated general housekeeping measures to seal all potential leaks in the system. Use 99% effective azotropic conditioners to filter exhaust; designed and installed new machine to reclaim the filters and solvent, which resulted in savings on solvent and filters of over $25,000 a year and reduced hazardous waste volume by more than 80%.</td>
</tr>
<tr>
<td>Anchorage, AK</td>
<td></td>
</tr>
<tr>
<td>United Coatings</td>
<td>Still bottoms generated from solvent recycling now used as a raw material for producing paint primer. The still bottoms replace part of the virgin raw materials used in the formulation. Water from the water-based paint manufacturing facility is used to wash down tanks and the water is recycled as part of the make-up water for subsequent batches of product of the same formulation. Used solvent from tank cleaning operations is reclaimed by use of a solvent still. The recycled solvent is reused as a cleaning solvent in tank cleaning operations.</td>
</tr>
<tr>
<td>Greenacres, WA</td>
<td></td>
</tr>
<tr>
<td>Keytronics Corporation</td>
<td>Replaced chlorinated solvent-based printed circuit board manufacturing operation with a non-hazardous waste generating process.</td>
</tr>
<tr>
<td>Spokane, WA</td>
<td></td>
</tr>
<tr>
<td>Bayliner Marine</td>
<td>Replaced acetone with a water-based system for cleanup operations.</td>
</tr>
<tr>
<td>Longview, WA</td>
<td></td>
</tr>
<tr>
<td>Union Carbide</td>
<td>Eliminated waste acetone generation by changing a degreasing process. Also implemented a solvent management program that has resulted in the reduction and reuse of several hazardous wastes including toluene and petroleum naphtha. An improved waste oil management program has significantly reduced their hazardous waste generation.</td>
</tr>
<tr>
<td>Moses Lake, WA</td>
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</table>

The evaporation of hazardous materials such as solvents is an important focus for source reduction strategies. Hazardous waste is by no means limited to liquids and solids disposed of in a landfill. In fact, large amounts of a company's hazardous waste stream can be lost to evaporation, which, when unchecked, can represent an insidious health hazard as well as a long-term environmental hazard. Often these evaporation losses are not accounted for in RCRA reporting, because they do not represent wastes that must be landfilled or sent to wastewater treatment plants. Currently, these emissions do not fall under Clean Air Act reporting requirements, either. Clearly, this loss through evaporation represents one waste stream that has potential for significant reduction through basic source reduction strategies.

Other Pacific Northwest companies are carrying out fundamental source reduction strategies to reduce a variety of other waste streams (Table 3). One automotive servicing business, Alexander's Chrysler-Plymouth in Portland, is substituting less toxic and non-toxic degreasers for the highly toxic solvents they were previously using. This company also has a method to catch waste grease and cleaner and recover some elements for reuse. Although these measures demand greater effort and expense...
from companies than just basic good housekeeping practices, substantial savings in fines, waste hauling, and the purchase of raw materials makes the effort worthwhile, according to many company representatives.

Many other small and large Northwest companies have begun to research and implement more complex strategies for source reduction. They have learned of new source reduction technologies or product reformulations from other companies nationwide. Such sharing of source reduction information has become more widespread among Pacific Northwest companies as national trade associations and large national corporations begin to make source reduction a priority waste management strategy.

After realizing initial gains using easily accessible technology and techniques, several Northwest companies have developed innovative ways to further reduce their hazardous waste stream. For example, East Side Plating, in Portland, has instituted a number of fundamental source reduction techniques to reduce their metal plating wastes, but are building a new facility complete with new technologies to further reduce their hazardous waste stream. This type of initiative represents a new direction for Northwest companies to go beyond fundamental source reduction measures to further reduce their hazardous waste stream.

Despite these efforts and examples, Northwest companies have not reached their full source reduction potential. It is up to the states of the Northwest, as well as these companies, to find new methods and mechanisms to meet source reduction goals in the coming decades.

**TABLE 3: SOURCE REDUCTION STRATEGIES (continued)**

<table>
<thead>
<tr>
<th>Company</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest Microfilm</td>
<td>Installed silver reclaiming technology for reclaiming silver from photographic fixer solution.</td>
</tr>
<tr>
<td>Espanola, WA</td>
<td>Use a still to recover acetone from waste solvent for reuse in the process. Also replaced acetone with water-based solvent called Replace-Tone in another part of the process.</td>
</tr>
<tr>
<td>Ershings Inc.</td>
<td>Has established the Comprehensive Chemical Reduction program for the minimization of hazardous materials and wastes. This program has several priorities: to eliminate CFC materials; to reduce solvent use, emissions, and disposal; to reduce chromate materials use, emissions, and disposal; and to minimize hazardous waste. The company furthers these priorities in present production practice, as well as when it designs and builds a new facility.</td>
</tr>
<tr>
<td>Bellingham, WA</td>
<td>Has established the Comprehensive Chemical Reduction program for the minimization of hazardous materials and wastes. This program has several priorities: to eliminate CFC materials; to reduce solvent use, emissions, and disposal; to reduce chromate materials use, emissions, and disposal; and to minimize hazardous waste. The company furthers these priorities in present production practice, as well as when it designs and builds a new facility.</td>
</tr>
</tbody>
</table>
State Source Reduction Programs were first established in the early 1980s, as state legislators and environmental agency leaders began to realize that ultimately the best way to prevent pollution is by not generating hazardous wastes at all. Several of the most industrialized states along the eastern
corridor of the U.S. recognized the limitations of their hazardous waste regulatory systems, due in part to such incidents as Love Canal, in which improper hazardous waste management practices led to severe health and environmental problems. Citizen pressure and state environmental agency frustration compelled states to seek new options for limiting industry generation of hazardous wastes.

The leading state source reduction program is considered to be North Carolina's multi-media program, Pollution Prevention Pays. It emphasizes source reduction education and technical assistance to hazardous waste generating businesses. Other states have duplicated parts of the program as its strategies prove to be successful means of lifting selected companies out of the hazardous waste generation and disposal cycle.

The state source reduction programs that have developed around the country tackle the job of emphasizing and encouraging hazardous waste source reduction or waste minimization through a variety of mechanisms (see Table 4 at the end of this section). Some state programs contain no regulatory or enforcement components. Other state programs only regulate companies, without providing education and technical assistance services. Still other programs generate interest in source reduction through market mechanisms, such as pollution tax credits or laws requiring labeling of hazardous products. While it is difficult to gauge how these programs have reduced waste volumes, it is possible to see how various elements can be combined into a comprehensive plan.

Many states have designated source reduction as the top of the waste management hierarchy. However, the promise of the resultant strategies has largely gone unrealized. The enactment of the Superfund Amendments and Reauthorization Act (SARA) has heightened the role of the states in decreasing waste generation. States are required under SARA to assure their capacity to handle wastes that are produced within their own state. This capacity assurance effort has been assisted in the Pacific Northwest by a regional Hazardous Waste Advisory Council, established to propose policy on the issue of waste disposal capacity, and to address other hazardous waste management issues.

The toxics use reduction movement, represented by such national organizations as the Citizens Clearinghouse for Hazardous Wastes, crusades for source reduction as only one means to decrease use of toxics. This movement opposes siting of new incinerators or hazardous waste landfills, arguing that more effective source reduction programs would ultimately make such sites unnecessary. Citizens are demanding serious source reduction initiatives prior to any new siting of hazardous waste treatment, storage, and disposal facilities or landfills. They stress that if waste generating and waste disposal companies have not even considered the effects of source reduction on decreasing the waste stream, there can be no proof that such facilities are needed.

Organizations opposed to hazardous waste management facilities in some communities often come together to support stringent require-
institutions. Others have a regional, rather than state focus. Programs can be operated by one agency usually at the state level or can be operated over a wide range of agencies or organizations with several inter-related programs.

New State Laws

States have sought to mandate that certain levels of source reduction be achieved. In 1987 New York passed the Preferred Statewide Hazardous Waste Management Hierarchy that places source reduction as the highest priority. Many other states have passed similar laws, including the Northwest states of Oregon and Washington. The New York program requires that a waste reduction impact statement be included in a company’s permit application for a new hazardous waste management facility. This type of oversight allows state agencies to evaluate the need for new facilities based on provable source reduction potential.

Massachusetts recently enacted the Massachusetts Toxics Use Reduction Act. The Act sets a goal of 50% toxic waste reduction by 1997 primarily through strict toxic use reduction by industry. The Act is one of the most comprehensive source reduction laws in the country, as it:

- mandates a Toxics Use Reduction Institute for research and technology transfer;
- sets up an Office of Toxics Use Reduction in the state environmental agency;
- mandates strict reporting requirements for gauging toxics use reduction achievement by companies;
- requires companies to report specific source reduction methods;
- mandates toxics use reduction planning by large quantity toxic materials users; and,
- requires companies that manufacture, process, or use a listed toxic substance in quantities above a specified level to pay a fee.

California has recently passed a law requiring companies to label consumer products with a warning if the production, use, or consumption of their product results in exposure to toxic substances. Enacted by initiative, the law has, in its early stages, encouraged the reduction of specific hazardous substances by industry, and increased public information about the toxic nature of products’ formulation and manufacturing process.

The new California law combines several market incentives for industry to decrease human exposure to toxics, for citizens to review industry action, and for ultimate reduction of hazardous substances to take place. This type of law is unique in the country, and may represent the new direction that toxic substance control and pollution control legislation is likely to take in the coming decades. For enforcement, the bill relies not on regulatory agency staff, but rather on the threat of direct action by public prosecutors or private citizens. If their suits are successful, citizens can garner a share of the fines levied against violating companies. According to one Environmental Defense Fund analyst, this sharing of fines acts effectively as an incentive for such public “watchdog” enforcement.

In the Northwest, Oregon and Washington have passed toxics use and hazardous waste reduction laws. Oregon’s Toxic Use and Hazardous Waste Reduction Act mandates pollution prevention planning by companies, as well as technical assistance to companies, and monitoring the use of toxic substances and the generation of hazardous waste. Not only will this law require businesses to participate in source reduction and toxics use reduction, but it will also enable the state to determine which companies are complying with the Act’s mandates, by measuring how the business’s source reduction planning actually affects their hazardous waste generation and source reduction patterns.

Washington’s recently-passed Hazardous Waste Reduction Act also requires Washington’s hazardous substance users and generators to think creatively and invest directly in reducing hazardous substances in the environment. The Act achieves this goal by mandating companies to engage in hazardous waste reduction planning, and to report their progress to the state Department of Ecology. In the same manner as Oregon, Washington’s law gauges the success of
waste reduction planning by the extent to which companies reduce their hazardous waste generation. Thus the Oregon and Washington laws will enable both state environmental agencies to identify which generators might need further assistance to develop a waste reduction program. Neither law is as stringent as the Massachusetts law in mandating a specific waste reduction goal or holding companies accountable for that goal.

Technical Assistance

Arkansas' program is non-regulatory, and focuses on waste minimization and waste management through exchange by companies of reusable wastes and in-plant technical assistance. The program is run by the Arkansas Industrial Development Commission, and only assists companies that request aid. Technical assistance ranges from recommending in-house recycling and process modification changes, to outlining ways to better comply with hazardous waste regulations. Because the program is administered by an economic development agency and not the state environmental agency, its goals are to help companies in the state overcome problems associated with hazardous waste generation in order to foster business development throughout the state. It may be easier for such a non-regulatory agency to gain the trust and participation of waste generators. Housing a program in a business development agency also allows those implementing the program to link the goals of business assistance and modernization with those of pollution control and hazardous waste management, a link that environmental agencies may not have the expertise to make.

The Georgia Institute of Technology also offers technical assistance to small quantity generators of hazardous waste on a voluntary, non-regulatory basis. The program is more technologically-oriented that the Arkansas program, offering waste reduction options to companies that seek to comply with state and federal hazardous waste regulation. Because it is run by engineers and not regulators, and provides direct assistance to individual companies, the program continues to achieve high levels of voluntary participation by companies. Its location within the Georgia Tech Research Institute demonstrates that programs operated by academic institutions can offer the expertise of engineers and graduate students to small businesses that might otherwise get lost in the regulatory system.

California's Alternative Technology Section of the Department of Health Services concentrates on research and development of waste reduction technologies as well as technology transfer. The Waste Reduction Unit provides grants to industry to promote research for source reduction, treatment, and recycling technologies. The Resource Recovery Unit operates a waste exchange and provides direct technical assistance to industry via plant inspections, process reviews and regulatory compliance recommendations. According to the Department, this unit has helped to bring about recycling of over fifty waste streams that were previously landfilled or incinerated. The Technology Transfer Unit publishes industry-specific waste reduction guidance reports as well as reports on the economic implications of waste reduction. They also work with universities to develop waste reduction training courses.

According to a recent National Governor's Association study, measuring the success of the California program is difficult because (as is the case with all such initiatives) it is difficult to attribute waste reduction results to the program alone. For instance, it is difficult to distinguish the impact of the program from the effect of more stringent regulatory requirements, escalating off-site waste management and disposal costs, and broad industry trends. Nonetheless, through its comprehensive approach the California program has become a leader in hazardous waste technology development and transfer.

