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2047 SSA HAZARDOUS MATERIALS & WASTE MGT. COMMITTEE 2047

control of the problem. In the United States, when Congress passes a federal law requiring control of an environmental problem, either the federal or state government can run the program (a program consists of people, laws, and money to stop pollution). The federal government will run the hazardous waste program in every state until the state adopts a program that meets certain minimum federal guidelines. When a state adopts such a program, the federal government will provide technical and financial support for the state program; but if the state does not adopt such a program the federal government program will remain in effect. Where the state adopts a program that does not meet the federal minimum guidelines, the federal program remains in effect. In such a case the federal program is funded and managed by the federal government, and the state program is funded and managed by the state government.

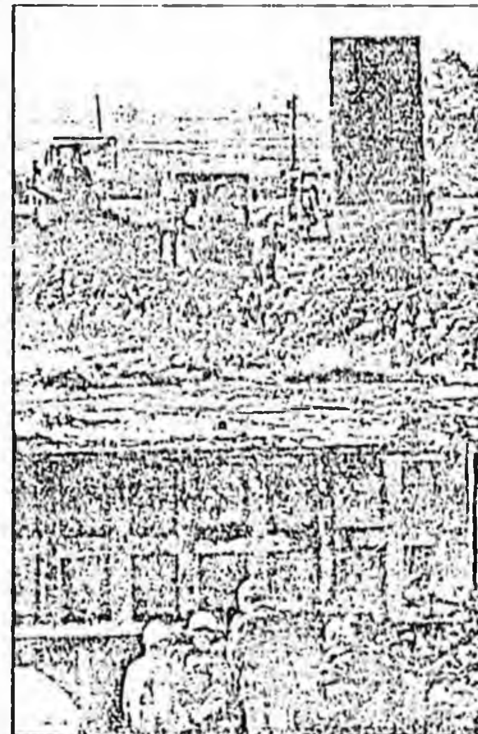
Most states want to run their own programs, and thus design them to meet federal requirements. However, before May 19, 1980, states were reluctant to develop their own hazardous waste programs because the federal minimum requirements had not yet been published. Since RCRA's passage in 1976, states had been assured that the requirements for federal funding would be issued at any moment. States were receiving the same public pressure to control hazardous wastes that Congress was, and many states were anxious to initiate their programs. Yet they did not want to design a program that might not meet the future requirements for federal funding, for most states could not afford the total cost of a hazardous waste control program and did not want both a state and a federal program operating at the same time. Thus the federal delay resulted in state delays.

Although the two year delay was costly, a more sinister evil was the weakening of the regulations that occurred during the delay. A comparison between the early versions of the regulations and the final version reveals that the final regulations control a smaller quantity of hazardous materials.

## The Regulations

Most of the hazardous waste regulations were issued on May 19, 1980 and go into effect on November 19, 1980. The rest of the regulations are expected sometime in 1981. The remainder of this article will attempt to explain some of the May regulations and will point out their weaknesses.

RCRA commands US EPA to do two things: (1) establish specific standards for determining which wastes are hazardous and (2) devise a system to control the generation, transportation, treatment, storage, and disposal of those wastes deemed hazardous, so that they will not harm human health and the environment. The control of environmental contamination by hazardous wastes requires two things: (1) the prohibition through regulations of unsafe practices and (2) the aquisition of information about the handling of hazardous wastes so that violations of the regulations can be detected. The following discussion will be broken into three parts: (1) defining hazardous wastes, (2) requirements for record keeping (the manifest system), and (3) regula-



Workers insta...

## CITIZENS HAVE MANY WAYS TO ACT

In the face of frequent malfeasance and nonfeasance by manufacturers, handlers, and government officials, as well as legal and regulatory loopholes, the nation's citizens are to a great extent left to protect themselves. Fortunately, there are many actions they can take.

Under the Resource Conservation and Recovery Act, they can demand public hearings before EPA issues a permit for a hazardous waste disposal site. They can register complaints about sites and performance at them. They can bring suit against operators for noncompliance, or on grounds of creating a public nuisance. They can petition for new types of waste to be added to the list of those covered under the law.

The Environmental Protection Agency is giving financial support to a program called "Waste Alert!"[1] which is being carried out by six national organizations—American Public Health Association, Environmental Action Foundation, Technical Information Project, National Wildlife Federation, Izaak Walton League of America, and League of Women Voters Education Fund. The program involves conferences around the country on issues related to abandoned sites, siting of new facilities, implementation of RCRA regulations, and other aspects of waste management.

The Sierra Club and Environmental Action have initiated a national "Hunt the Dump"[2] campaign, distributing handbooks with instructions for citizens on how to collect information and expose unsafe disposal sites, organize action groups, put pressure on company officials, and force local officials to act.

EPA's Region V in the Midwest has organized a "Seek and Find"[3] program which provides information to help the public identify hazardous waste problems and a hotline number to call. Of more than 50 phone calls received in the first week, a number came from employees reporting activities of their companies.

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**Notes**

1. Bruce Mibeck, Waste Alert Coordinator, Hazardous Waste Management Section, US EPA Region 5 (includes Illinois and Wisconsin), 230 S. Dearborn, Chicago, IL 60604; (312) 886-3712.
2. Instructions available for $0.25 from Marchant Wentworth, Environmental Action, 1346 Connecticut Ave NW, Washington, DC, 20036; (202) 833-1845.
3. The Seek and Find program is for region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin. For more information on what to look for, the brochure "Seek and Find" is available free from the Office of Public Information, US EPA Region 5, 230 S. Dearborn, Chicago, IL 60604; (312) 353-2072. The Hazardous Waste Hotline number is 800-972-3170 for Illinois and 800-621-3191 for the other states.

The state of California also has a State Abandoned Site Project. To obtain a report on abandoned sites in Contra Costa County or to report any suspicious site that could be an abandoned dump, contact Mark White, State Abandoned Site Project, California Department of Health Services, Sacramento, CA 95814; (916) 322-2337.

tions for existing hazardous waste facilities. Regulations for new hazardous waste facilities have not yet been issued; these are the regulations expected in 1981.

## Which Wastes Are Hazardous?

RCRA defines a hazardous waste as follows: "A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause . . . (an) increase in mortality or an increase in serious illness . . . or . . . pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

In the regulations, US EPA has established specific criteria and scientific tests for determining which wastes are hazardous. Hazardous wastes have one or more of the following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, (4) toxicity. Toxicity is divided into three categories: (a) EP toxicity—this is determined by an extraction procedure (EP) in which a specific concentration of one of 14 specified chemicals* appears in an extract from the waste, (b) acutely toxic—the substance is fatal to humans in small doses, (c) toxic—scientific studies have shown the substance to have toxic, carcinogenic, mutagenic, or teratogenic (causing birth defects) effects on humans or other animals.

Using these criteria and the associated scientific tests, US EPA evaluated the wastes from a wide range of industrial operations. It determined which specific chemicals and which types of effluent from specific processes are hazardous. The regulations contain several lists of these hazardous wastes and waste streams.

### Weakening the Regulations

An examination of the extraction procedure (EP) for testing hazardous wastes illustrates how the final regulations are weaker than the original drafts. The EP test involves mixing the waste in question with water. The water is then extracted and tested for the 14 specified contaminants. By this procedure, US EPA hopes to approximate the most common problem that results from dumping hazardous wastes in ordinary landfills. The test approximates the trickling of rain water through the ground of a chemical landfill and gives an idea of the amount of chemicals that would be carried with the water to underground drinking water supplies. If any of the 14 chemicals appears in the extraction water above a certain level, the waste is considered hazardous. However, between the early drafts and the final regulations, the level of contamination permitted was raised, in most cases by a factor of 10. With this change, wastes that would have failed the test under early drafts now pass and are not considered hazardous. In addition, about 5 chemicals were eliminated from the list, though US EPA says more may be added later. In this manner, US EPA reduced the amount of wastes that would fall within the regulations and thus the size and cost of the program. The cost to industry would also be less, for the wastes that now

*The chemicals are arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D, and 2,4,5-TP Silvex.

Photo by J..n Kuca, courtesy of the Niagara Gazette, Niagara Falls, NY

...e tiles at Love Canal

## PUT THE BLAME ON MAME

Some people like to place much of the blame for the hazardous waste mess on the public. After all, isn't it the public that demands and uses the products of modern chemistry? A *Fortune* magazine writer says that "every segment of society has played some part in generating" hazardous wastes.[1] Robert A. Roland, president of the Chemical Manufacturers Association, while conceding that the chemical industry is "a part of the problem," says it is a result of "society's advanced technology and pursuit of an increasingly complex lifestyle."

Roland says that "every individual and all of industry and even government itself . . . have contributed to this horrible mess. . . . Everyone should realize that the blame does not belong to a single company, or a single industry, but to all of us as individuals and as an advanced society."[2]

Even EPA sometimes reflects a similar line of thought—though in an understandable effort to encourage the public to accept some responsibility for the disposal problem rather than always insisting that hazardous wastes be put in someone else's community. An EPA booklet paraphrased Pogo: "We have found the sources of hazardous waste and they are us."[3] Eckardt C. Beck, EPA's assistant administrator for water and waste management, said, "It is in the final analysis the public who must realize that the products they consume produce the wastes they deplore."[4]

Beck also has said, "With a mind-boggling $100 billion a year in sales, the chemical industry is firmly here to stay, along with its wastes and the wastes of its clients."[5]

However, one should keep in mind that those public clients are not provided information on the consequences of chemical products, or on alternatives to them. They are not asked serious questions about what products should be developed by industry. Or what products should be promoted in magazines and TV commercials. They are not told anything about hazardous ingredients, problems with disposal of hazardous waste, or how wastes are handled.

A major step to encourage more rational public choices would be a system under which the prices of products reflect the full costs of hazardous waste disposal related to them.

**Notes**

1. *Fortune*, April 21, 1980.
2. *Washington Post*, April 21, 1980.
3. "Everybody's Problem: Hazardous Waste," EPA, 1980. This illustrated booklet is an excellent exposition of the hazardous waste problem.
4. Speech to National Solid Waste Management Association conference, Chicago, October 3, 1979.
5. *New York Times*, June 7, 1979.

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pass the test are not considered hazardous and are cheaper to dispose of.

**Exclusions**

Once a material is listed as a hazardous waste or fails the specified scientific tests, it should be subject to all the hazardous waste regulations issued under RCRA. However, virtually every person, business, and industry generates harmful materials, from the empty pesticide container that a homeowner used on the rosebushes to the massive quantities generated by an electroplating or pesticide manufacturing facility. US EPA clearly couldn't regulate all of these wastes. First, certain substances were excluded. Household wastes were excluded as are substances regulated under other acts, notably nuclear wastes, which are controlled under the Atomic Energy Act. Certain mining wastes were excluded, largely due to a powerful lobby that convinced Congress that to include these wastes would ruin the mining industry and stifle exploration of new fuel sources. Certain agricultural wastes and irrigation flows were also excluded.

Second, there are mechanisms by which wastes that are considered hazardous according to the regulations can avoid the regulatory control mechanisms. If the hazardous waste generator generates only a small quantity of hazardous wastes, he or she is exempt from the record keeping and disposal requirements.

Originally, those who generated less than 100 kilograms per month (about 220 pounds or about half of a 55 gallon drum of liquid) would be exempt from the regulations. In the final regulations, however, the cutoff point was raised to 1,000 kilograms per month. (The cutoff point for those who generate wastes considered to be acutely toxic remains at one kilogram per month.) Ostensibly, the reason that US EPA raised the cutoff point was to enable US EPA to concentrate its limited resources on the major hazardous waste generators. By decreasing the number of generators that it would have to monitor, US EPA also cut the cost of the program.

However, what these cutoffs mean is that if a generator produces 980 kilograms of hazardous waste or 0.98 kilograms of acutely toxic hazardous waste in a month, he or she does not have to keep records for that waste. More importantly, these wastes, certainly considered hazardous by US EPA standards, may be disposed of in an ordinary sanitary landfill, thus allowing the very hazards that the regulations are seeking to prohibit. US EPA states that it plans to extend the regulations to cover the small generators, but that may not happen for five or more years.

(Note: The proposed regulations for the state hazardous waste program in Illinois establishes the cutoff of 100 kilograms per month and requires those who generate less than 100 kilograms to dispose of their wastes in an approved hazardous waste site, although records need not be kept.)

**The Recycling Controversy**

If a waste is beneficially used, reused, recycled, or reclaimed, then it is not a waste and is not subject to the hazardous waste regulations. If a hazardous waste is sold, it is also no longer a waste. This creates problems. For example, if most industries discard waste oil from a certain process and that oil is hazardous, but one company sells that waste oil for use in another chemical process, what regulations should apply to the oil? US EPA maintains that if the material is sometimes discarded by the industry as a whole, then all of that material is subject to the hazardous waste controls. However, the specific company that reuses the waste can apply for exclusion of its waste from the regulations. Some industries claim that the US EPA ruling is overly strict and will impede recycling. However, unscrupulous generators could "sell" their hazardous wastes (and thus avoid the record keeping regulations) to persons who would subsequently mismanage them. This issue will cause significant controversy as US EPA seeks to maintain control over all real wastes, while trying not to impede recycling. (See "Recycling Haz-

## Hazardous Waste Facts[1]

**Major Routes of Environmental Damage by Hazardous Wastes**

- Groundwater contamination via leachate
- Surface water contamination via runoff or overflow
- Air pollution via open burning, evaporation, sublimation, and wind erosion
- Fire and explosion
- Poison via the food chain
- Human contact

**Other Legislation that Controls Hazardous Substances**

*Atomic Energy Act* covers the disposal of nuclear wastes.

*Clean Air Act* sets standards for hazardous air pollutants.

*Clean Water Act* prohibits discharge of pollutants in significant amounts into navigable waters of the United States.

*Safe Drinking Water Act* authorizes US EPA to set maximum contaminant levels for public drinking water systems.

*Federal Insecticide, Fungicide, and Rodenticide Act* authorizes US EPA to regulate registration, treatment, disposal, and storage of all pesticides; includes labeling requirements.

*Toxic Substances Control Act* authorizes US EPA to obtain data on health effects of chemical substances and to regulate the manufacture, use, and disposal of a chemical substance or mixture, where warranted. (Note: Just because these acts have been passed does not mean that they are effectively achieving their goals.)

**Cost of Complying with the Hazardous Waste Regulations**

- For industry—less than 0.2% of annual sales
- For the public—about $3.00 per year

## Disposal Options[2]

**Source Reduction** Modify industrial processes so that the volume or toxicity of waste is reduced.

**Waste Exchange** One company's waste may be another's raw material. Often wastes can be reclaimed so that they can be used as raw materials for another company.

**Treatment** Chemical procedures, such as neutralization of acids, can be used to render the waste less hazardous. Incineration may be useful, provided that there are safeguards against air pollution.

**Landfill** The last, least desirable, and least safe option, landfilling is the method that has led to the problems that the hazardous waste regulations are trying to solve. (Note: The hazardous waste regulations do nothing to facilitate, encourage, or provide funds for research into the first three options.)

**Notes**

1. Information from the US Environmental Protection Agency.
2. Based on article by Pojasek RB: "Developing Solutions to Hazardous-Waste Problems." *Environmental Science & Technology* 14(8): 927, August, 1980.

Photo by Dave Schulte courtesy of the Seymour (Ind.) Daily Tribune

ardous Wastes: The Only Way to Go" in this issue.)

### Sewage Sludge

One waste that CBE was particularly concerned about was sewage sludge. Research done by CBE had shown that sewage sludge often contains large amounts of the toxic chemical cadmium; and if the sludge were not carefully handled, human health could be endangered. Congress had specifically included sewage sludge as one of the susbstances that RCRA regulations were to control. The early regulations indicated that sewage sludge would be treated like any other solid waste—if it failed the tests, it would be considered hazardous and would be subject to controls. However, when drafts of the regulations were published in December, 1978, sewage sludge was excluded. According to this draft, sludge would never be considered hazardous, no matter how much toxic material was in it.

CBE submitted extensive comments to US EPA that explained why the exclusion of sewage sludge was unwise. CBE had also sued US EPA because sludge was excluded. Although the US Court of Appeals had decided that CBE had brought the case to court too early in the regulatory process, the case seems to have influenced US EPA. When the regulations finally came out, sewage sludge was no longer excluded.

## Hazardous Waste Facts

**Amount Generated In 1980**

- 57 million metric tons (wet)—US EPA estimate.
- Only 10% are currently being handled in a safe manner.
- Ten states generate 60% of all hazardous waste. In order by volume of waste generated, they are: New Jersey, Illinois, Ohio, California, Pennsylvania, Texas, New York, Michigan, Tennessee, Indiana.
- The quantity of hazardous waste generated is expected to increase by about 3.5% each year

**Hazardous Waste Sources**

| *Industrial Generators* | *Percent* |
|---|---|
| Chemicals and allied products | 60 |
| Machinery (except electrical) | 10 |
| Primary metals | 8 |
| Paper and allied products | 6 |
| Fabricated metal products | 4 |
| Stone, clay, and glass products | 3 |
| All others | 9 |

Information from the US Environmental Protection Agency

## The Manifest System

Now that we have an understanding of which wastes come under the regulations, we can turn to the record keeping procedures. The US EPA will keep records on all facilities that generate, transport, treat, store, or dispose of hazardous wastes. In addition, records will be kept on all hazardous wastes, from the moment of generation, through transport to storage, treatment, or disposal (cradle-to-grave tracking). When a hazardous waste is generated, the generator must fill out a form, called a manifest, that describes the waste and lists the names and addresses of the generator, the transporters, and the ultimate destination (a permitted treatment, storage, or disposal facility). This manifest must accompany the waste from its generation to ultimate disposal and must be signed by the appropriate people and returned to the generator. The manifest must be kept for three years; and generators and storage, treatment, and disposal facilities must submit annual summaries of their activities to US EPA. This system should minimize unauthorized disposal of hazardous wastes and enables US EPA to assign responsibility if a specific waste or disposal site causes damage in the future.

## Interim Permits

Now that we know which wastes are hazardous, where they come from, how much is generated, and where they are going, we will examine what happens at existing waste disposal sites.

Under the regulations, all an existing site has to do is notify US EPA of its location, its activities, and the identity of the waste it receives. Upon receiving this information, US EPA issues the facility an interim permit. This permit enables the facility to continue its operations, whether they are safe or not. In addition, by November, 1981, all operating facilities must have the following: wells to monitor leakage; analysis of incoming wastes; barriers, warning signs, and other security measures; an inspection system; trained personnel; emergency plans, including communications with local police and fire departments; and of course, the manifest system. All these items, however, are basically cosmetic.

The existing facilities must also apply for a permanent permit; and at some unspecified time in the future, US EPA will evaluate each existing site and decide, based on its potential for harm, how the facility should be improved.

US EPA had the authority to prohibit unsafe practices at existing sites. For example, US EPA could have mandated the closing of sites built on sand or 200 feet from an underground water source. Such regulations would have protected the public from the leaking of toxic wastes, such as occurred at Love Canal. However,

Photo by John Kuda, courtesy of the Niagara Gazette, Niagara Falls, NY

US EPA did not do so.

Under these rules, Love Canal (if it were still in use) could continue operating well into 1981 (and probably beyond) before any records of its leaking were made and evaluated.

## The Major Flaw

This is the major flaw in the regulations. Until US EPA evaluates and acts on the massive amounts of information that it will receive, nothing will change. The regulations do not require that existing sites meet any minimum waste containment standards. US EPA seems to have the following attitude. What happened in the past is too complicated to deal with in a uniform regulation. Also, if the standards for interim sites are too strict, then many will close; and there will be no place to put the 57 million metric tons (wet) of hazardous wastes that we will generate in 1980 alone. It would be better to have those wastes in a poor site than dumped on a back road. We will concentrate on making the requirements for new sites as rigorous as possible to prevent future calamities. (These are the regulations expected in 1981.) We will evaluate the established sites one by one and then determine what changes should be made at each site.

How soon the review of existing sites is accomplished depends on many variables—from the intangible attitude within US EPA to the tangible questions of whether there is enough money and qualified people to do the job. The present regulations could be used to promptly control current unsafe disposal practices. Or US EPA could do very little.

In addition to allowing the unsafe practices to proceed for an indefinite amount of time, US EPA's omission of prohibitions for unsafe practices at existing sites actually benefits those unsafe sites. For example, let's suppose that Love Canal is still operating. Its owners would apply for an interim permit, put up fences and warning signs, buy fire extinguishers, notify local police and fire departments of Love Canal's existence, and apply for a permanent permit. The owners then issue a press release saying that they have complied with all the requirements of the new federal hazardous waste regulations. A nervous public is relieved, thinking that if all the federal regulations are compiled with, then they are safe from any hazard from the site. Shortly thereafter, one of the residents notices a foul odor in the basement of his house. He also breaks out in rashes whenever he enters the basement. After doing research, he concludes that the odor and rashes are resulting from chemicals leaking from the Love Canal. He then sues the owners. The owners, however, have a ready defense. They claim that since a federal agency has issued regulations to protect the public's health in such situations, and since the owners have complied with those regulations, the owners are therefore not liable. The resident would have difficulty overcoming this defense.

## Conclusion

Now that the hazardous waste regulations are issued, some problems will diminish, some will become more evident. On the positive side, US EPA will for the first time have an accurate record of the generation, transportation, and disposition of hazardous waste in America. This will provide valuable insight for preventing future calamities. Once the last part of the regulations is issued next year, government agencies and citizens can work to ensure that final burial of hazardous wastes will not present problems to future generations.

On the negative side, many wastes that do present hazards will be improperly disposed of because they are generated by small quantity generators. Also, unless new hazardous waste sites are approved, we may shortly find ourselves with more wastes than we can properly dispose of. In such circumstances the risk of improper disposal by midnight dumpers is high.

In addition, the regulations do not address the issue of reducing the volume of hazardous wastes. We hope that US EPA will immediately begin encouraging new procedures for recycling or neutralizing hazardous wastes to diminish the amount of land disposal space we will need.

The long-term solution to the hazardous waste problem is not finding more places to bury the wastes, but rather finding ways to minimize the amount of wastes needing disposal.

**Products that Yield Hazardous Wastes**

| *Product* | *Hazardous Waste* |
|---|---|
| Plastics | Organic chlorine compounds |
| Pesticides | Organic chlorine compounds, organic phosphate compounds |
| Medicines | Organic solvents and residues, heavy metals (eg, mercury and zinc) |
| Paints | Heavy metals, pigments, solvents, organic residues |
| Oil, gasoline, other petroleum products | Oil, phenols, organic compounds, heavy metals, ammonia salts, acids, caustics |
| Metals | Heavy metals, fluorides, cyanides, acid and alkaline cleaners, solvents, pigments, abrasives, plating salts, oils, phenols |
| Leather | Heavy metals, organic solvents |
| Textiles | Heavy metals, dyes, organic chlorine compounds, solvents |

Information from the US Environmental Protection Agency

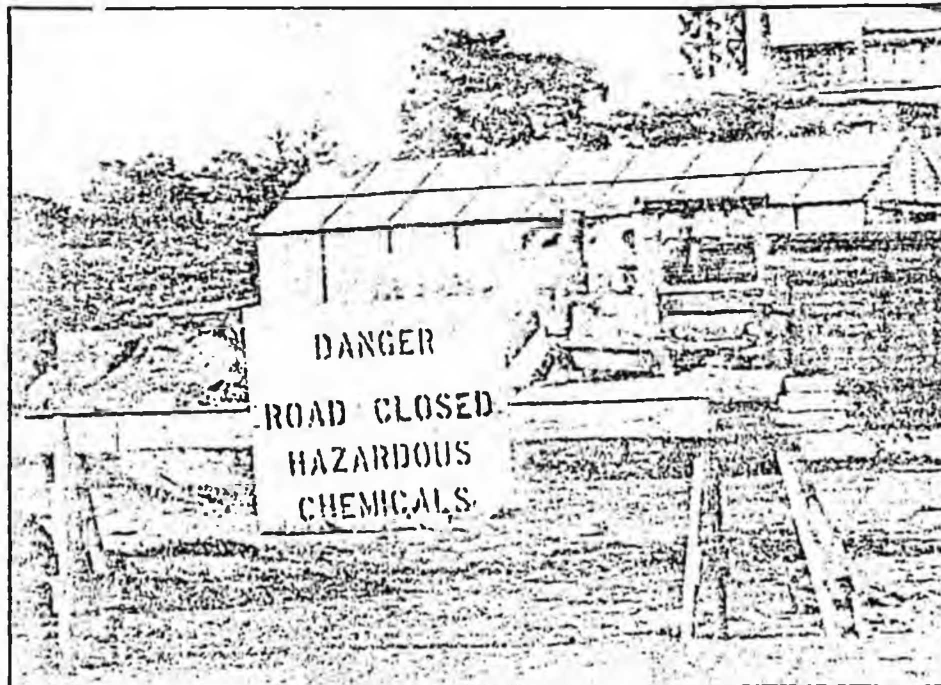

**Bibliography**

1. *The Resource Conservation and Recovery Act*, Public Law 94-580, 94th Congress, October 21, 1976, Sections 1004(5)(A) and (B) and 3001 to 3005.
2. *94 US Code Congressional and Administrative News*; pp6240-6249, 6254-6261 1976 (RCRA Legislative History).
3. Brown M: *Laying Waste: The Poisoning of America by Toxic Chemicals*. Pantheon Books, NY, 1980.
4. Conservation Foundation Letter: "Hazardous Waste Control Efforts: A Frightful Mess." April, 1980 (1717 Massachusetts Ave NW, Washington, DC, 20036).
5. Federal Register: "Environmental Protection Agency; Hazardous Waste and Consolidated Permit Regulations." Vol 45, no 98, book 2, May 19, 1980.
6. "Haulers Dump Toxic Wastes to Beat Rules." *Chicago Tribune*, August 4, 1980.
7. US Environmental Protection Agency: "Everybody's Problem: Hazardous Waste." SW-826, 1980.
8. ___: "Hazardous Waste Information," a set of information sheets summarizing each aspect of the hazardous waste regulations. These sheets, plus the booklet "Everybody's Problem" are available from Solid Waste Publications, 26 West St. Clair Street, Cincinnati, OH 45268. Ordering codes: booklet-SW-826, Hazardous Waste Facts-SW-737, Transporters-SW-830, Generators-SW-839, Notification Requirements-SW-840, State Programs-SW-847, Identification and Listing-SW-850, Facility Standards-SW-851, Facility Permits-SW-852.

# Controlling Toxic Wastes: A Model State Program

by Marchant Wentworth

*One of the greatest problems progressive public officials face today is the lack of specific programs to offer to address the many pressing problems in today's society. To help fill that void,* Ways & Means *will carry a series of model state and local programs on a broad range of issues in the coming months. We are pleased to have, as the first in the series, a program for controlling toxic wastes written by the well-known environmental lobbyist, Marchant Wentworth.*




On January 22, 1981, Philadelphia became the first major city to enact legislation giving workers and city residents the right to know what kinds of toxic wastes are around them. Passed through the efforts of a broad coalition of workers, enviornmentalists and community residents, this "right to know" legislation forces manufacturers to disclose to the public what toxic chemicals are emitted into the air or stored on the premises. This legislation is part of a comprehensive program which should be implemented in every state to reduce the ever increasing dangers posed by toxic waste disposal.

Responsibility for establishing a comprehensive hazardous waste disposal program falls squarely on the shoulders of state and local officials. While federal studies have documented the magnitude of the problem—millions exposed to health hazards from leaky dumps; a hundred million tons of improperly managed toxic waste generated each year; and thousands of yet to be discovered dump sites—federal efforts to address this situation have been underfunded and narrow in scope. With almost no hope for additional federal incentives, progressive public officials must take the lead in designing programs to address this growing concern.

Some states, notably those with severe chemical contamination problems, have responded early to address some of these issues. Most states, however, have been content to propose a minimal program in order to qualify for federal support. To prevent industries from shopping around for the weakest state program, legislators and other state officials must act to fill the gaps and provide the real protection that citizens are demanding.

While specific threats vary from state to state, a comprehensive hazardous waste program should contain four key elements:

*1. strong guidelines;*
*2. a hazardous waste facility siting procedure;*
*3. aid to victims of chemical contamination;*
*4. reliable funding.*

## Strong Guidelines

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) which established a management scheme for the treatment, transportation, and disposal of solid waste. Unfortunately, EPA's interpretation of RCRA created regulations which are far too weak to provide adequate protection from the dangers of chemical wastes.

For example, EPA's regulations exclude any company that produces less than 1,000 kilograms (2,200 pounds) of hazardous waste per month. This "small generator" waste will almost surely end up in landfills which are not designed to contain dangerous chemicals possibly resulting in contaminated water supplies.

### Suggested State Response

• *Include all hazardous waste generators, regardless of size, under any state hazardous waste act.*

Citizen groups and those working with hazardous waste often become aware of problems associated with the handling and disposal of toxic wastes long before state officials find out about a problem. At this time, no state gives these groups the right to find out from chemical producers and users what types of chemicals they are shipping and dumping.