Comprehensive Programs

Several states offer comprehensive waste reduction programs with services necessary to successfully engage businesses in hazardous waste reduction, monitor their efforts, and research and implement new technologies and policies for reduction. California, Illinois, New Jersey, New York, North Carolina, Massachusetts, Michigan, and Pennsylvania have established waste reduction programs through various channels, but all have similar components that make their programs comprehensive, rather than specialized. North Carolina, Michigan, and Massachusetts operate perhaps the most comprehensive programs given their equal emphasis on education, technical assistance, research, technology transfer, economic incentives and regulation.
North Carolina developed the first major hazardous waste reduction program in the nation in 1984, the Pollution Prevention Pays Program, within the North Carolina Department of Natural Resources and Community Development. The program consists of an innovative combination of services without regulatory control, other than that proposed under federal hazardous waste regulations. Education and technical assistance are the primary vehicles of the program’s message: that preventing pollution at the industry level makes economic as well as environmental sense. The 3-P program, as it is often called, has perhaps one of the largest information databases in the country on the subject of waste reduction. Through this database, citizens, regulators, industry, and anyone else interested in a particular facet of waste reduction can locate literature sources providing expertise on a wide range of subjects including technical, educational, and regulatory information.

Perhaps the most nationally significant aspect of the North Carolina program is its sponsorship of the National Roundtable of State Waste Reduction Programs. This Roundtable was organized to promote the development of state waste reduction programs and to exchange waste reduction information. Despite its name, the Roundtable is composed of not only state program representatives, but university interests, public interest groups, federal environmental agencies, and national organizations, and allows efficient exchange of information by all interested parties.

The Michigan source reduction program is operated by the state’s Department of Natural Resources and the Department of Commerce. Source reduction legislation passed in 1987 enabled the two departments to work together on a variety of elements, including technical assistance, education, and identifying ways that waste reduction can be incorporated into existing regulatory and permitting systems. The Michigan Modernization Service within the Department of Commerce provides consultations for business upgrading for competitiveness, with a substantial emphasis on linking goals of modernization with pollution control. Other outside agencies working on related issues include the State Research Fund, used to encourage development of new technology products and processes to spur new business activity and create jobs, the Technology Transfer Network (a network of universities that provide technical assistance to industry), the Toxic Substances Control Commission, and Waste Systems Institute of Michigan.

The Ohio Environmental Protection Agency has established a hazardous waste reduction awards program, a waste minimization task force, and has conducted workshops on technology transfer. Recycling has taken precedence over source reduction, however. In addition, the Ohio Technical Transfer Organization (which is funded by the Department of Development) provides technical assistance to industries in the state on a voluntary basis. INFORM has found the Ohio program deficient because source reduction of hazardous wastes is not a primary goal over such waste management techniques as recycling and treatment.

Housing a program in a business development agency also allows those implementing the program to link the goals of business assistance and modernization with those of pollution control and hazardous waste management, a link that environmental agencies may not have the expertise to make.
The task of measuring waste reduction on a state-wide basis is complicated by intervening variables such as general economic conditions, the composition of a given state program, regulatory structures, waste taxes, and liabilities that may serve as incentives or disincentives for industry to reduce wastes.

Evaluating State Source Reduction Programs

It is a difficult task to evaluate the effectiveness of state source reduction programs because each state’s program has developed out of the structure of its government and its needs. Still, there are leaders in the field whose programs offer models for other states. Many states are still in the initial stages of setting up a source reduction program, and cannot yet be compared with the national leaders. While state programs can possibly be evaluated by using such criteria as the extent to which companies work with government, most programs do not keep records of actual source reduction gains attributed to state source reduction measures. In fact, this type of gauge is quite difficult to utilize, for it is nearly impossible to determine what specific factors might have induced a company to practice source reduction. A more realistic way of evaluating these programs has been developed by two prominent national non-profit organizations, INFORM and the National Toxics Campaign.

Few states have evaluated their program’s effectiveness in reducing hazardous wastes. State programs appear to be too new and too experimental to have yet performed such evaluations. A few states have attempted to quantify their success based on measures such as cost-effectiveness, compliance, and funding. Clearly, the most valuable data and the best measure of program effectiveness is the volume of waste reduced over a given time period. However, the task of measuring waste reduction on a state-wide basis is complicated by intervening variables such as general economic conditions, the composition of a given state program, regulatory structures, waste taxes, and liabilities that may serve as incentives or disincentives for industry to reduce wastes. In many cases data are not gathered by state agencies because of budget limitations. States are also hesitant to require the necessary evaluative information for fear of threatening confidentiality and thus diminishing program participation. Finally, the budgets of many states are currently too limited to permit adequate evaluation of their source reduction programs.

Given the lack of data on state program impacts upon the quantity of wastes reduced, there may be other possible measures of program success. For instance, it may be useful to determine the extent to which the activities and budgets of state programs actually focus on waste reduction, as opposed to addressing best management practices or proper regulatory compliance. The Office of Technology Assessment has attempted to compile this kind of analysis, but the reported information is incomplete, at best. Once it is determined that a selected state does have program components directed at waste reduction, a measure of the level of activity may be useful. The problem is that while many states collect such information as the numbers of technical assistance phone calls, on-site consultations, promotional contacts and responses to written requests for information, it remains unclear the extent to which these activities are actually focused on and promoting source reduction.
INFORM Criteria

INFORM compares state source reduction programs to their own model of what such a program should include. Founded in 1973, INFORM is a non-profit research organization that works to identify and report on practical actions for the preservation and conservation of natural resources. Much of its work has focused on promoting the benefits of hazardous waste source reduction to industry, governments, and communities. INFORM's primary recommendations to states seeking to establish a source reduction program include establishing an explicit state policy that multi-media hazardous waste reduction is at the top of the hazardous waste management hierarchy, and also establishing a high level state office focused on hazardous waste reduction, with organizational independence from agencies regulating multi-media hazardous discharges.

The National Toxics Campaign, a Boston, Massachusetts based environmental organization, also recommends these two components. In fact, the programs recommended by these two groups are quite similar, but are presented in a somewhat different format. NTC's recommendations are summarized in their report, Policy and Program Options For Reduction of Hazardous Waste in Texas, which they prepared for the Texas Task Force on Waste Management Policy when Texas was in the initial stages of considering and implementing a state source reduction program. Consequently the recommendations set forth in the study are presented in an organized and programmatic way, while INFORM's recommendations constitute more of a checklist of desirable components.

INFORM maintains that the state office of waste reduction should be responsible for developing hazardous waste reduction goals; requiring and reviewing waste audits; selecting the focus of financial and technical assistance; identifying impediments to hazardous waste reduction; maintaining a hazardous waste reduction database (including research results and policy initiatives); identifying key hazardous waste reduction research needs; and producing a biennial report on state hazardous waste reduction activities, achievements, and future goals. The checklist also includes state support and training of hazardous waste reduction efforts by governments, corporations, and non-profit groups, as well as regulatory measures to ensure industry compliance with source reduction.

According to INFORM, the support/training component should include technical assistance targeted at specific industries identified as key waste generators; financial assistance to small businesses; awards programs; and expedited permits for companies pursuing hazardous waste reduction. The regulatory component should include strict enforcement activities; limiting cheap disposal alternatives; expanding the number of regulated chemical substances; and making permit approvals contingent upon source reduction efforts.

National Toxics Campaign Criteria

The National Toxics Campaign advocates institutional support for waste reduction through the development of a state source reduction policy and program. According to NTC, this state policy should include advocating hazardous waste reduction; assessing and removing obstacles to waste reduction; engaging in coordinated planning with other pollution control programs to ensure the primacy of waste reduction; providing waste reduction assistance; and providing industry with information and direction. NTC recommends that the state program consist of six components: information, analysis, education, economic incentives, regulation, and organization.

NTC maintains the informational component should include a detailed database of toxic chemical use and hazardous waste releases, as well as waste reduction trends (information that is not currently required under the 1986 Superfund Amendments). Along with this toxics database, NTC recommends that information be gathered on industry types and number of firms in the state, as well as the technical and economic characteristics of industry in order to develop economic incentives and link assistance services to economic policy. This combination would stimulate increased technological innovation and industrial competitiveness.

The analytical component should include efforts to assess waste reduction activity; analyze alternative waste reduction technologies and strategies; and assess toxicity and hazard of various processes, materials, and wastes in order
Source Reduction As A Critical Response

to provide a basis for identifying those materials and process technologies that should be targeted for source reduction, as well as to provide a baseline for gauging waste reduction and changes in toxicity or hazard of the waste stream. These analytic activities, NTC stresses, should be carried out on a consistent, periodic basis to track changes in industrial practice, technical and scientific knowledge, and waste generation trends.

The National Toxics Campaign also recommends that an education and assistance component should be part of any state source reduction program. This should consist of industrial technical assistance, financial assistance, government sponsored seminars and conferences on source reduction, research projects, university-based activities (such as training programs, and research and development), and planning requirements (whereby government would oversee and administer industry planning requirements to ensure that firms develop waste reduction plans).

A fourth component recommended by the National Toxics Campaign is one that includes various economic activities that would raise revenue and encourage source reduction by industry. One measure NTC advocates would impose a charge to industry at the point of purchase of industrial toxic substances. The revenue generated by this measure would provide funds for the operation of the state waste reduction program, while the measure itself could discourage industry from utilizing many toxic substances. The NTC also recommends the use of a front-end toxic material input charge, which would possibly shift industry towards material substitution and other waste reduction measures. The economic component of the state program should also include financial assistance programs to encourage industry to engage in source reduction. While the NTC doesn’t describe how this financial assistance should be allocated, it is widely recognized that small businesses in particular have financial difficulties that might prevent them from practicing source reduction. Thus financial assistance would most likely benefit these companies, rather than larger, more financially secure firms.

The NTC prescription for a state source reduction program also includes a regulatory component, which consists of a combination of direct and indirect waste reduction regulation. Indirect regulation would include pollution control and hazardous material use requirements that are not process-specific, but may indirectly limit the range of industrial processes through changing the economics of hazardous material usage and waste generation. Direct regulation imposes process-specific waste reduction standards as well as process prohibitions. NTC argues that indirect regulatory strategies are more desirable because they require fewer government resources, allow greater industry flexibility, and do not affect industrial production. Such indirect regulatory strategies would include regulatory coordination, enhanced and coordinated enforcement, integrated inspection (to include all environmental media), regulatory flexibility, and comprehensive regulatory review.

Finally, NTC recommends overall program coordination including interdepartmental coordination and a comprehensive state plan and report. This is included to formalize program design, set a public schedule for program evaluations and government actions, and provide for public accountability and legislative review.

Since hazardous waste generation varies from state to state, it may well be that not all of INFORM's or NTC's program prescriptions are applicable in every case.

The Office of Technology Assessment and INFORM have both indicated that most existing state programs leave much to be desired, in comparison to the models. Their evaluation criteria provide useful guidelines for future program development and implementation.
## Table 4: State Source Reduction Programs

<table>
<thead>
<tr>
<th>State and Agency</th>
<th>Components</th>
<th>Description of Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alabama</strong></td>
<td><strong>Hazardous Materials Management and Resource Recovery Program (HAMMARR), the Univ. of Alabama</strong></td>
<td>The Alabama Waste Exchange (AWE) is a confidential, non-profit information clearinghouse. The major service of the program is a listing of materials available or wanted by companies. The catalogue is published bi-monthly. Only waste description, quantity, availability, and general location is included. AWE also publishes a newsletter that provides information on waste recycling and small quantity generator workshops. HAMMARR provides on-site technical assistance to industry regarding regulatory compliance and waste minimization. It also conducts workshops for businesses on waste minimization and small quantity generator issues, and publishes a monthly newsletter.</td>
</tr>
<tr>
<td><strong>Arkansas</strong></td>
<td><strong>Arkansas Industrial Development Commission (AIDC)</strong></td>
<td>AIDC publishes The Arkansas Manufacturers Exchange, which contains a listing of waste and by-products, used equipment, excess capacity, scrap materials, and general news items. AIDC visits about 80 manufacturers every year to provide technical assistance on in-plant recycling, contract services, process modification, by-product marketing, and regulatory compliance. Literature and contract research are performed on request. A data base of potential markets and services for by-product resources is maintained.</td>
</tr>
<tr>
<td><strong>California</strong></td>
<td><strong>Alternative Technology Section, Toxic Substances Control Division, Dept. of Health Services</strong></td>
<td>The major activities of the unit include managing the Department's Hazardous Waste Reduction Grants Program and contracting for waste audit studies to assist small businesses in reducing hazardous wastes. The grants program is designed to promote research and commercial demonstration of technologies for reduction, recycling and treatment of wastes. The audit studies waste generating practices of small and medium sized companies, their potential for waste reduction, recycling, reuse, recovery, and alternative treatments.</td>
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*Note: This Table was prepared from information gathered during 1989 from each of the state agencies listed here.*
<table>
<thead>
<tr>
<th>STATE AND AGENCY (California Continued)</th>
<th>COMPONENTS</th>
<th>DESCRIPTION OF ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Recovery Unit</td>
<td></td>
<td>The Resource Recovery Unit promotes recycling, reuse, and recovery of resources that might otherwise be lost to land disposal. The Unit publishes the California Waste Exchange which lists, by waste stream, the name, address, and phone number of facilities that can accept wastes for recycling and processing. It also contains information on laws, regulations, and technologies. The Unit also provides technical assistance upon request and performs plant inspections and process reviews.</td>
</tr>
<tr>
<td>Technology Clearinghouse Unit</td>
<td></td>
<td>This program provides for dissemination of technical information on hazardous waste reduction, recycling, and treatment technologies and strategies. It also sponsors industry-specific waste reduction symposia and is producing two half-hour television documentaries to provide a broad overview of the concept of waste reduction and impediments to the successful implementation of waste reduction measures.</td>
</tr>
</tbody>
</table>

**Georgia**

| Environment Protection Division (EPD), Georgia State Department of Natural Resources | Regulatory Compliance | As part of its responsibility to ensure RCRA compliance, EPD inspects and monitors waste generation records, and offers businesses technical assistance on proper housekeeping and process changes to reduce wastes. EPD has also developed a five-year plan that will expand funding and staff for waste minimization and will establish a goal of 25% waste reduction. |
| Environment, Health, and Safety Division of the Georgia Tech Research Institute (GTRI) | Technical Assistance | GTRI offers technical assistance to small and medium sized businesses on product substitutions, waste stream separation, process changes, and regulatory compliance. Waste minimization is an integral part of this consulting process. |

**Idaho**

| Waste Reduction Assistance Program Idaho Department of Health and Welfare | Technical Assistance | The Idaho Waste Reduction Program (IWRAP) serves companies and individuals as a non-regulatory, multi-media statewide waste reduction and recycling program. IWRAP focuses on source reduction, but also provides information about other waste minimization alternatives such as recycling, as well as management options for solid and hazardous wastes. |
STATE INVOLVEMENT

STATE AND AGENCY

COMPONENTS

Resource Library

DESCRIPTION OF ACTIVITIES

IWRAP operates a free lending library of audio-visual aids and publications on various hazardous waste management and source reduction issues.

Hotline

IWRAP staffs an in-state toll-free 800 hotline telephone service providing waste reduction and recycling information and waste management guidance to businesses and individuals.

Public Education

IWRAP offers guidance and promotion of community recycling programs; contacts for waste exchanges and recycling directories; training and assistance with waste audits plus hazardous and solid waste regulatory information; referral services for waste reduction and recycling resources and facilities; and information on household hazardous waste collection days with primary focus on assistance to communities.

Illinois

Hazardous Waste Research and Information Center (HWRIC)

Research

HWRIC provides matching funding for recycling and reduction techniques. This program is intended to support industry efforts to initiate hazardous waste reduction activities and to study innovative waste reduction technologies. Grantees are expected to provide a report to HWRIC of their funded projects.

Technical Assistance

Assistance is available to Illinois industries, communities, and citizens that have hazardous waste management programs. Efforts focus on source reduction techniques such as recycling and product substitution.

Information Services

HWRIC manages the Computerized Waste Reduction and Waste Management Information System. It is designed to increase generators' knowledge of the numerous options available for reducing, recycling, and treatment of industrial hazardous waste. HWRIC also maintains a library and performs various outreach activities such as seminars, workshops, and education programs.

Awards Program

HWRIC, in cooperation with the Governor's office, sponsors the Governor's Innovative Waste Reduction Awards. These awards are designed to recognize industry waste reduction efforts, encourage further efforts, and acquire new information about existing industry efforts.

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<tr>
<th>STATE AND AGENCY</th>
<th>COMPONENTS</th>
<th>DESCRIPTION OF ACTIVITIES</th>
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<tbody>
<tr>
<td>Massachusetts</td>
<td>Primary Goals</td>
<td>The Commonwealth has passed the Massachusetts Toxics Use Reduction Act and is beginning to implement it. The Act establishes a statewide toxic waste reduction goal of 50% by 1997 primarily through toxics use reduction techniques. The Act also establishes toxics use reduction as the preferred means for achieving compliance with federal and state toxic and hazardous waste laws; establishes an Administrative Council on Toxics Use Reduction to aid in coordination of regulatory and enforcement efforts; mandates a Toxics Use Reduction Institute, an Office of Toxics Use Reduction Assistance and Technology within the Dept. of Environmental Management’s Executive Office of Environmental Affairs; and mandates strict new reporting requirements which include requirements for gauging toxics use reduction achievement by companies, as well as requirements for indicating what methods were used to achieve reduction. The Act also mandates development of toxics use reduction plans by large quantity users.</td>
</tr>
<tr>
<td></td>
<td>Technical Assistance</td>
<td>The Industry Outreach Program includes technical workshops; conferences; targeted industry mailings about source reduction; state sponsorship of local and regional industry outreach efforts; on-site assistance to companies; and an information clearinghouse. The program’s staff also conduct feasibility studies and economic analyses of source reduction strategies.</td>
</tr>
<tr>
<td></td>
<td>Economic Measures</td>
<td>The new Toxics Use Reduction Act mandates that companies that manufacture, process, or use a listed toxic substance in quantities above a specified threshold must pay a fee. The fees will generate $4-5 million in revenue to meet other mandates of the Act. The state also offers low interest loans to companies interested in adopting source reduction technologies or strategies.</td>
</tr>
<tr>
<td></td>
<td>Research and Development</td>
<td>Research and development is being emphasized for closed-loop processes for electroplating, substitutes for chlorinated and non-chlorinated hydrocarbon solvents, and alternatives for metal lubrication. More expansive research and development efforts will be undertaken by the new Toxics Use Reduction Institute.</td>
</tr>
<tr>
<td></td>
<td>Regulatory Requirements</td>
<td>The new Toxics Use Reduction Act mandates strict reporting requirements, reduction standards, design and operating standards, management standards, and planning requirements for source reduction by the state’s companies.</td>
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### STATE AND AGENCY

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<tr>
<th>Toxics Use Reduction Institute</th>
<th>Education</th>
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<tbody>
<tr>
<td>University of Lowell</td>
<td>Technical Assistance</td>
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<tr>
<td></td>
<td>Information Services</td>
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</table>

### COMPONENTS

- **Education**
- **Technical Assistance**
- **Information Services**

### DESCRIPTION OF ACTIVITIES

The Institute trains individuals to be certified as toxics use reduction planners, and provides toxics use reduction training to citizens, community groups, workers and labor representatives, and local officials. The Institute also offers courses, seminars, and conferences on toxics use reduction, and conduct general toxics use reduction education.

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<tr>
<th>Michigan Department of Natural Resources</th>
<th>Research</th>
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<tr>
<td>Department of Commerce</td>
<td>Technical Assistance</td>
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<td></td>
<td>Information and Education Services</td>
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</tbody>
</table>

### COMPONENTS

- **Research**
- **Technical Assistance**
- **Information and Education Services**

### DESCRIPTION OF ACTIVITIES

Four Public Acts of 1987 established new duties in the Michigan Departments of Commerce and Natural Resources. The two departments are charged with undertaking a variety of activities designed to further waste reduction by Michigan companies. Mandated activities include operation of an information clearinghouse; education activities; on-site technical assistance; analysis of waste reduction potentials and accomplishments in various industry sectors; identification of regulatory barriers to waste reduction and ways to overcome them; identification of ways waste reduction can be encouraged through regulatory and permit programs; documentation for the federal capacity assurance plan requirement; updating the state’s hazardous waste management plan; and identifying how the state might better support hazardous waste reduction research. Much of this activity takes place in the Office of Waste Reduction Services, within the Dept. of Commerce. The Office of Waste Reduction Services also runs a technical assistance intern program which allows interns to help companies in need of waste reduction technical assistance.

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<tr>
<th>Waste Systems Institute of Michigan</th>
<th>Research and Information Clearinghouse</th>
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### DESCRIPTION OF ACTIVITIES

The Institute is a non-profit, non-governmental organization that provides information services on topics related to solid and hazardous waste management. It has a non-advocacy approach, with emphasis on technical assistance.

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<tr>
<th>Michigan Modernization Service in the Department of Commerce</th>
<th>Technical Assistance</th>
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<td></td>
<td>Business Education</td>
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### DESCRIPTION OF ACTIVITIES

The services of the Michigan Modernization Service are carried out in partnership with the Industrial Technology Institute, a private, non-profit institute dedicated to the development and deployment of state-of-the-art manufacturing technologies. The Modernization Service provides customized consultations to small and medium sized manufacturers in the areas of technology deployment, workforce development, and market analysis. The Modernization Service also works with manufacturers, trade associations, researchers, vendors, and others to create a public and private infrastructure to support continuous modernization in Michigan’s manufacturing base. This includes frequent efforts in conjunction with the Office of Waste Reduction Services.

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<th>STATE AND AGENCY</th>
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<tbody>
<tr>
<td>New Jersey</td>
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<tr>
<td>Department of Environmental Protection, Division of Hazardous Waste Management, Hazardous Waste Assessment Program (HWAP)</td>
<td>Information Clearinghouse</td>
<td>HWAP's Technical Information Publication Series (TIPS) includes information on waste minimization. TIPS also publishes a newsletter and has conducted waste minimization workshops.</td>
</tr>
<tr>
<td></td>
<td>Waste Audit</td>
<td>A waste minimization audit will cover 30 New Jersey companies and will be conducted over three years. The project will test the EPA's Waste Minimization Opportunities Manual.</td>
</tr>
<tr>
<td>Division of Science and Research</td>
<td>Research</td>
<td>The Division is conducting research on such topics as guidelines for performing multi-media waste reduction audits; regulatory impacts on waste reduction; developing appropriate information collection practices for measuring industrial wastes reduced; identification of incentives that agencies can employ to promote waste reduction; and solutions to specific industrial obstacles to waste minimization.</td>
</tr>
<tr>
<td>Source Reduction Task Force</td>
<td>Technical Assistance</td>
<td>The task force has performed research on waste minimization techniques and has developed options for a New Jersey technical assistance program which it will present to the New Jersey state legislature.</td>
</tr>
<tr>
<td>New York</td>
<td>Regulation</td>
<td></td>
</tr>
<tr>
<td>New York State Department of Environmental Conservation</td>
<td>Technical Assistance</td>
<td>A Waste Reduction Impact Statement is required as part of the permit application for hazardous waste treatment, storage, and disposal facilities. The Impact Statement must evaluate the hazardous waste production process and assess the potential for reducing generation and/or toxicity of hazardous waste across all media. Regulations are currently being developed to include multi-media waste reduction activities at facilities receiving air and water or treatment, storage and disposal permits.</td>
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<td></td>
<td>Technical assistance offered by the State takes many forms, including a Waste Reduction Guidance Manual; an annual hazardous waste reduction conference; statewide workshops for vehicle repair shops; fact sheets for vehicle repair shops, dry cleaners, degreasing and parts cleaning facilities. The state also operates a Waste Reduction Clearinghouse, complete with source reduction literature, and is preparing an Organic Chemical Industry Waste Reduction Manual, and workshops for various industries.</td>
</tr>
</tbody>
</table>
### STATE AGENCY

#### New York State Environmental Facilities Corporation

**COMPONENTS**

- Confidential technical assistance to generators of hazardous waste, reduction audits and information dissemination, and provides funding for the Northeast Waste Exchange.

- The exchange issues a quarterly catalog listing wastes available. Any industry group may participate, and any waste may be made available. The exchange forwards inquiries about confidential listings to the company that placed the listings.

- The Center was established in 1987 to facilitate technology transfer between waste generators and handlers and the academic community. It supports technological research; encourages research and development; provides a clearinghouse for technical information; promotes interaction among all parties involved in hazardous waste management; and recommends programs essential to minimizing future toxic substances and hazardous waste problems.

#### Northeast Industrial Waste Exchange

**COMPONENTS**

- Technical Assistance
- Information Clearinghouse
- Information Services

- Staff provide comprehensive technical assistance through facility visits. During an on-site visit, detailed process and waste stream information is collected. The information is analyzed, and a series of waste reduction options are identified. A report is prepared detailing these options, which includes literature, contacts, case studies, and vendor information.

- An information data base provides access to literature sources, contacts, and information about source reduction techniques for industries or waste streams. Information is also available through customized computer literature searches. Waste reduction reports published by the program are also available.

- Staff can prepare facility or waste-stream specific waste reduction reports for industries and communities. Information provided by the business is used to identify cost-effective waste reduction options. A short report detailing these options is provided to the company or community with references, case studies, and contacts.