### Suggested State Response

• *Enact "right-to-know" legislation giving citizen groups and workers the right to determine what kinds of hazardous wastes are stored, processed and disposed of by chemical manufacturers and processors.*

An early warning system to alert state officials that a toxic shipment has not reached its proper destination is vital. The manifest designed by EPA to track waste from "cradle to grave" merely requires the generator to forward documentation of proper disposal to the federal government within three months of final disposal, and contains no requirement for state notification.

Illinois has developed a computerized system which allows officials to act quickly in case of problems. Maryland and New York have similar sytems and the New England states have developed common manifest systems to locate wastes in their area.

*(continued on page 4)*

**Suggested State Response**

• *Require that the state solid waste agency be notified within two weeks of final disposal.*

Federal regulations are weak in one other important area. Shippers of ultra-hazardous wastes, such as pesticide wastes containing dioxin, are not required to notify state officials when shipments pass through their states.

**Suggested State Response**

• *Require shippers to notify state officials of any ultra hazardous shipments as defined by the EPA regulations.*

# Siting

Locating suitable solid waste disposal sites is an old and difficult problem. Citizen groups are reluctant to allow facilities in their communities—questioning government's ability to protect them through regulation and industry's ability to protect them through technology. Siting a new facility is often reduced to finding the place of least opposition which means either continued use of already existing, leaking dumps or transportation of wastes over long distances, increasing the chances for accident or injury.

Without doubt, citizens should be encouraged to vigorously question any proposed sites in their area. But once a need has been proven, the goal should be to create a well-designed site at the best possible location. Rejection of any site, regardless of its design or location, could merely exacerbate the problem.

In spite of the controversy that has raged over siting for years, little federal guidance is available. Even minimal siting criteria for determining the environmental acceptability of a site have not been written.

On the other hand, the industry sponsored Chemical Manufacturers Association has drafted model state legislation calling for a governor-appointed siting board with broad powers to totally pre-empt all state and local zoning and land use laws.

Fortunately, most states which have passed siting laws provide for some form of public participation. Michigan creates an independent siting board composed of nine members—with four representatives from the area of the proposed site—each time a new site is proposed. Oregon allows the state health department to veto any site that it believes could present a threat to public health. Massachusetts has a system which requires the permittee to prepare a Notice of Intent describing the facility and its operation as the starting point for negotiations between the community and permittee.

Four main issues must be addressed in any siting legislation:

**1. Pre-emption —**

Experience shows that citizen pressure is capable of rejecting any site, regardless of the facts in the case. As a result, most states have drafted siting legislation creating boards that can pre-empt local authority. Of the ten states, either with or considering siting boards, nine provide some form of pre-emptive authority.

**Suggested State Response**

• *Create a siting board with pre-emptive authority which represents local concerns through some form of citizen or public representation.*

**2. Need —**

Hazardous waste generators have historically used landfills as the cheapest and easiest method of disposal—in spite of the environmental problems they create. In fact, generators are just beginning to realize the recycling potential of their hazardous wastes. Often they can be recycled and reused—either inside the plant or as an ingredient in another plant's process. But because disposal costs have traditionally been so low, managers rarely consider new approaches.

States can help change these attitudes by requiring waste generators to file a "certificate of need" detailing their efforts to recycle and reduce waste. Waste disposal, particularly in landfills, should be seen as the resting place of last resort. The certificate would force generators to exhaust all other possibilities before seeking a new landfill and would force them to justify the need for a new landfill.

The certificate of need can be a powerful tool for both citizens and local officials. First, information on the origins and delivery routes of wastes can provide an early warning system that can allow for long range planning. Second, making this information public forces the generators to be held directly accountable for the wastes they produce. Too often in the past, waste generators stood silently in the background while site operators took the heat for a dangerous facility.

**Suggested State Response**

• *Require that generators submit a certificate of need to the state solid waste management agency before disposing of any hazardous waste. The certificate should detail who the actual user of the facility will be, where the waste will come from, how much and what kinds of waste will be disposed of, and what other options were pursued for recycling the waste.*

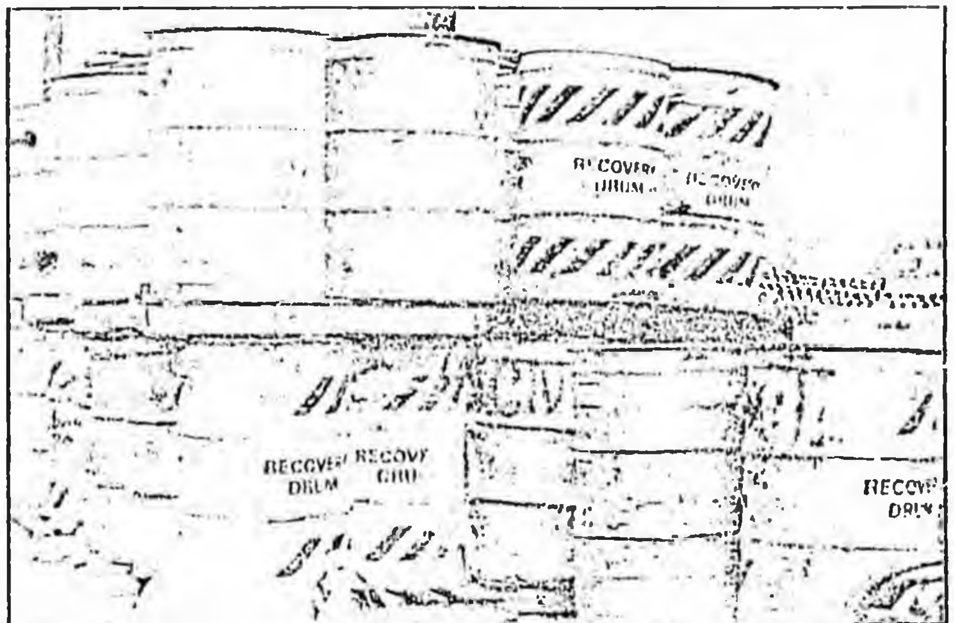
**3. Technical Assistance to Citizen Organizations —**

Siting decisions require careful evaluation from a variety of experts in the fields of hydrogeology, solid waste management, biology, chemistry, and toxicology. But since these experts are usually quite costly, site evaluations are typically available only to corporations and local officials. Citizen groups must depend on second hand information and volunteers to evaluate possible options.

**Suggested State Response**

• *Provide funding, either through a budget authorization or user fees, to allow technical experts to consult with citizen groups.*

*(continued on page 5)*



**4. Incentives —**

In the past, most communities involved in siting decisions have been forced to accept all of the risks of a facility without gaining any of the proposed benefits. In order to reverse this, some jurisdictions have proposed incentives that can be used as negotiating points between the permit applicant and the community. These incentives can be direct cash payments to the community, emergency equipment, job opportunities at the site, or road and bridge improvements leading to the site. Site operators can also provide a wide range of amenities including landscaping, elimination of odors and debris and noise control.

**Suggested State Response**

• *Require the permittee to develop a contract with the community detailing what types of incentives the permittee will make available and at what times during the construction and operation of the site.*

## Relief for Victims

Despite the tragedy surrounding Love Canal and the thousands of industrial workers who have been crippled by exposure to toxics, federal law has consistently failed to provide any easy recourse for toxic casualties. Even the recent Superfund legislation, which was proposed to solve this problem, was stripped of provisions for victim relief before final passage in December, 1980.

Studies by the Congressional Research Service have shown that our present tort systems is inadequate to address the complexities of toxic release. And because the effects are latent, proving a direct cause and effect relationship can be very difficult. Victims rarely have the time, money, or expertise to bring their case to court, let alone win. As a result, they are usually forced to accept a small out of court settlement rather than face years of expensive litigation.

**Suggested State Response**

• *Change the state tort law to allow the victim to prove that an injury or disease is "reasonably related" to a particular release or discharge rather than having to prove a direct causal relationship.*

The long latency period between exposure and discovery of many toxic related illnesses may prohibit victims from suing under current state statute of limitations. Under the present system, victims who, for example, contract cancer years after initial exposure cannot bring litigation against the operator or employer responsible for the exposure.

**Suggested State Response**

• *Alter the statute of limitations to begin at the point of discovery of a serious illness instead of the point of exposure.*

Determining the extent of chemical contamination often requires expensive diagnostic tests. Since victims rarely have the money to pay for such tests, little or nothing is done until their health deteriorates. By the time the disease is treated, long term expensive care is often required.

In 1974, residents of tiny Toone, Tennessee were unable to pay for expensive diagnostic tests to help them determine what was causing the noticeable deterioration in their health. Not until 1978 did public health officials discover that the damage was caused by pesticide dumping from a local chemical company into the town's water supply. By that time, extensive permanent damage had occurred.

**Suggested State Response**

• *Provide for early diagnostic treatment for toxic chemical victims either through user fees or expanded liability provisions to include repayment for diagnostic expenses from the guilty party.*

## Reliable Funding

The key to creating an adequate state program is developing a reliable source of funding. Clearly, the federal government will not provide the necessary funding. The U.S. General Accounting Office, in reviewing the national hazardous waste management effort, found that none of the 26 states it contacted had sufficient staff to develop and operate a program that could meet even minimal federal standards with the funds available.

In the face of the needs of this program, alternative funding sources must be found. The most obvious source is users fees for disposers of hazardous waste. GAO, in its recommendations to EPA, echoed this idea stating "... no long term funding sources are available for hazardous waste programs on the federal, state, and local levels. Self-supporting programs which charge for waste disposal—such as fee systems—would provide an alternative source to supplement existing funds and provide a means of long term program support."

In addition, GAO recommended that EPA should encourage state governments and agencies to develop fee systems, develop model legislation for such systems and propose amendments to the Resource Conservation and Recovery Act to include a fee system in cases where EPA is forced to implement a state's program.

Disposal fees offer a number of advantages over federal or state appropriations. Besides being more reliable, they place the burden of the program on the users of the system instead of the taxpayer. And because there are relatively few permitted hazardous waste disposers in most states, the fees are easily collected, keeping administrative costs low

A fee system can also support an effective enforcement and monitoring program—the backbone of any regulatory effort. Without a well funded enforcement program, the entire effort to control illegal and improper disposal could amount to little more than piles of papers shuffled between lawyers.

At least two states have instituted fee systems. California has created a hazardous waste disposal fee of $1.00 per ton which raised 2 million in 1978—enough to fund the state's entire hazardous waste management program. Maryland has developed a three part system consisting of a filing fee, an annual permit fee based on type and quantities of wastes and a per vehicle charge, which supports the system and provides funds for emergency removal spills.

While some state officials have expressed concern that fees increase illegal dumping or provoke bitter resistance from disposers and site operators, officials from California and Maryland have discounted these problems. They contend that a strong enforcement program is the most effective weapon against illegal dumping and note that the incremental cost increase of approximately five per cent is hardly enough to encourage illegal dumping.

**Suggested State Response**

• *Establish a state fee schedule for hazardous waste generators which will cover the costs, over and above federal appropriations, of management, enforcement, clean up of spills and illegal dumping and provide diagnostic testing for victims.*

On January 30, President Reagan instituted a freeze on all federal regulations not yet issued. This can only further slow the federal response to the problem of toxics in the environment. The burden now falls on state and local governments to institute strong programs citizens are demanding.

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# Attack on Hazardous Waste: The Challenge of the 1980's

## The Problem

Our country has recently endured an unprecedented spate of toxic-related episodes. It has become difficult to pick up a newspaper without reading about drums of hazardous waste left rotting in areas precariously close to aquatic resources, or even human communities. One need only draw on some recent historical events as examples of the effects:

**Pollution of Ground Water**

In 1978, the water supply of Toone, Tennessee, was found to be contaminated, six years after a nearby landfill containing pesticide wastes had been closed.

**Contamination of Rivers and Lakes**

In 1978, poisons leached from a dumpsite in Charles City, Iowa, into the Cedar River in quantities sufficient enough to be detected in the water supplies of communities 60 miles downstream.

**Air Pollution**

In 1972, hazardous chemicals vaporized from a landfill near the towns of Darrow and Geismar, Louisiana. People and livestock were exposed to toxic vapor.

**Explosion and Fire**

In 1978, a fire erupted at a Chester, Pennsylvania, disposal site. Forty-five firefighters were stricken after inhaling chemical fumes and a major bridge had to be closed.

**Poisoning**

In 1978, President Carter declared Love Canal the first national disaster area for events other than "an act of God." Miscarriages, birth defects and other serious health problems appear to have been caused by chemical wastes buried nearly a quarter of a century ago.

Although specific horror stories vary greatly in terms of the severity of the impacts upon health and the

environment, the hazardous waste problem has reached epidemic proportions. The seeds of this problem, in many cases, were planted years ago, beginning with the advent of the widespread use of synthetic materials following World War II.

Over the last 20 years, extensive national efforts have focused on cleaning up air and water, as well as on making the workplace safer for the American laborer. These were logical, immediate priorities. But overlooked were the by-product wastes from industrial processes.

We have now become painfully aware that some 50 million metric tons of potentially hazardous wastes are produced annually in the United States. The amount grows at a projected rate of about 3.5 percent a year. And less than 10 percent is probably being disposed of in an environmentally sound manner.

By a combination of ignorance of the hazards and deliberate avoidance of the costs of waste control by some industries, we find ourselves saddled with a problem which will take years to resolve.

## How Wastes are Presently Handled

We are the most highly industrialized society the world has ever known. Yet no system has been institutionalized for properly disposing of our toxic wastes. More effort has heretofore gone into the regulation of restaurants or taxicabs than into establishing a safe network for waste disposal.

Furthermore, the number of actors who are involved with hazardous waste is immense:

- over 750,000 businesses generate some amount of hazardous waste

- over 10,000 transporters are involved in shipping it

- over 30,000 sites are used for treatment, disposal, or storage, some on the premises of the generator, others located elsewhere.

- an unknown number of "midnight dumpers" — transporters who take the wastes off generators' hands for a low price, then dispose of it irresponsibly — also operate on a widespread basis. The end product of their

services often turns out to be drums of wastes discarded into sewers, in the woods, in open fields, on the sides of roads. . .often near municipal drinking water supplies.

Hazardous wastes—whether from a chemical plant, battery producer, or electroplater, to cite three examples—are either disposed of at the factory or off-site. In either case, the disposal options are nearly identical:

- disposal on the land
- incineration
- placement in lagoons
- injection wells
- cycling or reclaiming

If wastes are not retained on-site, they are transported elsewhere by truck, barge, or rail.