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<tr>
<td>Outreach</td>
<td></td>
<td>Staff give presentations on pollution prevention to companies, trade associations, professional organizations, and citizen groups. Depending on the audience, these programs range from an overview of the state's Pollution Prevention Pays Program to in-depth discussions of waste reduction technologies for specific industries.</td>
</tr>
<tr>
<td>Challenge Grants</td>
<td></td>
<td>A matching grant program provides funds for the cost of materials or consultants needed to undertake pollution prevention projects. Projects eligible for grant funds range from characterizing waste streams in order to identify pollution reduction techniques to conducting in-plant and pilot-scale studies of waste reduction technologies.</td>
</tr>
<tr>
<td>National Roundtable of State Waste Reduction Programs</td>
<td></td>
<td>The Roundtable promotes development of state waste reduction programs, and to exchange technical and general information on waste reduction. It is composed of governmental, university, and public interest groups, the EPA, Congress, and national environmental organizations.</td>
</tr>
<tr>
<td>Ohio</td>
<td>Regulation</td>
<td>Commercial disposal facilities that plan land disposal of more than 200 tons of hazardous waste per year must include a waste minimization plan in the required permit application.</td>
</tr>
<tr>
<td>Environmental Protection Agency, Division of Solid and Hazardous Waste Management</td>
<td>Waste Exchange</td>
<td>The Ohio EPA also provides funding for the Northeast Industrial Waste Exchange.</td>
</tr>
<tr>
<td>Ohio Technical Transfer Organization (OTTO)</td>
<td>Technical Assistance and Information</td>
<td>OTTO provides on-site technical assistance by utilizing experts at various academic institutions. OTTO also conducts an outreach program consisting of seminars, conferences, and an electronic mail system. These activities are focused, in part, on waste minimization.</td>
</tr>
<tr>
<td>Oregon</td>
<td>Information</td>
<td>Assists the state's businesses, industries, and institutions in voluntarily reducing the amount of hazardous waste they produce. Provide information and technical assistance on pollution prevention and waste minimization techniques. Offer workshops to industry to share technical information. Provide listings of Northwest and national hazardous waste reduction resources and facilities. Provide on-site technical assistance to companies to identify opportunities</td>
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**STATE INVOLVEMENT**

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<tr>
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<tbody>
<tr>
<td><strong>Pennsylvania</strong></td>
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<tr>
<td>Department of Environnemental Resources, Division of Waste Minimization and Planning</td>
<td>Governor's Award</td>
<td>The Department recognizes effective waste reduction efforts by sponsoring a Governor's Award program.</td>
</tr>
<tr>
<td></td>
<td>Technical Assistance and Education</td>
<td>A limited technical assistance program has been instituted including dissemination of information to waste generators.</td>
</tr>
<tr>
<td></td>
<td>Waste Exchange</td>
<td>The Department cosponsors the Northeast Industrial Waste Exchange, which provides waste exchange services, training, and information to industry.</td>
</tr>
<tr>
<td></td>
<td>Hazardous Waste Recycling and Equipment Grant</td>
<td>The state offers 25% matching grant to encourage industry to purchase or lease equipment for recycling hazardous waste.</td>
</tr>
<tr>
<td>Pennsylvania Technical Assistance Program (PENNTAP)</td>
<td>Technical Assistance</td>
<td>PENNTAP’s waste minimization programs include direct technical assistance for hazardous waste management through on-site inspection and an outreach program which includes regulatory assistance and workshops.</td>
</tr>
<tr>
<td>Center for Hazardous Materials Research (CHMR)</td>
<td>Research and Development Technical Assistance Education and Training Technology Transfer</td>
<td>CHMR develops solutions to the wide range of technical, environmental, economic, institutional, public health, and public policy problems associated with hazardous materials and wastes. CHMR is also involved in solid waste management and global environmental issues.</td>
</tr>
<tr>
<td>Northeast Industrial Waste Exchange</td>
<td></td>
<td>Provides waste exchange catalogue and services for Pennsylvania and Ohio industries.</td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td></td>
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</tr>
<tr>
<td>Washington Department of Ecology Waste Reduction, Recycling, and Litter Control Program</td>
<td>Information Hotline</td>
<td>Advises on recycling, safe disposal of household hazardous substances, alternatives to household toxics, and waste reduction techniques for businesses.</td>
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<thead>
<tr>
<th>STATE AND AGENCY</th>
<th>COMPONENTS</th>
<th>DESCRIPTION OF ACTIVITIES</th>
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<tbody>
<tr>
<td></td>
<td>Education</td>
<td>Prints and distributes booklets, brochures, and other materials to the public and industry to educate about waste reduction and recycling. Provides K-12 school curriculum for waste reduction and recycling (A-Way-With Waste).</td>
</tr>
<tr>
<td></td>
<td>Technical Assistance</td>
<td>Offers site visits and technical assistance services to companies for hazardous waste reduction and recycling. Print industry-specific fact sheets detailing fundamental waste reduction strategies.</td>
</tr>
<tr>
<td>Waste Reduction Innovative Technology Evaluation Program</td>
<td></td>
<td>Analyzing specific waste streams to determine how to reduce or recycle them.</td>
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<tr>
<td>Regulatory Requirements</td>
<td></td>
<td>New toxics use reduction legislation requires companies to develop reduction plans for certain toxic substances and wastes.</td>
</tr>
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</table>
There is a need for nongovernmental efforts to promote and implement the source reduction concept. The very threat of hazardous waste to human
TABLE 5: SELECTED NORTHWEST NON-GOVERNMENTAL SOURCE REDUCTION PROGRAMS

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<tr>
<th>ORGANIZATION</th>
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<th>AREA</th>
<th>CONTACT</th>
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<tbody>
<tr>
<td>Alaska Health Project</td>
<td>Private non-profit organization providing information and education about hazardous materials on the job and in the community to businesses and communities around the state.</td>
<td>Provides information services, conducts workshops, produces educational materials on occupational and environmental health issues. Has a Small Business Hazardous Materials Management Program that provides technical assistance to small businesses for hazardous waste management and waste reduction. Provides worker training, waste reduction newsletter, hazardous waste telephone hotline counseling service; teaching graduate level course in university engineering department on waste reduction; also work with communities on hazardous materials management.</td>
<td>Alaska</td>
<td>David Kidd</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1818 W. Northern Lights Suite 103</td>
</tr>
<tr>
<td>The Washington Toxics</td>
<td>Non-profit, challenges the increasing contamination of Washington from pesticide use and indiscriminate release of toxic chemicals into soils, water, and air through promotion of ecologically safe alternatives, environmentally sound technologies, public education, grassroots organizing, and participation in the legislative process.</td>
<td>Community outreach, information dissemination, technical assistance, education of households and companies, advocacy, legislative participation</td>
<td>Washington State</td>
<td>Carol Dansereau</td>
</tr>
<tr>
<td>Coalition</td>
<td></td>
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<td></td>
<td>WA Toxics Coalition</td>
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<td></td>
<td>4516 Univ. Way NE</td>
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<td></td>
<td></td>
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<td></td>
<td>Seattle, WA 98105</td>
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<td>(206)632-1545</td>
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Health and the natural environment makes its prevention, generation, and disposal a community issue, as well as an economic, political, and governmental one. Communities have begun to recognize their power to influence, monitor, and inform companies and citizens about hazardous waste and pollution control issues. Companies have also begun to recognize the need to become informed, as well as share information with other companies about hazardous waste regulation and source reduction technology. There is a growing awareness that government programs often do not address the entire range of hazardous waste problems. Through the activity of citizen and environmental organizations, university research initiatives, industry trade associations, and consortia of related groups and organizations, the private sector is beginning to play an important role in encouraging source reduction of hazardous wastes.

Many of the region's citizen and industry hazardous waste organizations are located in Washington state. This concentration of activity is understandable, as Washington generates over 75% of the region's regulated hazardous waste. Each of the other three states also boasts innovative programs that encourage source reduction.

**Industry Source Reduction Efforts**

The primary vehicles for addressing industry needs in light of hazardous waste issues are the many trade and business associations in the region. While these associations are usually
established to enable the exchange of information among members about markets and products, many are currently involved in addressing hazardous waste issues. For instance, the Independent Business Association of Washington offers detailed training programs, information dissemination, and technical assistance. Other associations such as the Automotive Services Association provide hazardous waste collection services to members. Some of the most active groups are state chapters of national associations, such as the Washington Chapter of the National Metal Finishers Association (NMFA) or the Oregon chapter of the National Electronics Association (NEA). Oregon NEA has been instrumental in establishing source reduction as a priority hazardous waste management strategy within the sector. In addition, it is active on a legislative level: its most recent effort has been working cooperatively with environmental agencies and citizen groups to draft and propose the new Oregon Toxics Use Reduction Act. No other trade association in the region has been as active on the source reduction legislative front as Oregon NEA.

Many other groups offer valuable services for companies faced with hazardous waste problems. For example, the Independent Business Association provides such education and information dissemination services as sector-specific brochures on source reduction techniques. The Washington chapter of the National Metal Finishers Organization conducts meetings that focus on hazardous waste regulations, source reduction technologies, and compliance issues. Such state business associations as the

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<tr>
<td>Pacific Materials Exchange</td>
<td>Privately operated nonprofit waste exchange of both hazardous and non-hazardous wastes for use by industry</td>
<td>Provides confidential listing of wastes by type for companies wanting to get rid of wastes, and companies in need of wastes for raw materials</td>
<td>Western U.S.</td>
<td>Bob Smee, Director</td>
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<td>S. 3707 Godfrey Blvd</td>
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<td>Spokane, WA 99204</td>
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<td>(509)623-4244</td>
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<tr>
<td>Hazardous Waste Inter-Agency</td>
<td>Composed of volunteer members from agencies, business, and public interest groups throughout the Puget Sound area who meet quarterly to educate themselves about hazardous waste issues and problems in order to foster better agency coordination on hazardous waste management.</td>
<td>Members share their individual expertise or knowledge with the rest of the group in a roundtable forum. Issues discussed include household hazardous waste issues, hazardous waste regulations, source reduction and recycling, technical assistance, and education.</td>
<td>Puget Sound Area</td>
<td>Scott Blair</td>
</tr>
<tr>
<td>Coordinating Committee</td>
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<td></td>
<td>King County Solid Waste</td>
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<td></td>
<td>500 4th Ave.</td>
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<td></td>
<td>Seattle, WA 98104</td>
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<tr>
<td>Waste Information Network</td>
<td>WIN is an informal forum that seeks to educate small businesses about the various waste generation, management, and compliance issues facing them. Consists of private businesses, public agencies and other groups working together to resolve waste management concerns</td>
<td>Worked with the Municipality of Metropolitan Seattle to produce three industry-specific brochures to provide hazardous waste reduction and recycling technical assistance to small quantity generators. Also planning to have a Waste Information Expo this year.</td>
<td>Puget Sound Area</td>
<td>Laurel Tomchick</td>
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<td></td>
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<td>322 W. Ewing</td>
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<td>Seattle, WA 98119</td>
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<td>(206) 684-2330</td>
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### TABLE 5: SELECTED NORTHWEST NON-GOVERNMENTAL SOURCE REDUCTION PROGRAMS (cont'd)

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<tr>
<th>ORGANIZATION</th>
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<tr>
<td><strong>Industrial Materials Exchange (IMEX)</strong></td>
<td>Free service designed to help Northwest businesses find markets for industrial by-products, surplus materials, and wastes. Goal is to conserve energy, resources, and landfill space by helping businesses and organizations find alternatives to disposal of valuable materials or wastes.</td>
<td>Finds markets for materials that businesses have traditionally thrown away (both solid and hazardous wastes). Publishes bi-monthly catalog listing materials available and wanted to a circulation of over 4000.</td>
<td>Pacific Northwest</td>
<td>Jerry Henderson Seattle/King City Health Dept. (206)296-4899</td>
</tr>
<tr>
<td><strong>Pacific Northwest Pollution Prevention Research Center</strong></td>
<td>Public-private partnership dedicated to the goal of furthering pollution prevention in the Pacific Northwest. The Center is built on the support of industry, environmental, civic, and labor organizations, academia, and federal, state, and local governments.</td>
<td>Identify where pollution prevention research gaps exist; set priorities based on research needs; support, sponsor and/or conduct pollution prevention research; disseminate results of this research; and foster ways to evaluate the effectiveness of pollution prevention efforts resulting from this research.</td>
<td>Pacific Northwest &amp; British Columbia</td>
<td>Jocelyn Mathiasen Program Manager Ross And Associates 1218 3rd Ave. Suite 1207 Seattle, WA 98101 (206)447-1805</td>
</tr>
</tbody>
</table>

Associated Oregon Industries and the Association of Washington Businesses, address source reduction in workshops and newsletters. They also offer technical assistance and consulting services, and link up companies to exchange source reduction ideas and technologies. Many trade associations have followed these leads to create their own hazardous waste and source reduction working groups and roundtables to discuss waste management and source reduction strategies. The Washington Automotive Association conducts frequent roundtable discussions to advance the position that source reduction is a good way to come into environmental compliance, as well as improve a firm's individual profits and savings on disposal costs.

**Technical Assistance and Technology Transfer Efforts**

Source reduction efforts often originate within government to address source reduction technology needs. Many states operate highly successful technical assistance programs, one-on-one waste auditing and consulting, and technology clearinghouses for source reduction and recycling of hazardous wastes. Exemplary programs include the Georgia Institute of Technology Technical Assistance Program, the Michigan Modernization Service Technical Assistance Program, and the Pennsylvania Technical Assistance Program, all discussed in the previous section. One limitation of many such efforts is that they are directly tied to
environmental agency enforcement programs. Companies may be less willing to participate if they fear an agency’s regulatory authority. Nonetheless, these government-sponsored programs can offer a blueprint for non-governmental technical assistance programs here in the Northwest.

The Minnesota Technical Assistance Program in particular represents a desirable direction for a regional source reduction technical assistance program, as it focuses on the needs of small and medium-sized companies. This program emphasizes small business hazardous waste management needs because it is the small companies that often do not have the financial and consultative resources that are necessary. Minnesota’s program offers a variety of important services to these smaller companies, including:

- a toll-free telephone hotline service;
- on-site visits to suggest waste reduction and improved waste management strategies;
- an opportunity for graduate student interns to learn about specific waste reduction technology or methods and transfer that information to needy businesses;
- a clearinghouse of information on source reduction strategies and technologies; and,
- presentations and seminars devoted to source reduction technical assistance.

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<tr>
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<tbody>
<tr>
<td>Automotive Services Association</td>
<td>Industry trade association provides common ground for discussing and sharing information on business strategies technical issues, and regulatory issues</td>
<td>Working under a Public Information and Education grant from the Puget Sound Water Quality Authority. Organized a collection day in 1989 in Tacoma to collect hazardous materials from automotive businesses. Set up a program with a local TSD facility to allow small quantities of waste to be dumped. Primarily emphasize how important hazardous waste source reduction and recycling/reuse of hazardous wastes is to businesses.</td>
<td>Pierce County, Washington State</td>
<td>Dan Meyer PO Box 9003 Tacoma, WA 98409 (206)272-0512</td>
</tr>
<tr>
<td>Puget Sound Alliance</td>
<td>Non-profit citizen group that fosters the protection of Puget Sound primarily through education</td>
<td>Have a grant from Metro and the PSWQA to do a source reduction education project for small businesses. Have created a brochure on source reduction strategies for small businesses</td>
<td>Puget Sound Area</td>
<td>Richard Conlin 909 4th Ave. Seattle, WA 98104 (206) 382-5013</td>
</tr>
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TABLE 5: SELECTED NORTHWEST NON-GOVERNMENTAL SOURCE REDUCTION PROGRAMS (cont'd)

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<tr>
<th>ORGANIZATION</th>
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<tr>
<td>Pacific Northwest Laboratory of the Federal Laboratory Consortium</td>
<td>The Federal Laboratory Consortium was established in 1971 to serve the Dept. of Defense, but later under the Technology Transfer Act became a federal channel for technology transfer.</td>
<td>Work to facilitate contact between laboratories and potential users of technology, such as businesses and government. Operate an electronic mail system which allows members to communicate on technological issues and problems. Are becoming involved in technology issues for source reduction of hazardous wastes and will be holding a national conference in California in 1991 on this issue.</td>
<td>Pacific Northwest</td>
<td>Scott Butner&lt;br&gt;PO Box 999&lt;br&gt;Batelie Blvd.&lt;br&gt;Richland, WA 99352&lt;br&gt;(509) 375-2675</td>
</tr>
</tbody>
</table>

Such technical assistance services exist in some form in the Pacific Northwest at a state or local level. Few, however, address source reduction. In Washington, the Washington Technology Center of the University of Washington provides business assistance to small and large companies on a variety of matters but these rarely include hazardous waste issues. Several of the region’s state environmental agencies, in addition to many of the region’s community action groups, offer hotlines such as that provided by the Intergovernmental Resource Center in Vancouver, Washington, to discuss toxics use or hazardous waste management problems. However, few of these programs deal exclusively with source reduction strategies. A source reduction hotline represents yet another opportunity for a state or regional source reduction technical assistance program.

Recently, several programs have been initiated in the region that could increase technical assistance and technology transfer for small companies. The highly-valued Alaska Health Project (AHP), founded in 1980, is a private, non-profit organization providing information and education about hazardous materials on the job and in the community. AHP has been helping Alaska companies make informed decisions about hazardous waste materials management and waste reduction since 1987. The AHP prepared a guide to meet these goals, Profiting from Waste Reduction in Your Small Business, that helps these companies identify, implement and evaluate an industrial waste reduction program.
The Pacific Northwest Hazardous Waste Advisory Council has played a key role in establishing a regional Pollution Prevention Research Center to develop waste reduction techniques with Northwest companies. This new Center’s goals are to institutionalize public-private partnerships with a common goal of pollution prevention; provide a forum for dialogue on the role of pollution prevention in our environmental protection system; sponsor pollution prevention research efforts; and develop and implement an appropriate means to measure the effectiveness of pollution efforts in the Pacific Northwest. The Center will utilize researchers from across the region to design and participate in the research and implementation of pollution prevention technologies.

Other existing regional technology transfer efforts such as the Waste Information Network’s recently approved On-site Team Consultation Program for small quantity generators offer opportunities for the Northwest to expand and coordinate technical assistance for hazardous waste generators. The RCRA Integrated Training and Technical Assistance (RITTA) grants offered by the Environmental Protection Agency will assist the region to continue to address its source reduction technology needs. Washington’s Environmental Resource Management has received a RITTA grant to develop a regional technical assistance program to encourage small companies in several industrial sectors to practice source reduction of hazardous wastes. This is the first and only technical assistance effort in the Northwest that is multi-state in scope. It will provide further opportunities for

### TABLE 5: SELECTED NORTHWEST NON-GOVERNMENTAL SOURCE REDUCTION PROGRAMS (cont’d)

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<tr>
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<tr>
<td>Idaho Association of Commerce and Industry</td>
<td>State business association active in lobbying and working with regulators to represent member firms and associations and their various interests. Also provide forum for education and information on wide variety of issues including hazardous waste issues.</td>
<td>Involved in helping to craft hazardous waste legislation which includes source reduction and technical assistance provisions; discuss hazardous waste issues at every committee meeting; bring in speakers to talk to members about hazardous waste issues, including source reduction; working with Idaho State University to put together industry workshop on hazardous waste issues, including source reduction</td>
<td>Idaho</td>
<td>Matt Eames&lt;br&gt;PO Box 389&lt;br&gt;Boise, ID 83701&lt;br&gt;(208) 343-1849</td>
</tr>
<tr>
<td>Oregon Environmental Council</td>
<td>A citizen/environmental advocacy group that provides public education and works with legislators on a host of environmental issues and legislation. Monitor and implement environmental regulations.</td>
<td>Their work includes advocating source reduction and related legislation, such as Oregon’s new Toxic Use Reduction law. Also work to improve technical assistance programs for hazardous waste generating companies in the region, especially by utilizing research done by university engineering departments on the subjects of source reduction and recycling.</td>
<td>Oregon</td>
<td>Jean Cameron&lt;br&gt;2637 SW Water&lt;br&gt;Portland, OR 97201&lt;br&gt;(503)222-1963</td>
</tr>
<tr>
<td>Metrocenter YMCA Hazardous Materials Project</td>
<td>Collaborate with community agencies to promote healthy lifestyles and also participate in and promote community activities that focus on efforts designed to improve the quality of life.</td>
<td>Operate a hazardous materials project that consists of regular household hazardous waste roundups, and community education on hazardous materials problems; a traveling hazardous wastemobile; campaigning in communities for hazard-free environment; helping to organize a Seattle area waste exchange.</td>
<td>Puget Sound Area</td>
<td>Richard Conlin&lt;br&gt;Metrocenter YMCA&lt;br&gt;901 4th Ave&lt;br&gt;Seattle, WA 98104&lt;br&gt;(206) 382-5013</td>
</tr>
</tbody>
</table>
SOURCE REDUCTION AS A CRITICAL RESPONSE

While local programs will remain essential, there is an unmet need for regional cooperation and information sharing if technical assistance and technology transfer is to better encourage Northwest companies to significantly reduce their hazardous wastes.

Each of the four states to work cooperatively to tackle source reduction technology transfer needs.

In addition to these industry trade associations and other technical assistance efforts, several other groups have begun to successfully address these issues. The Washington Waste Information Network (WIN), serves an information dissemination and technical assistance function. The Network’s major education effort is its annual Trade Fair, which brings together small businesses, waste recyclers and haulers, agency representatives, and industry associations to share information with each other about hazardous waste reporting requirements, responsible hazardous waste management, and source reduction strategies. WIN also provides voluntary individual business consultations to share information on hazardous waste regulations and source reduction strategies. In addition, WIN, along with the Municipality of Metropolitan Seattle (METRO) hazardous waste section, operates a technical assistance program for small quantity generators.

While local programs such as these will remain essential, there is an unmet need for regional cooperation and information sharing if technical assistance and technology transfer is to better encourage Northwest companies to significantly reduce their hazardous wastes.

Policy Coordination Efforts

Coordination among national, state, and local agencies can be critical to the overall success of source reduction as a means to control pollution. A recent Northwest Policy Center report, “Hazardous Waste Source Reduction: Industry Perception of Regulatory and Other Impediments” cites evidence of the need for agency and regulatory coordination in the region, particularly when regulating hazardous waste management by firms. Companies throughout the region argue that lack of agency coordination often creates barriers to their practicing hazardous waste reduction.

In the Northwest, many source reduction efforts (including state regulatory programs, citizen environmental groups, and industry associations efforts) are in their initial stages. There are two coordinating efforts that deserve mention here. In 1984, the Hazardous Waste Interagency Coordinating Committee was organized in the Seattle area. It meets once a month to discuss hazardous waste issues confronting each of the member agencies. The members meet independently of their agency affiliations and duties, and are not compensated for their involvement in the Committee. They have joined the Committee voluntarily for the sake of better communication among agencies and businesses about hazardous waste and source reduction issues. The Committee fosters information exchange, discussion, problem resolution, and education.

Although the Committee’s geographical focus is primarily upon western Washington state, its members occasionally discuss multi-
state issues, and often bring in experts from Alaska, Idaho, and Oregon to discuss other hazardous waste initiatives. The Committee has explored such matters as how fire codes regulate hazardous wastes; industry problems with the overall regulatory structure; federal, state, and local hazardous waste legislation; household and small business hazardous waste issues; and source reduction and recycling. The Committee often reviews solutions to identified problems. For example, the Committee addressed the need for small business hazardous waste education and technical assistance by developing a new initiative, the Waste Information Network (described above), which has since evolved into a successful, independent technical assistance effort.

The second coordinating effort, the Pacific Northwest Hazardous Waste Advisory Council, was established by EPA Region X in cooperation with Northwest governors in response to a perceived need for heightened interstate cooperation on hazardous waste and source reduction issues. The Council's primary goal was to determine feasible means to comply with the federal capacity assurance standards outlined in the Superfund amendments. In the process of reaching this goal, the Council served as a springboard for various regional coordination ideas and action, including fostering the creation of the previously mentioned Pollution Prevention Research Center. The Council has also served the much needed function of providing a regular forum for discussion of such region-wide hazardous waste issues as a means of placing source reduction at the top of a regional waste management hierarchy, increasing technical assistance, and improving waste transportation. Because the Council served its primary purpose of developing the regional capacity assurance plan, it was disbanded in Spring, 1990.

The Interagency Coordinating Committee, although it is only Washington-oriented, could serve as a model for similar coordination efforts around the region. Ultimately, all such efforts could be monitored or brought into the regional context by an organization similar to the Pacific Northwest Hazardous Waste Advisory Council, thus providing a continuing forum for regional discussion of hazardous waste issues and problems.

**Building New Partnerships — Citizen Involvement**

Public concern has increased as dangerous hazardous waste sites are discovered and as cleanup proves to be slow. State and local governments continually face public resistance in their search to site new or expanded landfills and incinerators. Coupled with resistance to siting is a new imperative: reduce wastes at the source. As outlined earlier, this source reduction theme is the key to improved pollution control and environmental protection. It is essential that as toxic source reduction programs are developed, new partnerships are formed between the public, government, and industry.

**Coordination among national, state, and local agencies can be critical to the overall success of source reduction as a means to control pollution.**
Grassroots organizations fill a very necessary role by providing the cornerstone for citizen involvement in and public awareness of hazardous waste and pollution control issues. These groups are often behind citizen lobbying against hazardous waste facility siting and inadequate hazardous waste policies. Many of these groups take a proactive role in encouraging and promoting stringent new policies for toxics use reduction by industry and households and many have been successful in getting these laws passed in their respective states. For example, the National Toxics Campaign in conjunction with the Massachusetts Public Interest Research Group (MASSPIRG), and the Oregon Public Interest Research Group have both successfully influenced such legislative efforts.

One successful grassroots toxics use prevention organization has been initiated by the woman most responsible for fighting the environmental battle at Love Canal, in New York. Lois Gibbs created the Citizen's Clearinghouse for Hazardous Wastes to help others around the country attack environmental problems related to toxic chemical use, waste generation, and disposal. This organization has become one of the foremost clearinghouses nationwide for information on hazardous waste measures such as the Community Right to Know Act; for recommendations on how to fight toxics use, generation and disposal; and for tips on how to encourage pollution control policy from a grassroots level. The Citizen's Clearinghouse is also involved in leading protests against large companies to bring environmental infractions into the public eye. Their primary focus is on preventing the siting of new hazardous waste landfills and incinerators, and in so doing increase industry reliance on source reduction and toxics use reduction.

Other grassroots education, policy research, action, and outreach groups include INFORM, the Institute for Local Self-Reliance, The National Toxics Campaign, and Greenpeace. These groups address various issues and problems surrounding hazardous waste generation and disposal. Oftentimes citizen groups are directly and indirectly responsible for advancing toxics use reduction and hazardous waste reporting legislation, with strong lobbying and publicizing the benefits of hazardous waste reduction.

Strong local community organizations can be important advocates for waste reduction. They can urge companies to use means to reduce wastes before and during production by:

- supporting the need for more research to further develop waste reduction techniques;
- commending companies that reduce wastes;
- publicizing safe substitutes for toxic substances; and
- developing comprehensive toxics use reduction proposals.