Most hazardous waste incidents arise as the result of indiscriminate disposal by midnight dumpers, improper management at inadequate treatment, storage or disposal facilities or spills in transport.

## Present Inadequacies

Industry, quite properly, seeks to dispose of wastes at the lowest possible cost, consistent with the requirements imposed upon them by laws and regulations. Presently, in most parts of the United States, such rules and regulations are non-existent or incomplete. As a result, there now are a number of glaring inadequacies in how hazardous wastes are managed in America:

**Inadequate identification of wastes that are hazardous**

All wastes have the potential to be harmful, but certain wastes are particularly hazardous. Until these wastes are identified as hazardous, mismanagment is likely to continue.

**Inadequate assignment of responsibility for safe management**

Currently, except in a few states, a generator, after handing waste over to a transporter, need assume no further responsibility. The transporter, in turn, is under no requirement to dispose of the waste properly. No records need be kept, hence liability for midnight

dumping incidents cannot be traced. No one is accountable, and in case of surreptitious dumping or an accident, the public gets stuck with health and environmental damage—and the cleanup tab.

**Inadequate standards for waste management facilities**

With the exception of some state programs, no process exists to define and enforce rigorous design and operating standards to ensure safe containment or destruction of hazardous wastes, or to ensure that sites are not abandoned and left unmonitored and forgotten.

**Inadequate information on wastes**

Except in a few states, no one is presently required to keep records of hazardous waste activities, so it is impossible to know who is generating hazardous wastes, how much, how handled, or where.

**Inadequate emergency notification system**

No method now exists to assure swift cleanup of hazardous waste spills during transport.

**Inadequate incentives to improve technology**

Safe waste management should embody the best technologies that can be developed. Yet without rules and regulations to ensure protection of public health and the environment, the costs of disposal have been low. As a result, industry has had little incentive to apply resources or brainpower to developing better, safer technologies for managing wastes.

## The World According to RCRA

The Congress passed the Resource Conservation and Recovery Act to address these inadequacies and thereby require industry to change its practices to ensure safe management of hazardous waste. RCRA provides specific remedies which will be embodied in EPA regulations to be issued over the next several months:

**Identification of wastes that are hazardous**

EPA will publish a list of approximately 200 waste streams that are hazardous, as well as characteristics and testing procedures whereby waste generators can identify other waste streams of theirs which are ignitable, corrosive, reactive, or toxic.

**Assignment of responsibility for safe management**

Generators will determine if their wastes are hazardous by consulting EPA's list, or by testing the wastes. Alternately, a generator may simply declare his waste hazardous based on his knowledge of its properties.

When generators ship wastes to off-site facilities,

they must identify an approved facility to which the wastes are to go; they must contract with a transporter to take it there; and they must initiate a manifest which will track the waste through every step enroute to its destination. Both the transporter and the management facility are required to sign the manifest and return the signed copy to the generator.

Generators must follow up in cases where a signed manifest is not returned and inform EPA of any missing wastes.

Transporters are obligated to follow the generator's instructions and deliver the waste to the designated facility.

## Standards for waste management facilities

All facilities which store, treat, or dispose of hazardous waste, whether on-site or off-site, will have to comply with a series of operating standards, which includes proper safety measures, development of emergency procedures, monitoring and training of employees, long-term financial responsibility, and participate in the manifest system.

Those facilities will also require permits based upon the latest technological advances in waste management. Facilities failing to meet standards must close down (or will not be permitted to begin) operations.

As the new national hazardous waste program begins, existing treatment, storage, and disposal facilities which notify EPA and submit a permit application may receive interim status to continue their operations until their permit applications can be reviewed. Those facilities must comply with extensive operating standards during interim status.

Because of the number of sites involved, the permitting process will necessarily be implemented over time. The most potentially dangerous sites will be reviewed first, so that they can be upgraded or closed. Priority will also be given to new hazardous waste facilities.

## Information on wastes

During the 90 days following promulgation of the regulation defining hazardous waste – i.e., during May, June, and July of this year – every firm which handles hazardous waste (whether it be a generator, transporter, treater, storer, or disposer) must notify EPA of that fact. EPA will then assign each firm which notifies an identification number. The firm cannot continue any hazardous waste activities without using that identification number.

To help inform those affected, EPA will mail

information about notification to over 350,000 firms which it believes may be involved. The mailing will contain a notification form to be completed and returned to EPA. If any waste handler fails to be contacted, it is still his responsibility to notify EPA within the 90-day period.

Subsequently, every firm which generates, transports, stores, treats, or disposes of hazardous waste will submit an annual report to EPA, providing information what wastes were handled, in what volume, and in what way.

**Emergency notification system**

Generators must make sure that wastes which are being shipped are properly containerized and labeled.

Transporters are obligated to take prompt cleanup actions and report any spills or accidents to the proper authorities.

**Incentives to improve technology**

With responsibilities clearly assigned, and with standards of safe practice clearly defined, a new era will begin in which industry will have a strong incentive to put its best, most imaginative minds to work toward developing new technologies and new approaches to the complex problems of safe waste management.

## When Will This Happen?

On *February 2[illegible]* EPA will issue regulations defining the responsibilities of generators of hazardous waste, of transporters of hazardous waste, and the requirements of the notification process. These regulations will specify how the manifest system is to work. Because these regulations are being issued early, the regulated firms will have extra time to understand their new responsibilities.

In *April,* EPA will issue regulations defining what wastes are hazardous and set forth operating standards for treatment, storage, and disposal facilities. It will also issue procedural regulations stating how the permit program will work, and what states must do to be authorized to run the Federal program.

[illegible]g *May, June, and July,* all firms which handle h[illegible]s waste must notify EPA.

[illegible]*ber,* all firms that store, treat, or dispose of [illegible] waste must apply for a permit. Those who [illegible]pply for a permit can obtain interim status to c[illegible]heir operations.

Also in *October,* the program takes effect and goes into operation. The manifest system must be used for all

waste shipments. All sites with interim status must be in compliance with the interim operating standards.

In the *fall*, EPA will issue the standards on which the permits for storage, treatment, and disposal sites will be developed.

In the spring of 1981, permitting of facilities will begin.

State involvement is critical to the success of RCRA. Under the law, EPA can authorize States to implement and enforce RCRA—on an interim basis for two years and then on a final basis. A State program must be equivalent to the Federal program (substantially equivalent during the interim period) to be authorized. Many States have indicated a strong interest in operating the program. EPA hopes that some 37 states will qualify for authorization. EPA will administer the program in any unauthorized States.

## Will RCRA Work?

To carry out the mandates of RCRA will require a massive transformation in the way that industry has been accustomed to managing its wastes. A skeptic might question whether these changes will occur. But a variety of forces will be at work to press towards the rapid adoption of safer approaches to waste management.

### Public Opinion

Public policy is an outgrowth of public demand. There is no greater force in a democratic society than that of public opinion. And by any measure, the current public attitude is one of outrage directed against the indiscriminate poisoning of our environment through hazardous waste mismanagement. Lawmakers, regulators, the business community—all are aware of a strong national mood toward tightening the screws on chemical carelessness.

### Forces in the Marketplace

Under the influence of the new hazardous waste controls, a number of incentives will be introduced into the economic marketplace which were previously missing. Firms offering advanced treatment and disposal approaches, which formally could not sell their services, will be swamped by the demand. New firms will enter the waste management field. Waste storers, treaters and disposers will seek out more sophisticated technological processes to properly handle their wastes. And the costs of environmentally sound waste management will rise, producing a powerful incentive

for generators to change methods of production so as to minimize their output of hazardous wastes.

## The Courts and Liability

RCRA contains numerous provisions designed to make those who handle hazardous waste legally and financially liable for violations of the regulations. The degree of liability will, of course, depend on the circumstances. Through liability suits and other lawsuits based on RCRA infractions, the judicial system will play a large role in interpreting the RCRA program and clearly defining the penalties for non-compliance.

## The Role of Citizens

"Public participation" has become a bureaucratic platitude in many quarters. That is unfortunate, because RCRA contains many real and potent opportunities for citizens to exert meaningful influence: RCRA provides for public hearings as part of the facility permitting process; it grants citizens opportunities to petition to add additional wastes to the hazardous waste list; it provides means for citizens to register complaints about existing sites or procedures which may pose public health threats; and it authorizes citizens to bring legal suits against corporate non-compliers. In short, RCRA authorizes citizens to play a central role in protecting themselves against the dangers brought on by the excesses of our synthetic-oriented society.

## Monitoring and Enforcement

Federal regulations carry the force of law. Enforcement activities to ensure compliance with the various aspects of the RCRA program will be conducted at the State, regional, and national levels. Failure to comply with specific provisions will result in prosecution. The initial enforcement effort will be on making sure that the manifest system and interim status standards are complied with. Once facilities have been permitted, major emphasis will be placed on ensuring that permit requirements are met. But equally as important, the flexing of RCRA's legal muscle will establish a system for responsible waste management which will be buttressed by public opinion, forces in the marketplace, the courts and liability, and the role of individual citizens.

# What the Future Holds

As this decade begins, so too begins a new effort to control the serious threats posed by mismanagement of hazardous waste. If the initiation of RCRA opens the door to better managerial practices, by the mid 1980's we should begin to realize noticeable changes in treatment, storage and disposal of hazardous wastes. New, safer facilities with highly developed technological capabilities should appear. Also, the cost and responsibility of properly handling wastes will be placed where it belongs – on the generators. This in turn will create incentives to reduce the production of hazardous waste in the second half of the 80's, as alternative products and production processes are developed.

But the 1980's will also bring a continuing array of difficult issues which must be dealt with as the attack on hazardous waste moves forward:

### Uncontrolled and Abandoned Sites

Tens of thousands of disposal sites exist all across the nation. Many are uncontrolled and/or abandoned. These sites need to be identified, analyzed, and, where necessary, brought under control, which will be an enormous task by any measure.

EPA, Justice, and the States are aggressively developing enforcement cases against such sites. But enactment of a Superfund by the Congress is essential to provide better tools. With a Superfund, EPA will be able to move in and protect health by cleaning up problem sites before, not after, time-consuming litigation. Further, a Superfund will provide funds for cleanup of abandoned sites, for which no resources are now available.

### Capacity and Siting

Our nation lacks sufficient hazardous waste management facilities. Establishment of new facilities almost always results in intense opposition of local citizens. Current public hostility to new waste disposal facilities is understandable; people are afraid. But industry can't properly manage wastes without sites at which improved management can take place. Hence every citizen has a personal stake in the resolution of the siting issue. Our society needs new processes and procedures whereby sites can be selected at which the best technologies can be applied to assure the safe management of hazardous waste.

## Liability

Persons who store, treat, or dispose of hazardous waste must be required to assume some liability for their actions to assure high standards of performance. But if liability exposure is too great, responsible industry may be driven from, or never enter, the marketplace. If that happens, private capital may fail to finance the new hazardous waste management facilities which our nation desperately needs, and the way will be open for midnight dumpers to resume their illicit operations on a black-market basis.

## Expanded Listing of Hazardous Waste

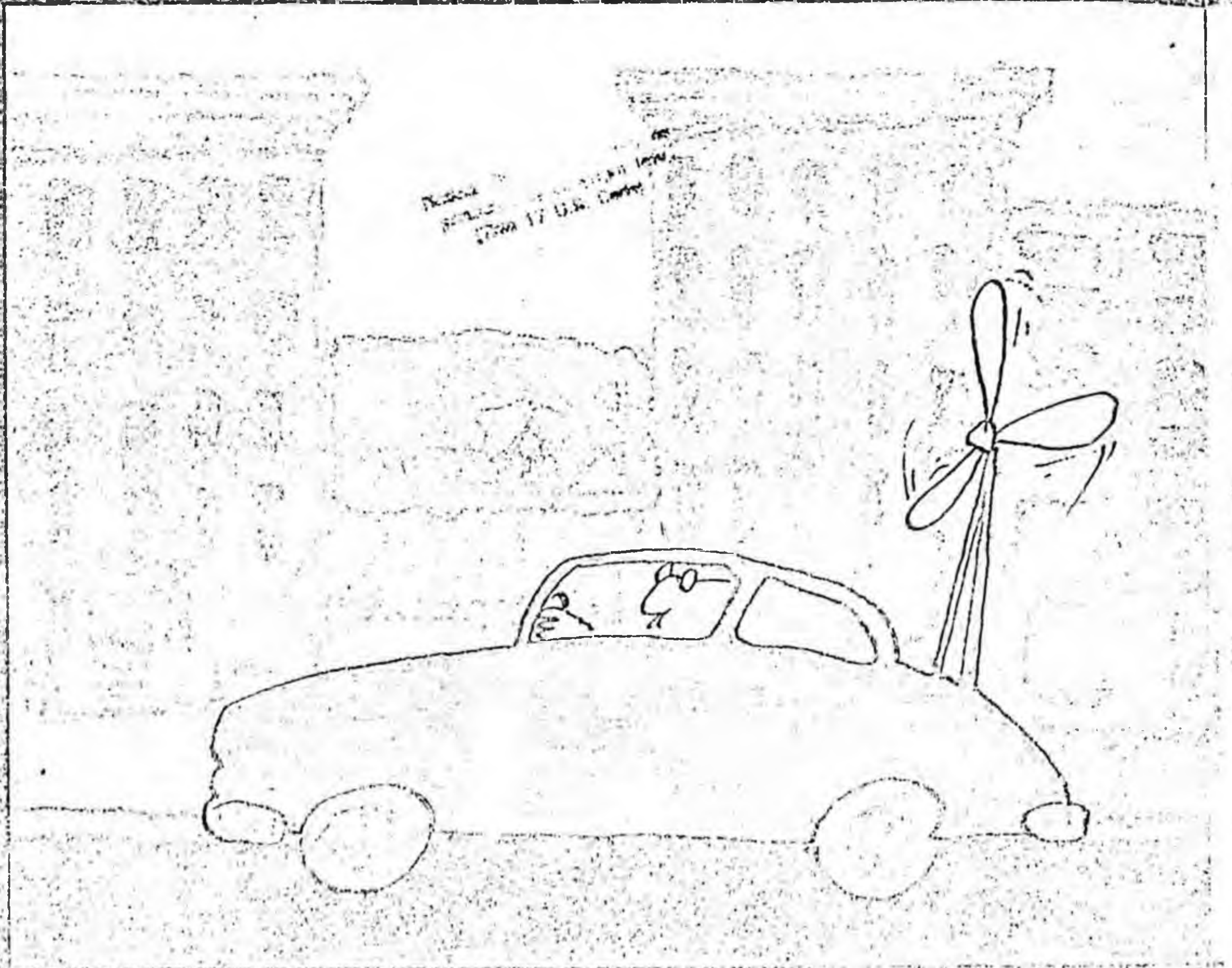
Knowledge of which wastes are hazardous is still imperfect. A continuing process must go forward to expand and refine the listing and management of hazardous wastes.

## Refined Standards for Hazardous Waste Management Facilities

EPA's standards for treatment, storage and disposal facilities are based on state-of-the-art knowledge about how wastes can best be managed. But the base of knowledge will expand and improve, and so too must the standards. Hazardous waste management facilities must be upgraded and improved over time so as to reflect an evolving understanding of how wastes can be managed most safely.

These are only a few of the issues which the hazardous waste Hydra will force us to confront throughout the foreseeable future. For, if the truth be known, the problem of hazardous waste management will be never ending. As long as society generates toxic wastes, society will be forced to find safe ways to manage these wastes—and the solutions will not be easy. Nevertheless—as any former resident of Love Canal can tell you—there comes a time when hazardous waste management problems can no longer be ignored or shoved under the rug. That time is now.

# Two Views on the Carb



## Reduction at the Source

by Don G. Scroggin and Robert H. Harris

**We must act now by conserving energy and accelerating the transition to renewable sources. Moreover, such measures are desirable in their own right.**

A buildup in [illegible] of carbon dioxide [illegible] atmosphere [illegible] burning of fossil fuels (coal, oil and natural gas) [illegible] induce a global warming [illegible] by the middle of the next century. This poses the risk of severe long-term changes in the global climate and the ecological systems [illegible] Some have [illegible] called [illegible] problem the most important long-term [illegible]. But although [illegible] regional [illegible] precipitation [illegible] shifts in agricultural [illegible] economic and political [illegible]

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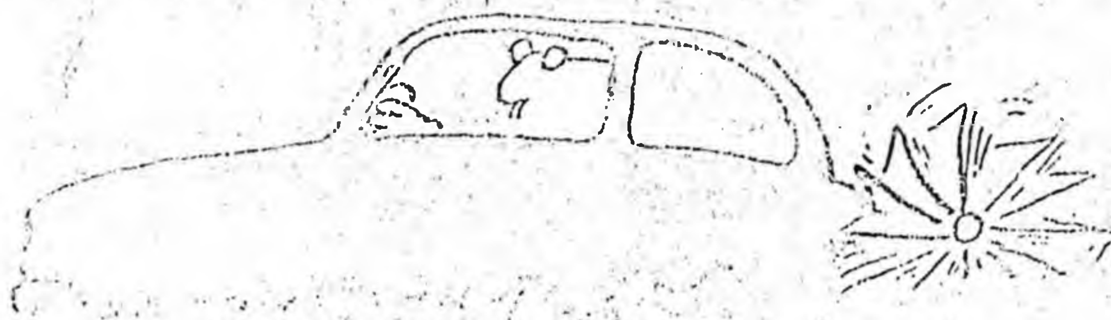

# A More Feasible Social Response

## Limiting $CO_2$ concentrations does not imply immediate reductions in total fossil-fuel use, but only in the rate of growth.

in the developed nations can offset the fossil-fuel use in the less-developed nations to allow them to grow. Such a balance could continue well into the next century, with total global $CO_2$ emissions still under control. Moreover, high levels of energy efficiency and reliance on renewable energy sources could be incorporated into the economies of developing countries, thus providing assurance that their energy and economic systems would not later require the major overhaul now necessary in the developed countries.

To forge an international response to an intangible problem with still-uncertain consequences is no easy task. But the United States and other industrialized nations can set an example through energy planning. The developed nations can [illegible]onstrate to the rest of the world that a decreased reliance on conventional energy sources, together with an increased application of conservation and renewable energy sources, are consistent with a growing and prosperous economy.

Even without the risks of climatic change, the more basic considerations of economics, national security, and other environmental harm offer persuasive arguments for a global policy to deemphasize dependence on fossil fuel and emphasize energy efficiency and renewable sources. With the risk of potentially disastrous $CO_2$-induced climatic changes added to the picture, these arguments are all the more compelling.

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Robert H. Harris has a Ph.D. in environmental sciences and engineering from Harvard University and was director of the Toxic Chemicals Program at the Environmental Defense Fund for fi[illegible]s before being appointed to the Council on Environmental Qual[illegible]mmy Carter. He is coauthor of *Malignant Neglect* (R[illegible]ndom Hou[illegible]979). Dr. Harris is currently an environmental consultant in Washington.

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*Continued from page 23*

emissions: the amount of fossil fuel that will be burned each year (depending on world population, economic activity, the costs and availability of each energy source, and technologies for utilizing energy); the resulting changes in the atmosphere, the polar ice caps, and the oceans; the ecological responses; and the extent to which humans can mitigate the adverse effects of the changes or even utilize them to better accomplish individual and social goals.

### A Virtual Inevitability

Policies designed to lessen carbon-dioxide emissions are inherently unattractive. Fossil fuels are currently the cheapest source of energy; proscribing them would be difficult and expensive. And since we can neither estimate the magnitude of global changes

## Fossil fuels are currently the cheapest source of energy; proscribing them would be difficult and expensive.

from increased $CO_2$ with assurance nor be certain that the physical changes will be predominantly detrimental, it would be extremely difficult to convince any nation to bear the higher costs associated with switching to other fuels.

Three lags in particular make prospects for abatement of carbon-dioxide emissions quite unlikely before the middle of the next century; even then, steps will be taken only if the effects are important and predominantly adverse and adaptation cannot mitigate the costs. The first is a recognition lag: conclusive proof that carbon dioxide will cause large, adverse effects does not yet exist, and we will have to wait at least until 2000 for confirmation that the simulation models are correctly predicting the global climatic change. Yet uncertainty would remain—the models could roughly predict the effects of small increases in carbon dioxide but err on the effects of larger concentrations. For example, features of climate that are currently of secondary importance could become of primary importance with large increases in carbon-dioxide levels. Even greater uncertainty arises over whether a particular climatic change would produce beneficial or adverse effects.

A second lag involves deciding on a solution. The perceived seriousness of the $CO_2$ problem would vary with location, affluence, and alternatives. Given the international nature of the carbon-dioxide problem, obtaining agreement on the problem—much less its solution—could take decades. Moreover, a small nation's abatement program would not noticeably affect climate, and some nations who stand to gain from climatic change might actually *encourage* fossil-fuel burning.

Finally, assuming that worldwide agreement were reached on policies, there would be a third lag in switching to alternative fuel sources, a decades-long proposition.

The three lags are likely to be so long that carbon-dioxide emissions could not be substantially curtailed until the latter part of the next century. Without other compelling reasons for relinquishing fossil fuels, therefore, it seems virtually certain that substantial climatic change from $CO_2$ will occur and persist. Thus, if society is to do something about this potential problem, the emphasis should be on adapting to it.

### Subtle Cues, Implicit Adjustments

Conscious adaptation is a thoughtful response by an institution or individual to a perceived problem or need for change. The action can result from legal compulsion or spontaneous recognition, but in both cases behavior is modified through widespread dissemination of information. Climatic change could affect investment decisions, education and training, migration and location generally, jobs, and the production and purchase of goods and services. Explicit government intervention to change behavior might take the form of laws, licensing, zoning, and control of conditions of operation. But mitigating the problems caused by carbon dioxide is likely to require subtle changes in individual behavior that could not be induced by such regulation. The pertinent facts, the people to be reached, and the points of leverage all vary with each target.

A range of other possible governmental actions, such as taxes, subsidies, and attempts at moral suasion, do not compel changes in behavior but do exert an influence. Although these actions stem from conscious decisions by government, they need not result in conscious decisions by consumers.

Taxes and subsidies can provide various degrees of incentive to change behavior, but implementation is difficult and applicability is limited. More important, there is the temptation to use taxes, subsidies, and licenses to reward special groups or accomplish unrelated, often socially undesirable goals. Economists have learned painfully that subsidies and regulations are predominantly political processes with outcomes that usually have little semblance of economic efficiency.

But the government's power of moral suasion should not be underestimated. When not against an individual's perceived self-interest, moral suasion can lead to important changes in behavior. Even if individuals are required to make sacrifices, most will do so provided there is a perceived threat to society and a belief that all individuals will share the burden. Examples of such actions include service in the armed forces during wartime or conservation of water and energy during crises. If people were convinced that carbon dioxide is a serious problem, they would probably respond to appeals to conserve energy.

More important than conscious adaptation, however, is implicit or automatic adjustment. For example, adjustment to changes in consumer preferences for goods and services is done automatically via prices and profits in the marketplace. The market provides unmistakable signals in the form of crop failures, unemployment, and bankruptcy, or more subtlely in the form of lower wages and profits for some busi-

The ability to adapt to carbon-dioxide-induced changes will be determined by our general ability to adapt to social and economic change.

nesses compared with profit increases and higher wages for others. Closely related are social structures and pressures that affect family size, economic activity, geographic location, and consumption patterns and indirectly affect $CO_2$ emission rates and adaptability to climatic change.

Unconscious adaptation is the translation of subtle cues into individual and social change. But whether such adaptation is helpful to a community, a nation, or the world depends on the aggregation of individual actions. Ultimately, the institutional and technological structures of society determine whether individuals acting in their self-interest will speed or impede social adjustments. The economic model of perfect competition, for example, is one institutional framework wherein individual actions are perfectly consonant with social obligations.

### Adaptation for All Seasons

Carbon-dioxide-induced environmental changes may require the relocation of businesses, residences, and social-overhead capital such as streets and sewers. Plant and equipment may have to be replaced and workers may be obliged to find new jobs, which often require new skills. Firms may have to redesign their products and manufacturing processes. Yet these changes will accompany other, more profound changes caused by shifts in taste, technological innovation, the availability of raw materials, and patterns of international trade and relations, as well as "normal" climatic variations. The ability to adapt to the carbon-dioxide-induced changes will be determined by our ability to adapt to these other changes.

Will the automatic mechanisms send the proper signals? Will governmental and other decision makers perceive the problem and implement policies to expedite adaptation? If people perceive the need to change their behavior, will they have the resources and knowledge to do so? Will social and economic institutions be able to keep pace with climatic and social change? In other words, will our social and economic institutions respond to the changing conditions or break down under the pressure?

Whether society will have the required resources to adapt will be measured by several indicators. The first is gross national product (or income) per capita. This is a measure of aggregate economic activity and a surrogate for the economic resources available to build new facilities or move people. (The precise variable is "free" economic resources per capita. A poor society, such as a nomadic one, might be able to adapt more easily than a rich society unwilling or unable to direct resources to implement needed changes.)

The second indicator is the gross rate of investment, or ratio of investment to GNP. A high ratio means that the economy is putting many new facilities into place and turning over its capital stock rapidly. Since plant and equipment can be designed for the new situations and be built in the right places, rapid turnover means that most capital would be tailored to the new regime. For example, consider an economy in which capital lasts 50 years—only 2 percent is replaced each year. Although climatic change could make much of the capital obsolete, it would remain in place for a long time. In contrast, an economy that turns over its capital stock rapidly—say, every decade—could better respond as changes were perceived.

A third measure of an economy's capacity to adapt is the general educational level of workers. Well-educated workers can better redesign products and facilities to respond to new conditions, and they find it easier to acquire the skills needed for new jobs.

Other characteristics facilitating adaptation are not so simple to measure. One is the flexibility and diversity of capital stock. Some plant and equipment are so highly specialized that minor changes in raw materials, product design, or fuels are impossible to accommodate. Some oil refineries, for example, were built to process only one type of crude oil and produce a fixed set of outputs. A counterexample is an electrical generating unit that burns oil, coal, natural gas, any two, or even all three fuels at once. Diversity of the capital stock also gives the economy the resiliency to avoid disaster in the face of changing external conditions such as climate. However, flexibility generally entails higher capital cost and lower efficiency.

Another vital but difficult-to-measure characteristic is the level of basic scientific knowledge, which can be used to increase the number of technological alternatives currently available or that can be quickly developed. And another, related characteristic is the capacity of individuals to interpret the signals of changing conditions correctly and adapt to them—in both cases by using the available tools.

Society should take steps to enhance each of these characteristics so that we have the ability to adapt more easily to carbon-dioxide-induced changes. But note that each attribute (with the possible exception of data collection and analysis focused on climate) benefits society generally and is not unique to carbon-

dioxide-induced problems. Carbon-dioxide buildup can p. vide a rationale—but more probably it will be a catalyst—for enhancing society's ability to adapt to and exploit a changing environment. The issue is but one of many that will have an enormous impact on the world economy and social institutions in the twenty-first century, and it provides one more argument to make these institutions flexible, adaptable, and strong.


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mixed year in 1981, with food processing employment dropping eight percent. In the salmon sector, however, 1981 was another banner year with the harvest totaling 110 million fish. In 1982, this positive trend is expected to continue with the salmon harvest registering between 110 and 130 million fish. Declining salmon prices are expected, however, due to high inventories, another anticipated record harvest and currency exchange disadvantages. The shellflish side of the industry suffered during 1981, with the king crab catch declining to less than one-half of 1980's level and the shrimp harvest dropping by one-half as well. In 1982, these low harvests for shellfish are expected to continue.

### Forest Products

Alaska's forest products industry, reflecting very poor world marl ts for lumber and pulp, is in the midst of possibly the worst down cycle in industry history. Forest products employment dropped 16 percent in 1981 in Alaska. High interest rates in the United States and continued sluggishness in the Japanese economy both will have to turn around before the forest products industry can regain some ground. Industry experts anticipate, however, some improvement in late 1982 or early 1983.

### Visitor Industry

Tourists to Alaska spend about $300 million annually, with the typical tourist ranging in age from 35 to 55 with a household income of at lelast $35,000 per year. Between 650,000 and 700,000 visitors arrived in Alaska during 1981, registering a 10 to 15 percent increase from 1980. This pattern, which has been relatively constant over the last several years, will continue during 1982. In the f ure, foreign travelers will account for an increased portion of Alaska's visitor picture. Presently at least one-fifth of all Alaska visitors originate in Japan or Europe.

### Distributive Industries

Alaska's distributive industries employ approximately one-half of the total Alaska nonagriculture workforce, excluding the military. In 1981, all egments of the distributive industries registered gains, most notab'y transportation and finance. Total distributive sector employment incrased four percent. In 1982, the support industries will continue to mirror the steady advance of the Alas' economy as a whole.