To ensure government and industry accountability, community groups have a role in such activities as:

It is essential that as toxic source reduction programs are developed, new partnerships are formed between the public, government, and industry.

SOURCE REDUCTION AS A CRITICAL RESPONSE

66
• **Information Gathering** — Under right-to-know provisions, the public has access to information about particular hazardous waste generation amounts by companies. Citizens can compare information from year to year on toxic releases by companies, and can use the information to seek source reduction by local companies;

• **Waste Assessment** — Citizens can gain access to waste audits performed by government, and participate in a review of the state-wide assessment of annual source reduction. Citizens also could request or carry out their own waste assessments of industrial facilities in their communities; and

• **Education** — Citizen groups have a role to play in toxics use reduction education about non-toxic alternatives to household and garden products. For example, the Washington Toxics Coalition, a state-wide coalition of individuals and groups that seek to reduce the generation of hazardous wastes, as well as minimize society’s reliance on chemicals, publishes a quarterly newsletter with a regular column on alternatives to toxic household products. The Toxics Coalition has published a series of fact sheets on reducing toxics use in the household, and is currently developing a listing of alternatives to toxic household products.

**Toxics Use Reduction**

The “pollution shell game” where environmental impacts of disposal are shifted back and forth from one medium to another, can be slowed down by the avoidance of the initial generation of hazardous waste. This can be done through several strategies that move beyond those of technical assistance and even mandated reduction. Toxics use reduction moves beyond the “source” reduction strategy of influencing the initial production practices of businesses to the realm of consumer practices, additional state and local government involvement, and industrial chemical selection.

Incentives for toxics use reduction can be leveraged through other programs. For example, if the state and locally sponsored energy insulation programs provided a preference for toxic-free or less toxic insulation, purchasers would respond to that market incentive. State and local grants for specific projects could be tied to a toxics use reduction plan by individual applicants. Municipal permits for buildings and other small projects could similarly require toxics use reduction during the various stages of completion.

**State and local procurement policies** for purchase of less toxic or non-toxic products by government could be established as well. A “waste audit” of current local and state procurement policies could be carried out to identify areas where procurement policies would have an impact. Recent experience with government procurement requirements for recycled paper
products shows that the marketplace has responded. For example, several counties in Washington require that all government printing be done on recycled paper, and new and more available products have come into the market to meet the demand. A “toxics use reduction” procurement policy could be adopted by state and local governments, and on a regional level to ensure consistency among Northwest states.

Changes in personal values, or creating an “environmental ethic,” will require education from elementary school through adult life. The awareness of toxics use begins in early education about what is used at home. Citizen organizations could prepare an “audit” of consumer behavior to review home use of toxics. Like the diet plans that have been prepared for low cholesterol, low-fat diets, the household toxics use reduction plan could be carried out by the family. In addition, citizen networks of the product users could be tapped about alternatives to toxics. For example, garden clubs and farm organizations could sponsor information events about non-toxic alternatives to pesticides. Through measures such as these local communities can become more informed about toxics use reduction and hazardous waste reduction in the home and the community.
The Regulatory Climate
Improving the Climate

Reduction represents a critical component of hazardous waste management. Why then is the potential for source reduction largely unfulfilled? Are innovative practices of large and small companies in the region?

A 1989 study conducted for the Pacific Northwest Hazardous Waste Advisory Council by the Northwest Policy Center identifies factors which significantly affect corporate decisionmaking regarding hazardous waste management, source reduction and recycling. Based on interviews with 34 Northwest businesses and trade associations, the report, "Hazardous Waste Source Reduction - Industry Perception of Regulatory and Other Impediments," examined the possibility that regulatory barriers might discourage or prevent Northwest companies from practicing source reduction. Nationally, such barriers are a primary hindrance to source reduction, but they are far from being the only significant factor affecting hazardous waste management by industry. The Northwest Policy Center analysis discovered similar non-regulatory barriers to source reduction as those outlined in a recent New Jersey study, Design of Programs to Encourage Hazardous Waste Reduction. These included technical, financial, consumer-related, and educational obstacles to source reduction by Northwest companies. However, the
TABLE 6: RECOMMENDATIONS FOR ELIMINATING BARRIERS TO SOURCE REDUCTION

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<th>Source Reduction Issue Areas</th>
<th>Recommendations</th>
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<tr>
<td>On-site Recycling and Reuse</td>
<td>Explore the feasibility of establishing a limited class of specific recycling activities that state regulators and EPA can certify companies to conduct, even when those companies have not qualified for a TSD permit.</td>
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<tr>
<td>Technology Transfer</td>
<td>Strengthen efforts to provide technical assistance to small companies which focus on sharing the technical and organizational expertise of larger firms and trade associations with small businesses throughout the region. Local industry sector groups should also be formed to allow convenient discussion and transfer of technological information on a peer-to-peer basis.</td>
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<tr>
<td>Risk Management</td>
<td>Examine the possibility of devising ways that the regulatory structure can permit the &quot;decommissioning&quot; of certain wastes from the regulatory list after a proven, successful recovery process is completed and the material is to be reused. Northwest Policy Center study makes no attempt to determine the importance of regulatory factors relative to these other influences on corporate waste management behavior, and recognizes that there are numerous other factors that determine individual company behavior. The report concludes that although the regulatory environment encourages source reduction through liability standards and increased waste disposal costs, it may also discourage certain practices that could substantially reduce waste generation in the Northwest. It reveals no industry consensus on the impact of the regulatory system on source reduction. Companies differ widely in their financial health, in-house technical expertise, and frequency of process modification. Based on these findings, authors of the report make recommendations to policymakers and state regulatory agencies on how to expand source reduction opportunities for Northwest companies (Table 6). The greatest immediate source reduction potential may exist with companies that have not yet taken any action. By pursuing basic strategies such as housekeeping improvements and simple process modifications these companies can often substantially reduce their production of hazardous waste with little capital investment or effort. One factor that complicates further source reduction beyond these basic measures is the rapid pace of regulatory and technological change. Frequent reclassification of hazardous and banned substances, plus periodic changes in hazardous waste regulations create an uncertain environment for companies that generate hazardous waste. An increasing use of customized batch or single-order processes by many companies often makes the implementation of hazardous waste regulations more complicated or near impossible. Another factor that may discourage source reduction beyond the basic measures described above is the cost of more complex and more technology-based source reduction measures. These obstacles may prevent companies that have a high potential for reducing wastes from practicing source reduction. Northwest hazardous waste generators interviewed for this project identified a variety of impediments to source reduction, which have been organized into six main issues: On-site Recycling and Reuse, Technology Transfer, Risk Management, Regulatory Consistency, Liability, and Customer Requirements. While some of the study's recommendations could be implemented by state regulatory agencies in the Northwest to address specific regional and state barriers to source reduction, others would require modifications of federal, state, or local laws.</td>
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On-site Recycling and Reuse

On-site recycling and reuse of wastes provide significant opportunities for both large and small generators to reduce the amounts of hazardous wastes eventually leaving their facilities for treatment, storage, or disposal. Although high disposal costs, liability concerns, and land bans often provide a powerful incentive to recycle, generators argue that such regulations as the Resource Conservation and Recovery Act
(RCRA) often serve to discourage on-site recycling and reuse.

Some critics of RCRA maintain that it treats hazardous wastes in a "uniform regulatory manner" regardless of how the material is managed. In *Reducing Hazardous Waste Generation*, the National Research Council reports that, as RCRA is written and enforced, "there is little impetus to develop more desirable techniques for these [hazardous] materials." Thus, there is little incentive provided for the generator to go beyond traditional waste management such as treatment, storage, and disposal.

Many of the Northwest companies interviewed for this study report the above view, but also argue that regulations such as RCRA cause the regulatory agencies to micro-manage hazardous waste handling procedures at the expense of achieving source reduction goals. They believe that companies that have proven expertise or sophistication in on-site recycling practices should be extended greater flexibility and encouragement by the regulatory agencies.

Some of the companies interviewed that have Treatment, Storage and Disposal (TSD) permits and on-site TSD facilities maintain that the stringently TSD requirements for a maximum 90-day storage time can preclude on-site recycling, especially for those companies operating batch processes. These companies indicated that it may take longer than this 90-day period to accumulate a sufficient quantity of a particular waste to economically justify recycling. In addition, some of the companies must also meet stringent EPA and local fire marshal standards for safety and storage, while the recyclable amount builds. Meeting these standards can create expenses that outweigh the benefits of recycling hazardous wastes.

Extensive labeling and handling requirements for hazardous wastes and materials present significant obstacles to recycling as well. Some Northwest companies interviewed stated that they spend most of their time keeping up with the regulatory paperwork, which leaves little time to consider additional waste management strategies such as recycling and source reduction. One company suggested that certain recyclable materials could possibly be removed from the regulated list, in order to encourage recycling and reuse of these wastes as a source reduction strategy.

Spent solvents are one of the largest waste streams, by volume, in the Pacific Northwest, according to a report prepared by Lee Stokes and Ross and Associates for the Pacific Northwest Hazardous Waste Advisory Council. Several Northwest generators, including Micron, Tektronix, and John Fluke, have a special interest in the ability to distill spent solvents on-site for recovery and reuse back into the manufacturing process. One report, *Chlorinated Solvents: The Regulatory Dilemma*, estimates the national potential for recycling spent solvents to be over 400% greater than what is currently being achieved. Storage and waste handling regulations are the primary obstacle to realizing this potential. The time required to accumulate sufficient volumes of waste to operate batch distillers often exceeds the maximum 90-day storage limit. Clearly, encouraging on-site recycling of these wastes would move the Pacific

| Regulatory Consistency | Organize a special short-term investigation of possible regulatory inconsistencies in the region which might contribute to discouraging source reduction, and propose possible measures to resolve them. |
| Customer Requirements | Encourage the concept of waste recycling and exchange in the Northwest in order to expand the hazardous waste reprocessing and reuse options available to Northwest companies. |
| Liability | Members of the Northwest Congressional delegation should attempt to make federal agencies more conscious of source reduction practices, and seek ultimate modification of federal purchasing practices which might inhibit source reduction. |

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**TABLE 6: RECOMMENDATIONS FOR ELIMINATING BARRIERS TO SOURCE REDUCTION (cont'd)**
Northwest closer to attaining its source reduction potential.

Based on the information gathered for this study, the Northwest states would encourage source reduction through encouraging recycling and reuse of hazardous wastes. Regional policymakers should explore the feasibility of establishing a limited class of specific recycling activities that state regulators and the EPA can certify companies to conduct, even when those companies have not qualified for a TSD permit.

Technology Transfer

Some of the businesses interviewed indicated that a lack of education, information, and technical assistance to companies in need of these services can indirectly discourage small companies in particular from implementing source reduction practices. Companies often choose the “safe” route of treatment, storage, and disposal, rather than source reduction, simply because they are unaware of more environmentally acceptable alternatives to traditional waste management. The wide variety of manufacturing processes and product designs used by companies can make technology transfer of source reduction strategies difficult, however. Options for source reduction must often be individually tailored to fit a particular company. However, generators can still benefit from learning about the practices of others.

Many Northwest companies argue that environmental regulators bear a responsibility to strengthen the technology transfer process for source reduction as long as regulations remain difficult to understand and apply. Many companies indicate that they would welcome education and information exchange as an integral part of the regulatory process, rather than a disjointed attempt to bring businesses into compliance. Some companies stress the value of educational efforts already underway in the region (see Chapter 2) and encourage the expansion of these efforts.

To the extent allowed by constraints on time and resources, an increasing number of small companies in the Northwest are cooperating within a competitive framework. In addition to the prospect of working together on waste management matters, small companies have jointly marketed their products, shared facilities, and trained workers. As individual companies in the Northwest begin to recognize their need to learn from the experience of other regarding hazardous waste management issues, there is an opportunity for the Pacific Northwest to address their needs through encouraging source reduction as a pollution control and business assistance strategy. Chapter 4 discusses this issue in more detail.

In order to address the issues above, the Northwest should strengthen its efforts to provide technical assistance to small companies. These technical assistance efforts should focus on sharing with small businesses the technical and organizational expertise of larger firms and trade associations which have had more experience practicing source reduction. In addition local industry sector groups should also be formed to allow convenient discussion and
transfer of technological information on a peer-to-peer basis.

Risk Management

Leaders throughout the United States are debating the fundamental question of how environmental regulations and enforcement actions measure and respond to risk. Many are concerned that regulatory control over hazardous substance has often been governed by public perception of and reaction to risk. They also argue that the present regulatory system devotes considerable effort and expense to reducing perceived potential public health and environmental hazards regardless of their actual risk.

Several Northwest companies maintain that RCRA hazardous waste definitions force them to manage all wastes in the same manner regardless of the relative toxicity of the wastes, due to what they feel are distorted perceptions of risk. Many companies believe that such risk distortion discourages or prevents them from recovery and reuse of some hazardous wastes, because they are concerned with liability. However, many of these same companies recognize that public fears and perceptions of risk are often a response to poor hazardous waste management practices of the past which resulted in human health hazards and environmental degradation. Yet they claim that “crisis management” now dictates their waste management priorities. They feel they are spending so much time responding to regulation that they have little or no time to concentrate on source reduction and recycling measures.

The alleged focus of regulation on perceived rather than actual toxicity may have also enabled companies to claim illusory improvements by reducing waste volume through the separation of sludge from waste water. Although the resulting smaller waste volume may place the company in compliance with hazardous waste regulations, or even allow it to fall below minimum waste reporting amounts, the waste may be no less toxic than before. In fact, it may even represent a greater hazard by virtue of its increased concentration of toxics.

To address the problems of how current hazardous waste management strategies measure and respond to risk, particularly with a view toward improving the atmosphere for source reduction, the Northwest should examine the possibility of “decommissioning” certain wastes from the regulatory system. Such wastes should be considered if a proven, successful recycling or recovery process is completed and the material has potential to be reused. In addition, the Northwest should explore the risk management issue in greater detail to ensure that the regional regulatory response to hazardous waste management accurately reflects the toxicity or hazard of each waste and process which is regulated.

Regulatory Consistency

Over the past 20 years, the United States has undergone a substantial upheaval in the way its regulatory framework addresses environmental protection. Events such as the Exxon Valdez oil spill and Love Canal have served to

Companies often choose the “safe” route of treatment, storage, and disposal, rather than source reduction, simply because they are unaware of more environmentally acceptable alternatives to traditional waste management.
**State and federal liability laws, coupled with rising land disposal costs and restrictions, may be one of the greatest incentives to businesses to consider source reduction practices.**

Focus governmental and regulatory attention on the way all sectors of our society affect the environment and public health. Numerous environmental laws have been enacted by federal, state, and local agencies to address pollution, resource protection, and conservation. Collectively, these laws are intended to weave a blanket of environmental protection for our land, water, and air. Yet in reality, these laws can conflict with each other, often causing difficulty in compliance for industry as well as having a substantial impact on source reduction of hazardous wastes. Companies with operations in more than one state must learn and comply with the requirements of each. Companies maintain that inconsistencies in the regulations can force them away from source reduction and toward the traditional route of treatment storage and disposal.

For example, five years ago, spent potliner (a hazardous waste generated during aluminum manufacturing) was listed as a hazardous waste in Oregon, but not in Washington. At that time, the Washington Department of Ecology issued an order to a Reynolds Metals facility in Oregon to stop their transport of potliner to another Reynolds facility in Washington, where they were sending it to be recycled. Consequently, Reynolds began sending their potliner to a hazardous waste landfill, effectively terminating their recycling activity.

Tektronix, an electronics company in Oregon, maintains that fire marshal and insurance requirements mandate open ventilated containers for storage of flammable solvents to avoid a fire hazard, while state and federal environmental agencies require sealed solvent containers to minimize air pollution through evaporation. Clearly, such regulatory contradictions can cause confusion in companies that may have good intentions of minimizing environmental and safety hazards. When these companies are confounded by such inconsistent requirements, many may shy away from source reduction strategies in an effort to reduce the regulatory confusion they face.

To address the problems of inconsistent or conflicting hazardous waste management regulation, the Northwest should organize a special short-term investigation of possible regulatory inconsistencies in the region which might contribute to discouraging source reduction. Once the Northwest states are aware of which regulations in particular are inhibiting source reduction because they conflict with other regulations, the states can begin to work cooperatively to propose measures to resolve any regulatory conflict.

**Liability**

State and federal liability laws, coupled with rising land disposal costs and restrictions, may be one of the greatest incentives to businesses to consider source reduction practices. However, fear of liability can also cause companies to avoid new or unproven waste reduction strategies and technologies. "Cradle-to-grave" responsibilities that companies have for the hazardous wastes they generate from the moment the wastes are produced to when they are
properly handled and disposed has also caused companies to be wary of marketing those wastes they have recovered for reuse, because they will be liable for the wastes if the waste hauling or recycling company goes out of business or manages the wastes irresponsibly.

The concern over liability has also caused companies to be cautious about waste exchanges. These waste exchange programs facilitate the distribution of wastes that other companies may wish to use in the manufacturing process, thereby reducing overall demand for some raw materials. Extended liability, however, makes companies liable for subsequent misuse of the materials garnered from their hazardous wastes. This can be a powerful disincentive to participate in such exchange programs.

Many Northwest companies harbor these same concerns over liability, and believe that their fears have discouraged them from practicing source reduction, recycling, and marketing of hazardous wastes. For example, the Boeing Company has had to assume responsibility for cleaning up hazardous wastes from the site of a bankrupt waste management company that had contracted to reprocess or dispose of Boeing’s wastes. This experience has diminished Boeing’s interest in pursuing new waste management enterprises, even if they offer recycling or recovery of hazardous wastes as a service. FMC, an Idaho electronics company, has been involved in several cases where a silver reclaimer has gone out of business, leaving the company’s wastes unprocessed. The company now believes that incineration provides better protection against future liability claims.

To encourage companies to consider recycling and reuse without fear of liability, Northwest leaders should publicly support the concept of waste recycling and exchange in the region. This support could possibly take the form of the Northwest states taking on partial responsibility for liability if a hazardous waste exchange proves to be unreliable.

**Customer Requirements**

Customer specifications represent an additional complication for a company which is considering a process or product modification to achieve source reduction of hazardous wastes. Companies operating under customer specifications or preferences fear that changing the product in any way will ultimately diminish their ability to sell it. They want to make certain that substituting a less toxic chemical or alternative raw material will not diminish the product’s quality, or the consumer’s perception of the quality. Moreover, if a company acts as a subcontractor and sells most or all of its product to one or a few larger companies, those larger companies take an active interest in all production changes. The sub-contractor may have little or no flexibility to experiment with source reduction strategies.

Many Northwest companies indicate that one of the largest contractors, the federal government, often hands down restrictions or specifications that run counter to environmental goals. For example, although the U.S. Environmental Protection Agency has called for significant reductions of chlorofluorocarbons (CFC’s),
certain specifications of the U.S. Department of Defense require either the use of CFC-based solvents, or a cleanliness standard that only CFC-based solvents can achieve. This specification has caused Northwest government subcontractors such as Sundstrand Data Control, John Fluke Manufacturing, and Tektronix to continue to use CFC-based solvents despite the call for reduction of these substances. Keytronics, a Washington electronics firm, follows Department of Defense specifications for a soldering process which creates more hazardous waste than alternative processes.

Many other Pacific Northwest businesses continue to operate under customer specifications despite the environmental hazards these standards might engender, because to do otherwise would threaten their profits. Although it has instituted a number of innovative source reduction strategies, Alexander's Chrysler-Plymouth of Oregon is still constrained by customer preference for specific paints, and has been unable to find more environmentally acceptable paints that meet customer demands. Similarly, Preservative Paint Company of Seattle, another environmentally-conscious firm, often provides road paint for the state highway system. They note that state regulations require certain paints which contain hazardous constituents for use on roads and bridges.

To address the issue of federal purchasing requirements inhibiting source reduction of hazardous wastes, the members of the Northwest congressional delegation should attempt to make federal agencies more conscious of source reduction practices, and seek ultimate modification of those federal purchasing requirements which pose a barrier to source reduction. Northwest policymakers should explore state and local laws which might require the use of products whose manufacture results in hazardous wastes or which are hazardous in and of themselves. These laws should be modified wherever possible so that they encourage, rather than prevent source reduction of hazardous wastes in the Pacific Northwest.

**Conclusion**

Source reduction by Northwest businesses has been widely adopted as a pollution control and compliance strategy. Many companies in the region have instituted, or are in the process of instituting source reduction strategies as part of their hazardous waste management programs. However, the Northwest Policy Center study of corporate responses reveals that substantial impediments to both source reduction and recycling prevail in the six issue areas discussed above. The impediments these companies outline present a challenge to the four states of the region to work cooperatively to better encourage source reduction by Northwest businesses. Further source reduction efforts will require the commitment and attention of the regulatory, industrial, environmental, and legislative communities alike. The recommendations of this Northwest Policy Center report, "Hazardous Waste Source Reduction - Industry Perception of Regulatory and Other Impediments," are summarized in Table 6, and represent a first step towards meeting these challenges.
NEW LEVERS
FOR SOURCE REDUCTION
NEW DIRECTIONS
FOR THE NORTHWEST

An inspiring future for the Northwest is one in which the region's citizens and communities will understand that the goals of long-term economic vitality and improved environmental quality are inextricably interwoven. They speak of a future in which investments to advance environmental quality are seen as economic development investments as well, and a day in which individual companies will benefit from taking such actions. Protecting the region's extraordinary natural resources will be seen as a central factor in maintaining its competitiveness in the changing international economy.

That day has yet to come, and dreaming about it will help neither environmental activists nor those who advocate additional economic growth. Instead, this vision of the future challenges us on a day-to-day basis to learn how to make it come true. What kind of strategies can we identify that will allow us to be stewards of the environment and still create and maintain the jobs that sustain humans?

The biggest challenge of all is at the point where economic activity and environmental protection most clearly intersect. This point is the production and consumption of goods, which threatens to bury us under a mountain of waste or to poison us. We are forced to confront our environmentally
Thus emerges the greatest irony of the new world of environmental management. The most significant gains to be achieved are in the place where the obstacles may be the greatest as well—prior to and during the production process, where wastes can be reduced at their source.

As much as it may seem so to corporate officials, this is not at all the point where environmental regulation is presently focused. The present “end of the pipe” regulatory structure most often invokes the interest of government when the production process is over or even after the process of consumption is concluded. Rather than concentrating on the quantity and toxicity of waste produced, it centers government’s efforts around the manner in which waste is managed either by companies or individuals.

Though both groups might find it hard to believe, this “end of the pipe” orientation has been in the interests of both the advocates of environmental regulation and the companies that are being regulated. Environmental advocates drive very significant government expenditures to allay their biggest fear—that improperly managed and disposed waste will seep into both groundwaters and surface waters. For their part, many companies wish to avoid what they see as an even greater threat than this regulation. This threat is the intervention of government in the production process itself.

Corporate officials may understandably believe that government lacks the capacity to oversee production process decisions. They may believe that these proprietary procedures lie at the heart of the free enterprise system, and should forever remain free from governmental scrutiny. Thus emerges the greatest irony of the new world of environmental management. The most significant gains to be achieved are in the place where the obstacles may be the greatest as well—prior to and during the production process, where wastes can be reduced at their source.

Source Reduction and the Changing Economy

The economy of much of the Northwest continues to grow. Idaho, Alaska, Oregon, and Washington were all among the nation’s ten fastest growing states during the first half of 1989. A growing portion of this economic activity is concentrated in companies of one hundred or fewer employees. The Northwest has shown similar increases in the economy’s dependence on smaller companies.

The fact that these companies are small makes the source reduction challenge even more difficult. By their own admission, companies large and small have neglected source reduction opportunities because of the short term costs. Even when the pay back period on a source reduction investment is only two or three years, a company may fail to take the desirable action because of a shortage of capital, or because of the quest to please owners or stockholders by maximizing profits in the short term.

The smaller companies upon whom the economy increasingly relies have proven vexing to regulators for two other reasons. First, they are less likely than larger companies to be carrying out the repetitive, continuous production processes where waste outputs are more predictable. They are more likely to be producing wastes in the shorter duration “batch”
processes that defy the standardization upon which much of environmental regulation depends.

Second, and even more important, these companies which are generators of smaller amounts of hazardous wastes are less likely than the larger companies to have the in-house expertise to modify their processes or the materials used in production. When these companies become regulated by new laws, it is more difficult for them to respond and often takes a higher percentage of their available resources. It is also more likely that such companies will not have taken advantage of the easiest and least expensive means to achieve hazardous waste reduction, since they often do not have the in-house expertise to identify the steps that must be taken.

**Focusing on Small Companies**

Small companies have proven to be important to the region both environmentally and economically. As environmental regulators have noted the adverse economic impact of regulation on companies in various sub-sectors, they have begun to increase the technical assistance available to these companies. Such assistance is intended to augment the company’s own resources. In effect, it seeks to make a small company act more like a large one in the sophistication of its waste management practices.

As appealing as it is to reach small companies (because of their need for technical assistance and their growing importance in the economy), the task has proven difficult. And even the inevitable change in production process does not automatically decrease environmental impacts. As Robert Healy states in *America’s Industrial Future - An Environmental Perspective*, “The normal course of industrial technological change is not guaranteed to produce cleaner processes.” Both higher production outputs and new production inputs can increase the environmental threat associated with industrial manufacturing.

The challenge of providing technical assistance as an explicit strategy to decrease generation of hazardous wastes is thus very demanding. Designers of such programs stress they should include most if not all of these characteristics:

- provide services beyond supply of information. Programs must go beyond the passive presentation of information to assurance of its interpretation and use;
- offer information and services tailored to users. Many production processes are customized to match the resources, production goals and other standards of the manufacturer. Technical assistance must respect those individual characteristics;
- recognize that demand for basic research continues. Technical assistance/technology transfer programs must depend upon and benefit from ongoing applied research devising source reduction improvements possible for each waste stream;

Energy conservation techniques are more likely to have reached small enterprises, to have been given serious consideration, and to have influenced production practice changes than source reduction strategies.
• understand on-site assistance is most valuable. There is no substitute for on-site evaluation of waste generation practices and of the modifications which may be possible;
• don’t ignore “low technology.” Gains in many small enterprises are achievable using existing technology, including strategies which require only limited adjustment of the production process;
• identify existing barriers. In some instances, source reduction techniques agreed to by the waste generator may not be able to be implemented unless external financial, regulatory or other barriers are removed; and,
• encourage interchange between companies with similar circumstances. Helping companies to form working relationships with similar generators can assist in the ongoing achievement of source reduction gains.