### Government

Government has been a major stabilizing force on the Alaska economy, providing about 40 percent of all the jobs statewide, when including the military. Prudhoe Bay petroleum revenuesagain will support state government growth with $3.3 billion in FY81, $3.9 billion in FY82 and $4.3 billion in FY83 (net of required permanent fund contribution). The overall presence of state government will remain strong in the future. Alaskans must make fundamental decisions soon concerning the direction and the extent of involvement that government will take in the future growth of the Alaska economy.

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# Reagan Spurs Corps Construction

## $100 Million for '82

By COL. LEE R. NUNN
Corps of Engineers
Alaska District

Buoyed by increased military spending, the Alaska District's construction program for fiscal year 1982 will cost 57 percent more than 1981. The 1982 military program will total $75 million, while civil works projects will add another $26 million. This compares to $40 million of construction contracts awarded by the district during FY 1981.

We expect a continuing increase in military construction for the next few years as a result of President Reagan's decision to strengthen the country's military posture. Our 1983 military construction program will approach $110 million. Additionally, we already have early design starts on projects totalling more than $33 million for FY 1984, indicating that program also may exceed $100 million.

The Alaska District achieved a significant goal in 1981. It issued three general permits for oil development activities on the North Slope. These general permits — which have been issued for a five-year period — will practically eliminate the need to process individual Corps permits for construction of access roads, drilling pads, storage areas and other petroleum-related developments north of the Brooks Range. We expect these GPs to encompass nearly 90 percent of the North Slope permit actions, especially those that receive few comments and yet take so much processing time.

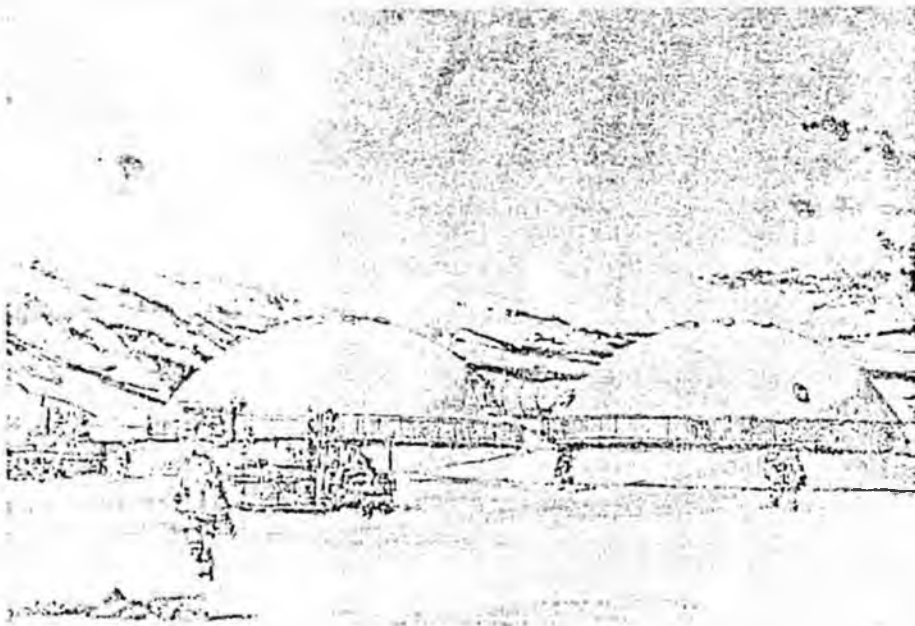
Fills up to 150,000 cu. yd. are permitted in two of the permits and access roads up to five miles in length are permitted in the other. A pre-application coordination conference is required to help iron out problems before final application plans are prepared. These conferences are similar to the gravel conferences already held by oil companies and resource agencies. Because of the size of the fills, the district requires submission of an application so that we can tabulate and assess cumulative impacts. Then following a short 15 day period for comments from resource agencies, we can generally issue a letter of authorization.

The district also expects to issue general permits for each of the regional housing authority areas in Alaska.

### MAR Construction to Start

The largest military construction start this year is phase one of the Minimally Attended Radar (MAR) project. The Air Force is planning to replace 1950-vintage facilities throughout western and interior Alaska that are part of the Aircraft Control and Warning System. This spring the Corps of Engineers will begin constructing support facilities at Indian Mountain, Cape Romanzof, Sparrevohn and Tatalina. We will call for bids soon on a single contract for all four sites. The cost is expected to range from $30 to $50 million. The Alaska District design is based on a concept developed by the architectural firm of Mayne and Partch. A 90-ft. diameter dome for living quarters and a 100-ft. diameter dome for industrial and maintenance functions will be constructed at each site.

Phase two of MAR construction will begin in 1983. Existing buildings will be renovated and facilities consolidated at Cape Lisburne, Cape Newenham, Cold Bay and Tin City. Smaller facilities will be located at Kotzebue, Fort Yukon, Galena and Murphy Dome.



*Artist's rendering of the Minimally Attended Radar project, Phase One, designed for the U.S. Army Corps of Engineers by Maynard and Partch.*

Design of the FY83 phase will be accomplished by the district's design branch and by contract with architectural-engineering firms. Construction for phase two also is expected to cost between $30 and $50 million.

### Military Construction Scheduled

The FY82 construction pr am for Eielson AFB includes four pr ts. New construction includes an 8,000-sq.-ft. asphalt concrete ammunition holding area with associated gravel road and a 6,000-sq.-ft. flight simulator building containing fire protection, air conditioning and environmental control systems. The ammo maintenance upgrade will cost less than $1 million and the flight simulator project will cost between $1 million and $5 million.

Two projects will modify existing facilities. A munitions maintenance shop will be improved by adding 800 sq. ft. of parking pads for explosive haul vehicles and approximately 2,500 ft. of security fencing. The project is estimated to cost between $1 million and $5 million. A project expected to cost less than $1 million will modify an existing telecommunications building.

On Elmendorf AFB, two existing barracks will be remodeled to house unaccompanied enlisted personnel. The project will cost $5-$10 million and will be advertised in the third quarter of FY 1982.

Other projects scheduled for Elmendorf include alterations to a transmitter building and a fuel cell hanger. The second project includes installations of fire suppression systems, alarm systems and upgrading of the existing electrical system. Both projects are expected to cost between $1 million and $5 million.

Another project in the same cost range will convert an existing building to a training facility. The facility will contain classrooms, a mobile training set, visual aid rooms and a hydraulic power room.

Two projects are scheduled for construction at King Salmon AFS. Repairs to a taxiway will be combined with an operations and maintenance job for runway repairs. The project was scheduled for early advertisement so that materials can be shipped by Cool Barge which leaves Seattle in mid-March. A taxiway project is expected to cost between $1 million and $5 million. A composite building, expected to cost more than $10 million, consists of replacing the existing facilities with a new 22,780-sq.-ft. building. The composite building will provide office space, dining facilities and industrial functions.

A $1-$5-million project close to award will install vehicle exhaust systems in shop buildings at Ft. Wainwright and Ft. Greely. The base contract includes three buildings on Ft. Wainwright and two buildings at Ft. Greely.

### Corps, State Cooperate at Homer

Civil works projects in Fairbanks and Homer are scheduled for 1982. Scheduled for advertising in the second quarter of FY82 is a project to enlarge the existing small boat harbor at Homer. Estimated to cost in excess of $10 million, the project includes construction of new breakwaters, removal of existing breakers and dredging. The harbor would be expanded from its present 16.5 acres to 50 acres and moorage capacity would be increased from 400 spaces to a total of 1,500.

The State of Alaska and the City of Homer feel the project is needed urgently enough for the state to pay the bulk of construction costs if this will make early contract award possible. The Corps and the State are trying to develop a unique agreement whereby the state would pay the federal portion of the construction costs but the project would remain a Corps project. The Corps would prepare plans and specifications and administer the construction contract as usual.

This type of cooperation between the Corps and the state also could be used to expedite construction of two hydroelectric projects, Bradley Lake and Snettisham, phase two. The Alaska Legislature appropriated $15 million for the Bradley Lake project and $4.5 million for the Snettisham project.

The Alaska congressional delegation strongly supports initiatives to accelerate construction of needed hydropower projects and is working on legislation which would allow the Corps to accept state funds and start work. Depending on funds available this year, the district will prepare plans and specifications for constructing a temporary construction camp to accommodate up to 200 workers. Continuing drilling and survey work will be conducted, and two local service roads, one from the airstrip to the powerhouse and the other from the powerhouse to the dam site will be designed.

The Bradley Lake project includes a concrete gravity dam with a lake tap diversion into a concrete-lined power tunnel which will carry the water to a steel penstock. Water will then fall through the penstock to an above-ground power house near sea level. The present schedule calls for power to come on line in 1987.

The Snettisham project, located near Juneau, has congressional authorization but has not yet been funded. If funds are authorized, the Corps will begin preparing plans and specifications for construction of the powerhouse tunnel, construction camp, a short access road and a third turbine generator set to be installed in the existing underground powerhouse.

Snettisham was designed in phases to meet expanding demand. Construction of the Long Lake phase was completed in 1974. Interest has been revived in the second phase, tapping Crater Lake, which would involve constructing a 7,820-ft. power tunnel and penstock, about one mile of roads and installing the third turbine.

### More Work at Chena

In Fairbanks, the third major interior drainage channel (Channel A) was scheduled to be advertised in December. This project will provide interior drainage features on the lower portion of the Tanana levee in the vicinity of the Fairbanks airport.

Major construction contracts to provide seepage control measures also are under design for Chena. Scheduled for advertisement early this year, the projects will consist of placing silt blankets and drilling relief wells. This remedial work is a result of an operations test the Corps conducted on the project this summer.

Main features of the project, including a seven-mile-long Moose Creek Dam with its outlet works, a floodway and a 20-mile-long levee have been operation since 1979. However, until recently, water levels in the Chena River had not been high enough to operate the project and divert water form the Chena to the larger Tanana River. Heavy rains in July allowed the gates to be closed for the first time.

The District used the event as a test fill to

evaluate the performance of the structure. Surveillance of the embankment and downstream areas resulted in the discovery of a minor erosion problem on the upstream slope and several sand boils in low areas downstream of the dam. A small groin was constructed to correct the erosion problem. The scheduled contract work will correct the downstream problems.

A contract for constructing recreation facilities at the Moose Creek Dam project is on the district's schedule with a spring advertising date.

### Dredging Project Added

In addition to the annual maintenance dredging at Nome, Homer, Ninilchik, Dillingham and Anchorage, the district will be dredging Dry Pass this year. Dry Pass is the waterway between El Capitan Passage and Shakan Strait which provides a safer, shorter route for passage of fishing vessels, log rafts and small vessels from the northwest coast of Prince of Wales Island. The Corps has not dredged the passage since 1958-59. A contract valued at less than $1 million will be advertised in February.

### Carryover and Completed Work

Carryover work includes expansion of the Cordova small boat harbor and installation of the Barrow gas line. The Alaska District has a $5.7-million contract with JIJ Construction Co. of Ferndale, Wash., to double Cordova's harbor size. Twenty acres will be added by enclosing a near rectangular area with rubblemound breakwaters and removing the existing breakwater. Now closed down for the winter, the project is scheduled for completion in November 1982.

In Barrow, the Corps is building a natural gas distribution line for the Bureau of Indian Affairs. Work on the $45 million project takes place in the winter when the ground is frozen enough to protect the tundra.

Three major civil construction contracts were accomplished during FY81. Peter Kiewit Sons' Co. completed the small boat harbor at Port Lions on Kodiak Island a year early. The $1.5-million contract included construction of a 170-ft. stub breakwater and a 600-ft. main breakwater. Two quarries were developed and approximately 66,000 cu. yd. of materials were placed.

At Craig, T.O. Paddock Construction Co./Construction Rigging, a joint venture, completed a 150-ft. stub breakwater and a 27[illegible] main breaker to provide additional wave protection to the entrance of Craig's South Cove Harbor. The $[illegible]00-project was completed in September.

Another project completed by Peter Kiewit was the Tanana River Levee, phase three. The $7-million project protects a large area of southeast Fairbanks as well as property used by the airport, the Alaska Railroad and many industrial companies. The contractor started the work in early February and completed the project by early April.

Major military construction projects accomplished during FY81 included the Regional Operations Control Center on Elmendorf AFB. The Interstate Co. constructed a 23,600-sq.-ft., two-story steel-framed, precast concrete panel enclosed operations structure and similar generator building, both adjacent to existing headquarters. The $6.9-million contract also included paving the parking lots, associated utilities and site work. Phase two will begin this year when Interstate remodels the control center facility after the Air Force completes installation of communications and radar equipment.

Other Elmendorf projects completed during FY81 included a $2.8-million contract with McWil, Inc., to alter a base enlisted quarters building, a $1.2-million contract with Sandland Construction to construct a concrete block addition to the fire station and a $3-million contract with Green Construction to repair airfield pavement.

At Ft. Richardson, major contracts included $610,000 to McLee Construction Co. to construct a 4,605-sq.-ft. airfield fire and rescue station, and $4.7 million to Alaska Diversified/Fischbach for modernizing two barracks buildings and the dining facility.

At Shemya, Hoffman Construction completed a $4.5-million contract to construct a 729 sq. ft. approach facility, concrete foundations, and stands for landing equipment and antennae. Work also included repair on the dock with new sheet piling and H-piling. City Electric had a $222,000 contract to furnish and install instruments for the electrical power generating plant. At King Salmon, Rockford Corp. had a $416,000 contract to construct a new aerated sewage lagoon and modify and add to the existing blower house. □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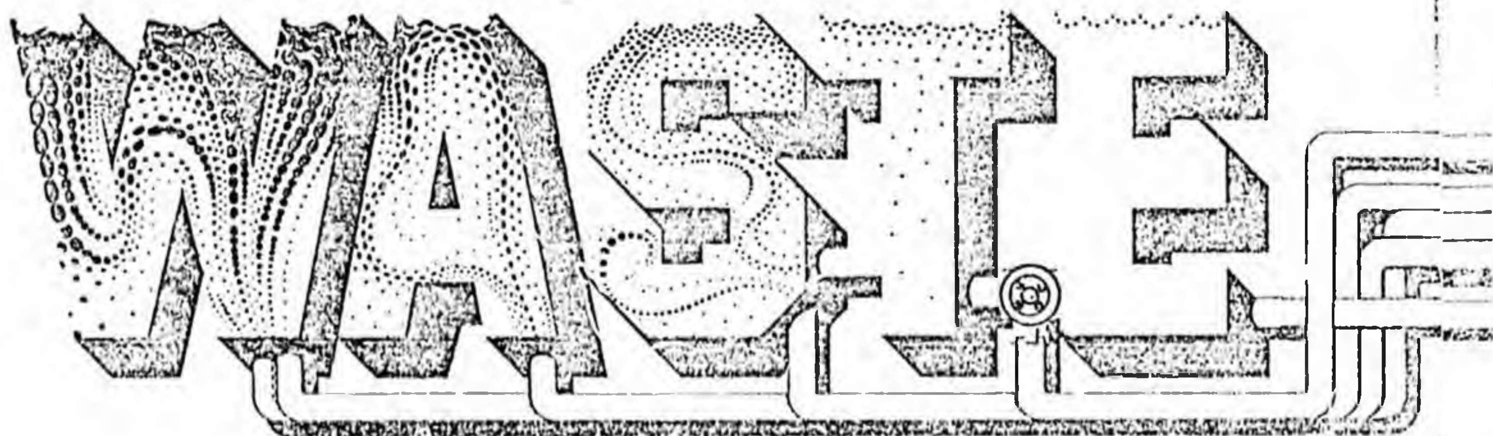
# WHAT TO DO WITH HAZARDOUS



by Selim M. Senkan and Nancy W. Stauffer

Toxic and hazardous chemical wastes, the inevitable by-products of a technological society, rank as one of our most serious problems. But proper management practices can prevent them from threatening life or its environment.