A growing number of state and local agencies (Table 4) have developed such technical assistance programs. In many cases, programs are only in their early stages and are relatively small in scale. In other cases, programs may be relatively sophisticated, but lack the innovation necessary to overcome many of the problems mentioned herein.

Additional Public Interests Emerge

Two other governmental interests in the production process emerged even prior to the design of technology transfer or technical assistance initiatives to achieve hazardous waste reduction. The first of these, interest in energy conservation, was created by rising energy prices, initially brought on by the energy supply crisis of the 1970s.

These higher costs and the desire to avoid construction of additional electricity generating plants (or to prevent drilling offshore in environmentally sensitive areas) have stimulated ongoing interest in all types of energy conservation. Robert Healy further stresses “the desire to limit energy costs is a much larger factor in encouraging modification of production processes than is the desire to limit waste disposal costs.” This is the case because energy costs are usually a higher percentage of the total costs of production, reaching especially high levels in such energy intensive sub-sectors as aluminum production. In contrast, some of the real costs of waste disposed in the air, water and in landfills are externalized - borne by others, including the general public and their governments.

For these reasons, energy conservation techniques are more likely to have reached small enterprises, to have been given serious consideration, and to have influenced production practice changes than source reduction strategies. Many federally-funded energy conservation programs (including attempts to decrease the capital costs of conservation-enhancing technology installed by small companies) have vanished or diminished since the energy crisis officially “ended.” But, prodded by regulators seeking to avoid power plant construction, both public utilities and investor-owned utilities have continued technical assistance to many small companies seeking to reduce energy use.

Following the energy conservation movement has been an increasing government concern with the economic competitiveness of American companies. As with source reduction and energy conservation, this focus on modernization to enhance a company’s ability to compete has primarily been applied to smaller enterprises that are thought to lack their own capacity to take modernization steps beneficial to them and to the economy.

Government-sponsored technical assistance efforts to help make small companies more competitive so they can provide good jobs were in their infancy until the 1980s. At that time, as David Osborne outlines in Laboratories of Democracy, states became more aggressive in their economic development programs. They were spurred both by the recession suffered by much of the country during 1979-1982, and by the significant decline in federal economic development efforts during the Reagan administration.

Both Osborne and the managers of the emerging business modernization programs argue that the programs are an important response in an economy that is increasingly internationalized (and thus more highly competitive) and that is facing rapid technological change. The European Economic Community (EEC) has agreed to break down most of its
economic barriers among member companies by 1992, and has itself designed strategies to help small companies improve their processes and compete. Policy makers in the U.S. are attracted to the call for competition at the advanced technology, higher value-added end of the manufacturing spectrum because it is in these sectors that higher wages are more prevalent. Additionally, the American economy has shown an increasing inability to pursue an alternate course - the manufacture of lower value-added products using high-volume production processes often pay lower wages.

The state-sponsored business modernization programs that have emerged go beyond provision of technical assistance at the individual firm level. They include capital assistance or financial incentives for companies investing in new plants or equipment (whether or not that investment decreases energy consumption or waste generation). These programs also involve significant investment by government for applied research and attempts to speed the process through which ideas and research findings inspire commercial ventures.

**Addressing Shared Problems**

The considerations for providing technical assistance to small businesses to increase energy conservation, decrease waste generation, and enhance competitiveness are nearly identical. In each area, there remains a high premium placed on applying ever-changing technology; on realizing “low technology” gains as well; on providing on-site assistance to companies because such assistance is most likely to change practices; and on serving as many companies as possible.

Similar problems in these various efforts to provide technical assistance have emerged as well. In some cases, agents of the government are distrusted or responded to with caution because government must regulate and sanction as well as advise. In other instances, the quality of the assistance provided is judged insufficient, or inadequately targeted to an individual firm’s needs. Assistance providers run into barriers, including lack of capital to carry out improvements which will ultimately benefit a company.

The greatest single obstacle appears to be lack of scale. There are thousands of small enterprises in the Northwest which might benefit from one or more of these types of assistance. Reaching a significant percentage of these companies is the unmet challenge of all technical assistance programs. Even the Michigan Modernization Service, identified by the non-profit Corporation for Enterprise Development as the most successful modernization program, has reached less than a third of the targeted six thousand firms. No hazardous waste reduction program has provided meaningful services to even that number.

Several elements of energy conservation, and modernization programs for competitiveness could advantageously be applied to hazardous waste reduction initiatives. These include institutionalized delivery systems, flexible manufacturing networks, and industry service centers.
Institutionalized Delivery Systems

Energy conservation services, most often provided by utilities, have become more entrenched in the needs of firms and have developed a broader "reach" than other technical assistance to small enterprise. State regulators have made it so, demanding enhanced conservation efforts as a precondition for rate increases or for permitting construction of additional electricity generation capacity. This model can be applied to hazardous waste reduction in at least two powerful ways.

First, municipalities and private companies responsible for collecting and disposing of solid wastes have a strong interest in the mix of wastes they receive, since waste with little or no hazardous content is easier and cheaper to dispose. In addition, non-contaminated solid waste does not pose a future threat of ground and surface water contamination or expensive cleanup liability. At least in larger municipalities, there is sufficient scale for the waste utility to go beyond the most common practice of providing customer assistance and other incentives for citizens who sort their solid waste to increase recycling. It can be in their interest to provide technical assistance to these same citizens and to companies as well, encouraging them to modify their disposal or manufacturing practices to ensure that solid wastes do not include hazardous components.

Second, both investor-owned and municipally-owned electrical utilities (prodded by state regulators) have altered energy pricing policy and offered information to influence consumer behavior and thus decrease energy consumption. Pricing policy will prove to be a critical aspect of source reduction strategy as well. If the true costs of disposing of hazardous wastes begins to be reflected in the price of the product that is manufactured, both the consumer and the waste generating company will take notice.

Flexible Manufacturing Networks

A few states have begun to experiment with stimulating formation of flexible manufacturing networks of small companies to help them compete in the international economy. Borrowing from a strategy that has helped to revitalize much of Northern Italy, these states believe such networks help small companies to act like larger companies when size is an advantage.

The theme of such networks, or "manufacturer's circles" is cooperation among companies within a competitive framework when that cooperation proves profitable. In the United States as well as Europe, companies have worked together to consider modernization options, and have even shared investment in capital equipment. They have regularly exchanged information on new markets and on product design changes. The area of greatest reluctance is the fear of providing proprietary technology to a company with similar markets.

There is not a more ideal matter for cooperation than reducing waste generation. Companies have begun to take advantage of this opportunity at the trade association level, holding meetings on how to respond to environmental regulation. A smaller number of compa-
nies working together in a flexible network provides additional advantages. When they band together around similar interests, technical assistance they can provide each other on process modification and other waste generation matters can be that much more precise and useful. Dry cleaners have worked together on alternative cleaning agents, while automotive service companies have worked together on alternative degreasing agents and waste oil collection and recycling. In the Northwest, mills have formed sawdust cooperatives to treat and sell what would otherwise be a waste.

States have trained “brokers” as agents to encourage development of such networks where they are appropriate and where there is sufficient company interest. They have provided grants to evaluate the feasibility of networks under consideration. But, none to date have tried to take ongoing advantage of this application of the network concept to environmental management issues such as waste reduction.

Industry Service Centers

States have also experimented with another means of expanding technical assistance available to companies in selected sectors—industry service centers. The primary motivation for establishing these programs, as has been the case with flexible networks, is to assist companies in the modernization process. This includes research on new technologies and their application.

Pennsylvania has established a number of such centers under the aegis of the Ben Franklin Partnership. Michigan’s Institute for Technological Innovation has centered its efforts around auto manufacturing and the emerging role of robotic technology. Other states have established centers that focus on food processing, biotechnology, and industrial ceramics.

Many of these centers are funded almost entirely by state governments, unlike models established in Denmark and Italy. In these latter instances, governments subsidize a center’s establishment but ultimately reduce their contribution to ten or twenty percent of total costs. The remainder of costs are covered by the companies themselves, who set priorities, design joint projects, and manage operations.

These programs, too, have excellent application to source reduction strategy. Centers focused on modernization for competitiveness can expand their research applications agenda to include modernization to reduce environmental impacts. But few of such centers have recognized those potential gains. A new Northwest program, the Pacific Northwest Pollution Prevention Research Center, applies the industry service center concept solely to environmental management. It is anticipated that it will group companies together in sectors to jointly commission research on specific waste streams and how those waste streams can be reduced.

Centers focused on modernization for competitiveness can expand their research applications agenda to include modernization to reduce environmental impacts.
The vision of a region which has not only reconciled its environmental goals with its economic future, but has intertwined the two remains unrealized.

Progress in the States

There has been little progress in state's seeking to carry out energy, economic development and environmental objectives in concert. There are obvious obstacles. Economic development practitioners at the state and local levels are reluctant to identify their programs and goals with environmental objectives, for fear that company resistance will be increased. This is particularly the case because companies identify environmental agencies with their regulatory mandate.

Lack of cooperation can cause problems beyond the missed opportunity to expand the scope and impact of government sponsored technology transfer efforts. For instance, many state economic development agencies sponsor developmental lending programs that increase the availability of small companies seeking to expand. As long as environmental regulations are being complied with, none of these programs distinguishes between a loan purchasing capital equipment that will permit a reduction in waste generated and one that will significantly increase waste generated.

In several states, the principal environmental protection agency and the principal economic development agency have a formal working agreement on the ways their technology transfer programs intersect. In at least two, these arrangements have been translated into more ambitious cooperative efforts.

The Minnesota Technical Assistance Program (MnTAP) is recognized as one of the nation's leading source reduction programs. MnTAP has arranged to deliver many of its technical assistance programs through Small Business Development Centers (SBDC's). These federally funded, state coordinated entities work with small businesses on how to develop business plans, resolve competitiveness problems, and identify and take advantage of new markets. Because the entire focus of their program is economic development, they are a nearly ideal way to reach more members of the business community than would be attracted by an environmental agency acting alone.

Michigan's Waste Reduction Service is a joint initiative of the state's Departments of Commerce and Natural Resources. It has established a working relationship with one of the country's best economic development technology transfer programs, the state sponsored Michigan Modernization Service. The Modernization Service's goal is to increase the productivity of small and medium sized businesses. Though its customized consultations are in such areas as computer aided design and computer aided manufacturing, the program does work with the Waste Reduction Service in such areas as solvent re-use.

The Northwest's Unmet Challenges

Though there are promising initial efforts, the Northwest has not yet "come of age" in devising and implementing source reduction strategies. In every area of evaluation, the programs that have emerged are deficient. They reach too few companies; they generate relatively low levels of investment by governments and companies; they have not ascended to the
priority level they deserve; and they have taken almost no advantage of the possible synergy between energy, environmental, and economic aims. In like manner, the actions of the companies themselves in decreasing the quantity and toxicity of wastes generated are insufficient. Individual success stories abound, but region wide results are unimpressive.

The challenges are largely unmet. The vision of a region which has not only reconciled its environmental goals with its economic future, but has intertwined the two remains unrealized. The public remains distracted by the conflict between environmental and economic goals. One area, where gains are within our grasp, remains relatively untended. The opportunities for source reduction in the Northwest have not been sufficiently addressed, but the time remains to reverse that condition. There is no comparison between the waste management problems of the states of the Northwest and those of the industrial Midwest and Northeast, which have been generating such wastes longer and at much higher volumes. There is no comparison at present, and if the appropriate actions are taken and the priorities set, there will be no comparison in the future.

This report has identified numerous lessons to be learned from others as Northwest efforts have intensified. Benefitting from the experiences of others remains a critical dimension. But, so too are bringing new commitment, new levels of investment, higher levels of cooperation and a greater sense of urgency to the unmet challenges. If we supply each, we can tame the toxic threat.
SUGGESTED READING

Books


(Continued next page)
Suggested Reading (continued)


Journal Articles


Reports, Pamphlets, White Papers, and Manuals


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About the Northwest Policy Center...

The Northwest Policy Center, an initiative of the Institute for Public Policy and Management at the University of Washington Graduate School of Public Affairs, carries out policy research, designs and evaluates policy alternatives, and places them before elected officials and other policymakers. The Center fosters continuous information exchange among those seeking to meet the economic challenges facing the region. The Center was formed in the fall of 1987 through a grant from the Northwest Area Foundation, and receives additional support from several public and private sources.

About Triangle Associates...

Triangle Associates is a consulting firm committed to helping people understand and resolve environmental and other public policy issues. Triangle provides an array of public involvement, planning and mediation services to public agencies, businesses, and communities. Triangle has worked on controversial public policy issues such as land use and flood control, transportation, energy, water pollution control, hazardous waste and source reduction management. Triangle Associates was established in the State of Washington in 1979.

Information about other programs and publications of the Northwest Policy Center can be obtained by contacting:

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