For many decades industrialized society has produced hazardous chemical wastes. They threaten human health and the environment because they have dangerous properties; many are toxic and some can explode or undergo destructive reactions. In the 1970s a series of highly publicized incidents began linking human tragedy with hazardous wastes handled improperly in the past, either through negligence or lack of knowledge. People became terrified of waste-disposal sites, viewing them as time bombs. The fragile nature of our environment became clear, but much damage had already been done.

Meanwhile, industrial and other activities continued to produce billions of pounds of potentially hazardous wastes. Responding to growing concern, many companies adopted the safest waste-handling techniques available, and some began to invest substantial funds into improving current technologies and developing new ones. Unfortunately, some companies continued to handle their wastes irresponsibly. After all, the economic incentive is great: it costs ten to a hundred times more to use proper waste-treatment methods than simply to dump untreated wastes in unsecured landfills, rivers, lakes, and oceans. The prices

charged by companies using unsafe methods did not reflect the full social cost of production, and the conscientious producers found themselves at a serious competitive disadvantage. Recognizing the economic pressures within industry and the potential dangers posed by hazardous wastes, the federal government began to take legal and political steps to ensure better waste management.

However, developing sound waste-management policies has proved controversial and complex. The Resource Conservation and Recovery Act (RCRA) of 1976 gives the U.S. Environmental Protection Agency (EPA) overall responsibility for setting hazardous-waste regulations and assigns individual states responsibility for developing specific hazardous-waste programs. Both tasks have been difficult. After considerable effort, EPA published its first set of rules and regulations in May of 1980, including criteria for identifying hazardous and toxic wastes, a list of specific and nonspecific hazardous-waste streams, and a manifest system for controlling them from production to disposal ("cradle-to-grave").

Industry immediately criticized the regulations as expensive and stifling, calling for—at a minimum—added provisions establishing "degree of hazard." (Under the current system, all substances that fit EPA's broad definition of "hazardous" are subject to the same rules.) EPA is trying to respond to industry's demand, but developing an acceptable scheme may be impossible: the agency had considerable difficulty just creating a broad definition (*see page 40*).

While EPA and industry continue their controversy, the states have problems of their own. Many states want or need regulations stricter than those set by EPA, but while they have the legal right to set stricter laws, they might find it impossible to enact them without federal backing (*see page 48*). Like environmental groups, the states are worried about the Reagan administration's steps to cut EPA's budget and ease current regulations in an attempt to improve the economy.

### The Federal Perspective

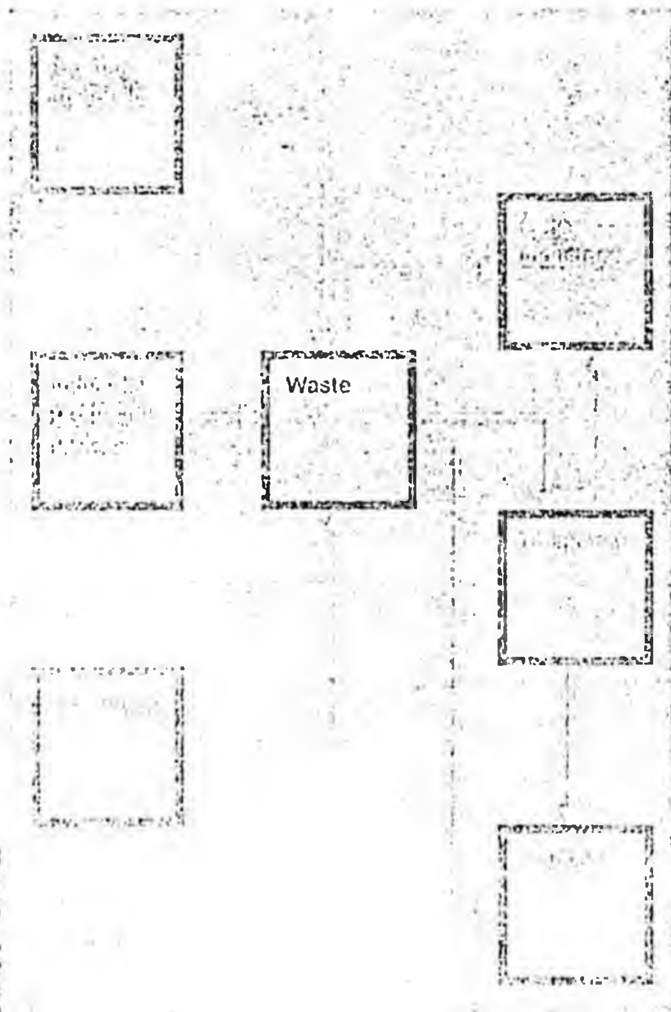
Despite those steps, the Reagan administration claims that the cleanup of hazardous spills and dumpsites is its highest priority. Such cleanup activities are covered by the Comprehensive Environmental Response Act of December 1980, which establishes a trust fund to pay for cleanup of waste sites and spills and assigns EPA responsibility for administering it. Of the $1.6 billion in this "Superfund," 87.5 percent will be collected from the chemical industry over a five-year period. Under the Superfund program, by July 1981, EPA had identified 9,300 hazardous waste sites, undertaken preliminary assessments of 5,900, completed investigations of 2,700, and begun emergency actions at 52. Both EPA and the Justice Department have been pursuing vigorous enforcement programs.

Nevertheless, some congresspeople and environmentalists are charging the administration with dragging its feet in administering the Superfund program. Many are concerned that EPA missed the June 1981 deadline for developing a National Contingency Plan, slated to be the cornerstone of the Superfund response actions. Furthermore, EPA has not completed a uniform scheme for states to rank sites they identify as threatening. And emergency actions taken thus far have focused mostly on preventing further leaching of hazardous materials from existing waste sites into groundwater; little actual hazardous-waste removal and treatment has occurred. There is also much speculation that Superfund money will not be sufficient for cleanup, with administration of the program taking most of the funds.

Environmental groups and many states fear the administration will not spend all the fees collected from industry to clean up priority sites. States could be faced with cleaning up both priority and nonpriority sites—a task exceeding the capabilities of most state budgets. Likewise, industry worries that it will end up with excessive financial responsibilities. If EPA judges a company's cleanup efforts inadequate, the agency will do the work and bill the company three times its expenses. But when a company cleans up its own sites, there is no limit on its cleanup responsibilities—no definition of what is "adequate."

The crux of the hazardous-waste regulation problem is clear: we do not have enough solid scientific information to identify with certainty the "right" level of regulation. And it is not surprising that battles are highly emotional: too much regulation can severely impair our economic well-being, while too little regulation can threaten our very lives. Nevertheless, we must not let the regulatory furor obscure one encouraging fact: while we may not fully understand all aspects of the hazardous-waste issue, we do have the basic technology to handle most waste-related problems. Many of the processes are expensive, but their costs are outweighed by the potential gains associated with saving human lives, decreasing human

To manage hazardous wastes, the general pathways of industrial waste generation, recycle, and disposal must be considered. The best solution includes reducing the initial quantity and danger of hazardous wastes, and many industries are modifying their processes to accomplish this source reduction. Wastes can also be recycled or reused; what's left must be treated and disposed of in an environmentally acceptable way.




CHARTS: DIMAGRAPHICS

suffering, and protecting our environment from toxic chemical contamination. Also, research is underway in government, industry, and academia to improve the technology, and the prospects for even more effective, less costly methods of treatment and disposal are good.

## The Magnitude of the Problem

According to EPA's definition, between 10 and 17 percent of all chemical wastes are "hazardous"—some 35 to 60 million metric tons (77 to 130 billion pounds) in 1980. Although some toxic substances are now being banned, production of chemicals is increasing and new materials are being identified as hazardous, resulting in a 5 to 10 percent growth in the amount of hazardous wastes generated each year.

Essentially all industries, both manufacturing and nonmanufacturing, produce hazardous wastes in varying amounts and compositions. Most wastes come from very large generators, typically large manufacturing facilities located in the Mid-Atlantic, Southeast, Great Lakes, and Gulf Coast regions. In the nonmanufacturing sector, generators include schools, hospitals, gas stations, and repair garages.

In all, there are about 760,000 individual generators of hazardous wastes. About 40,000 produce more than five metric tons of wastes per month, while 695,000 produce less than one metric ton per month. The top 5 percent of the generators are reponsible for 98 percent of the nation's wastes, while 91 percent of the generators together contribute only 1 percent of the total. However, the geographical distribution of large and small generators is not uniform nationwide (*see the figure at the right*). This regional variation is one of the factors making federal regulation of hazardous wastes difficult.

The EPA has estimated the total wastes and hazardous wastes generated by 14 specific industries (*see the figure on page 38*). Primary-metals and inorganic-chemicals industries are the biggest waste producers on the list, yet proportionally the fractions of their wastes that are hazardous are extremely low: 7.5 percent and 5 percent, respectively. Excluding pharmaceuticals, the other industries produce wastes that range from 24 percent to 100 percent hazardous. Together the primary-metal, organic-chemicals, pesticides, explosives, electroplating, and inorganic-chemicals industries produce about 83 percent of the total hazardous wastes generated by the industries.

A complete picture of the hazardous-waste problem must include wastes produced and handled in the past. It's estimated that from 330 to 570 million metric tons of hazardous wastes were produced between 1960 and 1980. Though some of these wastes have been eliminated through proper treatment and disposal, significant quantities have been kept in over 100,000 industrial disposal sites, many still operating today. In addition to the identified sites, we must assume there are many sites that have long been closed and cannot now be accounted for. Clearly, not all industrial sites pose an immediate threat to human health, but experts estimate that between 1,200 and 34,000 sites may cause problems, such as underground water contamination, and eliminating dangers at those sites may cost more than $50 billion.

Unfortunately, precise sources, volumes, and components of the nation's hazardous wastes are not yet known and may never be public knowledge: the industrial sector is highly competitive and secretive, and

In 1980, an estimated 760,000 generators produced 35 to 60 million metric tons of hazardous waste. Most wastes come from large generators—typically large manufacturing plants in the Mid-Atlantic, Southeast, Great Lakes, and Gulf Coast regions. Proper treatment and disposal of hazardous wastes from large generators will make the greatest national impact, but in many regions small hazardous-waste generators pose serious local problems.

Percentage of total hazardous wastes
Percentage of total waste generators

many companies believe information on their waste streams should remain confidential. But if we consider the enormous quantities of hazardous wastes being generated and stored, the persistence of many of the constituent compounds, and the difficulties involved in identifying their short-term and long-term toxic effects, we must conclude that our hazardous-waste problem is very serious indeed.

## Waste Generation and Management

Hazardous wastes are produced by virtually all types of industries, and characteristics of the waste streams are as variable as the industries themselves. Although many cleanup and disposal options exist, no single process can be applied to all types of waste streams. Considerable knowledge and judgment are needed to select a suitable process for each specific waste or class of wastes.

To clarify the approaches to managing hazardous wastes, it is helpful to consider general pathways by which wastes are generated. There are essentially three sources of wastes (*see the figure on p. 36*). All industries require raw materials, and frequently a fraction of those materials ends up as waste streams. The process of using raw materials to form a product or perform a service also produces a substantial amount of waste. Finally, consumers create wastes by using and discarding the products.

There are several options for managing wastes, also shown in the figure:

☐ They can be recycled within the industry that produced them.

☐ They can be sold to another industry.

☐ They can be treated and recycled within the same industry, sold to another industry, or disposed of.

☐ They can be disposed of without pretreatment (a practice that is illegal for hazardous wastes).

**Total and hazardous wastes generated by 14 specific U.S. industries, estimated by the Environmental Protection Agency.**

This analysis is valuable because it makes clear the several strategies available for reducing the hazardous-waste problem.

*Source Reduction.* Clearly, the ideal solution involves reducing the quantity and danger of hazardous wastes produced in the first place. Although source reduction is not always feasible, many industries are working to modify their processes to accomplish that end. Some companies are altering or pretreating their feedstocks, while others are changing processes or selected operating conditions to reduce the formation of hazardous compounds. The expenses will be partly offset by lower treatment and disposal costs and reduced potential for future problems.

Such economic incentives have recently been increased: industry must use expensive treatment and disposal practices mandated by RCRA, and must pay high prices for raw materials, particularly petroleum, petroleum-derived intermediates, and strategic minerals. Nevertheless, regulatory action may be required to ensure that all waste producers pursue source reduction. It is encouraging that industry has made significant changes, a notable example being the development of easily biodegradable pesticides to replace persistent ones such as DDT.

*Waste Recycling and Reuse.* Despite source reduction, however, some hazardous wastes will no doubt be produced. Before disposing of those materials, industry can explore another option, recycling and reuse. In the past, environmental regulations were minimal, and the cost of recovering materials from waste streams was greater than the cost of acquiring new materials; recycling was therefore rare. But higher costs of treatment, disposal, and raw materials are making recycling far more attractive.

Most companies are actively pursuing new ways to recover and reuse their own wastes. But given the wide variety of companies nationwide, the greatest

Clearly, the ideal solution involves reducing the quantity and danger of hazardous wastes produced in the first place.

opportunity for increased recycling clearly lies in industry-to-industry transfers. However, such transfers are difficult to arrange because of competition; industry places great value on secrecy, so it is difficult if not impossible for one company to know what materials are available from another.

This problem is being solved through establishment of waste clearinghouses and waste-exchange organizations that list available materials without identifying their sources. When RCRA was passed in 1976, there were 4 such waste exchanges; in 1981 there are at least 29. And many of today's exchangers are quite aggressive: while some still simply provide lists of available materials, others seek out both producers and potential consumers. There are also waste brokers who act as agents for waste-generating companies, receiving a commission for each successful sale.

One of the fastest-growing recycling markets is in chemical solvents. Recycling solvents has always been feasible; these high-value compounds can frequently be recovered by simple distillation techniques. RCRA further encouraged such recycling by making disposal of spent solvents difficult and expensive. By early 1981, solvent recycling involved some $200 million per year, and experts foresee a billion-dollar yearly market by 1986. The National Association of Solvent Recyclers, formed in Dayton, Ohio, in 1980, now has 43 members. These and other companies are making plans to construct improved facilities to handle chemical solvents. Some of the plants will recycle all the solvent, some will recycle part of the material and recover the rest as synthetic fuel oil, and others will convert all the waste to fuel.

While the trend toward recycling is clear, more can be done. Today only about 10 percent of the materials listed with waste exchanges actually changes hands; in older European organizations 30 to 40 percent is traded. Part of the problem stems from current regulations. Provisions of RCRA do not cover recycling activities comprehensively. For example, under present law some recyclers are not required to have permits for processing wastes unless they generate their own hazardous wastes. (However, recyclers may need permits for storage and transportation.) Such complications may make waste-generating companies hesitant to deal with recyclers and brokers, because if the company receiving the waste does not handle it correctly, the liability may revert to the waste generator.

The EPA is now considering revising RCRA to provide for better control over waste recyclers. However, the Chemical Manufacturers Association and a host of chemical companies are challenging EPA on the grounds that materials destined for recovery, recycling, and reuse are, by definition, not waste and thus should be exempt from hazardous-waste regulations. Although this point is valid, the likelihood that such an exemption will materialize is quite slim, as some recyclers were among the major offenders of environmental law in the past.

Meanwhile, two bills supporting recycling are being considered by Congress. One would make procedural changes in RCRA that encourage creation of pollution-control facilities, including recycling units. The other would increase the investment tax credit for companies involved in energy conservation and waste recycling. Senate hearings on the former bill were held in June 1981; hearings on the latter bill have yet to be scheduled. With such changes pending, the outlook for recycling is better than ever.

However, we must not have unrealistic expectations: according to a 1976 study by Arthur D. Little, only 3 percent of the 350 million metric tons of industrial wastes generated that year were potentially recyclable, although the fraction of hazardous wastes that is recyclable is probably higher. Changing regulations and rising prices have no doubt increased both percentages, but the fact remains that for certain types of wastes, recovery and recycling are simply not yet practical. The best we can do is to treat and dispose of such wastes in an environmentally safe way.

### Classifying Hazardous Wastes

There are many waste-treatment and disposal processes, each best suited to certain types of materials. Therefore, the first step toward effective waste management is to examine an individual waste stream in enough detail to identify the appropriate processing techniques. The most practical method of classifying substances is according to their basic physical and chemical properties.

The first decision involves the state of the waste stream: is it predominantly a gas, a liquid, a solid, or a mixture? Next, the waste is classified according to its chemical constituents: are they organic or inorganic? Explosive materials should be identified, as they require special handling. Both organics and inorganics are subdivided into aqueous and nonaqueous categories, and then classified according to their concentrations of heavy metals. Heavy metals are important because their presence complicates many waste-treatment operations. Organic wastes can be further classi-

# The Difficulties of Defining Hazardous Wastes

ESTABLISHING effective and just hazardous-waste regulations is difficult, in part because it is hard to define precisely which materials should be considered hazardous. Should a chemical be classified as hazardous because at some dosage it is toxic to humans? If so, should it be regulated only at certain levels of generation?

Not surprisingly, different people offer drastically different answers to such questions. At one extreme are those who believe human activities should generate no pollutants; they advocate very strict government regulations. At the other extreme are those who believe industry can and should take responsibility for protecting the public; they are opposed to any government regulation of any industry.

## A Delicate Balance

The practical optimum is somewhere between those extremes, and therein lies the problem. The best regulations would protect human health and the environment while imposing the minimum economic hardship on industry and thus our national economy. Unfortunately, we do not fully understand the possible long-term adverse health effects of many chemicals. Indeed, only recently has environmental contamination been recognized as a problem worthy of intensive scientific research. Regulators have thus been faced with the problem of imposing quantitative pollutant emission controls in the presence of little (if any) solid scientific data.

Some hazardous wastes have properties that are easy to recognize—for example, ignitability, corrosivity, reactivity, and acute toxicity—making their definition and regulation relatively uncontroversial. However, chronically toxic chemicals are harder to identify and thus are the subject of considerable controversy. Chronically toxic compounds can take 15 to 20 years or longer to produce adverse health effects. Because everyone is exposed to a wide variety of chemicals for many years, it is difficult to identify cause-and-effect relationships. Although epidemiological studies, bioassays, and other research efforts provide some insight, our understanding of the scientific principles of chronic toxicology is in its infancy and inadequate for clearing up regulatory disputes.

Defining and identifying acutely toxic chemicals can also be a problem because virtually all substances become toxic at sufficiently high doses. Some chemicals produce death in microgram doses and thus are commonly considered extremely hazardous or toxic. Others are essentially harmless, inducing a toxic response only at doses over several grams. But most chemicals fall between those two extremes, posing the question of where on such a scale we make the (perhaps arbitrary) switch from "toxic" to "safe."

There is yet another problem in deciding whether specific compounds are hazardous. Laboratory tests generally focus on a single compound, but compounds almost always exist in mixtures, and there is growing evidence of synergisms between them. Thus, the health impacts of the mixture may be totally unlike those of the individual components. For example, we may determine that a compound is harmless, but in combination with another (perhaps harmless) chemical, this compound may become highly toxic. Since we do not understand how these interactions occur, we need to examine not only an enormous number of chemicals but also all possible combinations—a formidable task. Furthermore, most standard laboratory studies use nonhuman subjects and high chemical doses, so another troublesome question is how reliably we can extrapolate the results to people. Although this is also a highly controversial area, single-cell and animal tests will be the major source of quantitative toxicity data until better means are developed.

Despite the present shortage of information, in response to public outcry, the U.S. Environmental Protection Agency (EPA) developed a system for identifying hazardous wastes through well-defined characteristics such as ignitability, corrosivity, reactivity, and acute toxicity as determined through a specific extraction and testing procedure. The EPA system also considers each chemical's chronic toxicity, changes in its health impacts at various concentrations, its potential for degrading into toxic products, its persistence in nature, and its potential for bioaccumulation. The EPA has also created a list of specific and nonspecific hazardous-waste streams.

There are several indications of the difficulty EPA had in establishing hazardous-waste regulations. First is the long time delay before any action was taken. The Resource Conservation and Recovery Act mandated that EPA establish hazardous-waste regulations in 1976, but the agency did not publish any rulings until May of 1980, primarily because of its problems in defining the legal and technical terms on which the rulings are based. Even today, those terms are not defined with sufficient scientific rigor—this situation leads to continuing conflict between industry and regulatory agencies.

## As the List Changes

As an even clearer demonstration of the problems of regulating hazardous wastes, the official list of hazardous wastes is constantly changing. In May 1980 that list contained about 300 chemicals and 80 waste streams (*see the figure*). There have been almost daily additions to the list as more toxicological evidence is obtained about specific compounds or groups. Not surprisingly, many substances

have also been dele ed, since EPA created the list under substantial public pressure and in many cases without sound scientific data. Given that situation, the tendency was to include any waste streams that aroused the slightest suspicion. Whenever research uncovers an unnecessary item on the list, industry claims "overregulation."

Arguments among environmentalists, waste-producing industries, and regulators (who consider themselves caught in the middle) are energetic and often emotional. The difficulties of regulating hazardous wastes can be reduced only through the acquisition of better scientific data. Recognizing that fact, researchers are now creating new fields of study combining engineering, environmental chemistry, and toxicology to help define and quantify the risks associated with various types of potentially hazardous wastes. With such information we will be in a better position to attack the complex issue of determining which risks can be reduced or eliminated, and what levels of risk we may have to accept to maintain our industrialized society.—*S.M.S. and N.W.S.* ☐

| [illegible] | |
|---|---|
| [illegible] | |
| Nonspecific Sources | |
| [illegible] | |
| Specific Compounds | |
| [illegible] | Chlorobenzene |
| [illegible] | Chloroform |
| [illegible] | DDT |
| [illegible] | Methanol |
| [illegible] | Naphthalene |
| [illegible] | Phenol |
| [illegible] | Formaldehyde |
| [illegible] | Toluene |

**The Environmental Protection Agency has compiled a list of hazardous wastes and waste streams, considering such factors as acute and chronic toxicity, ignitability, corrosivity, breakdown products, and potential bioaccumulation. In May 1980, the list contained 300 chemicals and 60 waste streams; examples are shown in the table. There have been many additions and deletions as the list has developed, with changes often bringing charges of "overregulation" from some industries.**

fied according to whether they are biological.

Unfortunately, most waste streams contain mixtures of all sorts of materials, and it is necessary to use several processes, either in series or in parallel. Since this practice leads to even higher treatment costs, it is likely that industries generating hazardous wastes will move in the direction of making their waste streams more uniform.

### Designing Facilities

Choosing an optimal design for a waste-treatment and disposal facility is not simple, as different generators have different needs and options. There are at least three possible choices for generators of small quantities of hazardous wastes. They can install permanent, small-scale treatment facilities at plant sites and then use regional sites for ultimate disposal of treatment residues. They can use a contractor with specialized, mobile treatment units that operate at the plant site from time to time. Or they can use the services of a specialized treatment/disposal company.

The concept of a completely integrated regional facility is appealing but hard to implement (*see the figure on page 44*). Such a facility must be able to handle both large and small quantities of hazardous wastes at a reasonable cost, and must be readily accessible to a large number of generators. The siting of such a facility involves careful analysis of the geography, geology, topography, and hydrology of an area, along with social, economic, and political factors.

While integrated regional facilities are useful for small generators, companies that generate large quantities of wastes may be best served by having their own waste-treatment systems, even if there is no suitable landfill nearby for disposal of the treatment residues. Treating the wastes at the point of generation frequently reduces the amount and danger of the waste material and provides substantial reduction in transportation and related costs. Having their own treatment plants also enables companies to take greater advantage of recovery and recycling.

### Treatment and Disposal Methods

There is a long list of processes for treating hazardous wastes (*see the table on page 43*). These processes are basically designed to reduce the volume of the waste, separate it into individual components that are easier to process, and/or detoxify it. Often certain processes also allow resources to be recovered. Each

Treatment processes are designed to reduce the volume of the waste, separate it into individual components that are easier to process, and detoxify it.

process ultimately produces residues that require a final disposal site, typically a secured landfill. Rather than describe each process, we will focus on a few that have a relatively broad range of applicability.

*Incineration and Pyrolysis.* The hazardous nature of certain wastes may be due to the structure of the molecules present rather than to the properties of the elements contained. In such cases, high-temperature treatment may simultaneously detoxify the waste and reduce its volume. The most common thermal treatment methods are incineration and pyrolysis.

Incineration involves burning wastes in the presence of sufficient oxygen with or without the use of an auxiliary fuel source. The products are generally gases (carbon dioxide, steam, hydrochloric acid, and sulfur dioxide) and ash with essentially no heating value. Pyrolysis essentially involves heating wastes in the absence of oxygen: the wastes thermally decompose to form a solid carbonaceous residue along with gaseous products. Often these two processes are combined.

The advantages of incineration and pyrolysis are substantial. These processes can in principle be applied to almost all organic wastes not severely contaminated by volatile heavy metals, and they can be used equally well on some inorganics. The facilities are capable of handling large volumes at a time, there is potential for energy and materials recovery, and the necessary equipment requires relatively little land. Finally, the processes can reduce the volume of most wastes to a minimum, reducing their danger and the costs of storing and transporting them.

However, there are several disadvantages to incineration and pyrolysis. The processes tend to be technically complicated and costly to operate—as high as $300 per cubic meter of waste. The methods may not be directly applicable to some hazardous-waste streams because of the unusual combustion characteristics of some toxic wastes, especially those containing halogenated compounds. In addition, under some circumstances the processes produce a toxic residue that requires special disposal techniques, and they frequently give off pollutants such as carbon monoxide, hydrochloric acid, chlorinated dioxins, sulfur dioxide, or soot, requiring strict operating controls and additional pollution-control equipment.

Incinerators are used both at industrial plants where wastes are generated and at specialized disposal facilities. Incineration requires the user to select a system design suited to the type of waste, and operating conditions should be fine-tuned to the particular waste being burned. Certain materials in wastes also require special handling. For instance, heavy metals such as arsenic, selenium, sodium, and mercury must be removed before incineration.

Our understanding of the subtleties of incineration and pyrolysis is limited, but advances are being made. For example, the Midwest Research Institute in Kansas City is opening a facility that will provide information on the compounds formed in an incinerator. The facility simulates actual incinerator conditions, but includes ports from which samples can be taken; the compounds in those samples can be identified and quantified. By running the system under different operating conditions, the researchers claim they can identify conditions that result in 99.99 percent destruction of the principal organic hazardous constituents—the level required by EPA.

In our laboratories in the Department of Chemical Engineering and the Energy Laboratory at M.I.T., fundamental combustion studies are in progress. We are examining the basic combustion characteristics of a variety of chlorinated hydrocarbons and their mixtures, thereby establishing a better understanding of the scientific principles involved in the incineration of toxic chemical wastes. And at the University of Dayton, researchers are examining the pyrolysis characteristics of toxic chemicals using a laboratory-scale thermal-decomposition analytical system.

*Biological Methods.* Biological treatment offers an effective means of handling organic and some inorganic toxic wastes. The waste stream is brought into contact with microorganisms that detoxify the waste material—decomposing organic molecules into carbon dioxide, water, or compounds with lower molecular weights. If the microorganisms are aerobes, molecular oxygen must be added to the systems; if they are anaerobes, oxygen is not necessary for them to degrade the wastes. (There are also certain microorganisms that can act either as aerobes or as anaerobes.) Of the aerobic and anaerobic processes, the former are generally faster and have wider applicability.

Principal biological treatment processes include activated sludge systems, trickling filters, aerated lagoons, anaerobic digestion systems, and composters. The first three processes can be used for aqueous waste streams with total contaminant levels under 1 percent. The activated sludge system is particularly well-developed and tested, having been used in industry for many years. Its attractive features include compactness, flexibility, and relatively rapid rates of degradation.

Major hazardous-waste treatment and disposal processes

| Process | Function Performed | Type of Waste | Forms of Waste | Typical cost range (Dollars per cubic meter of waste) |
|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

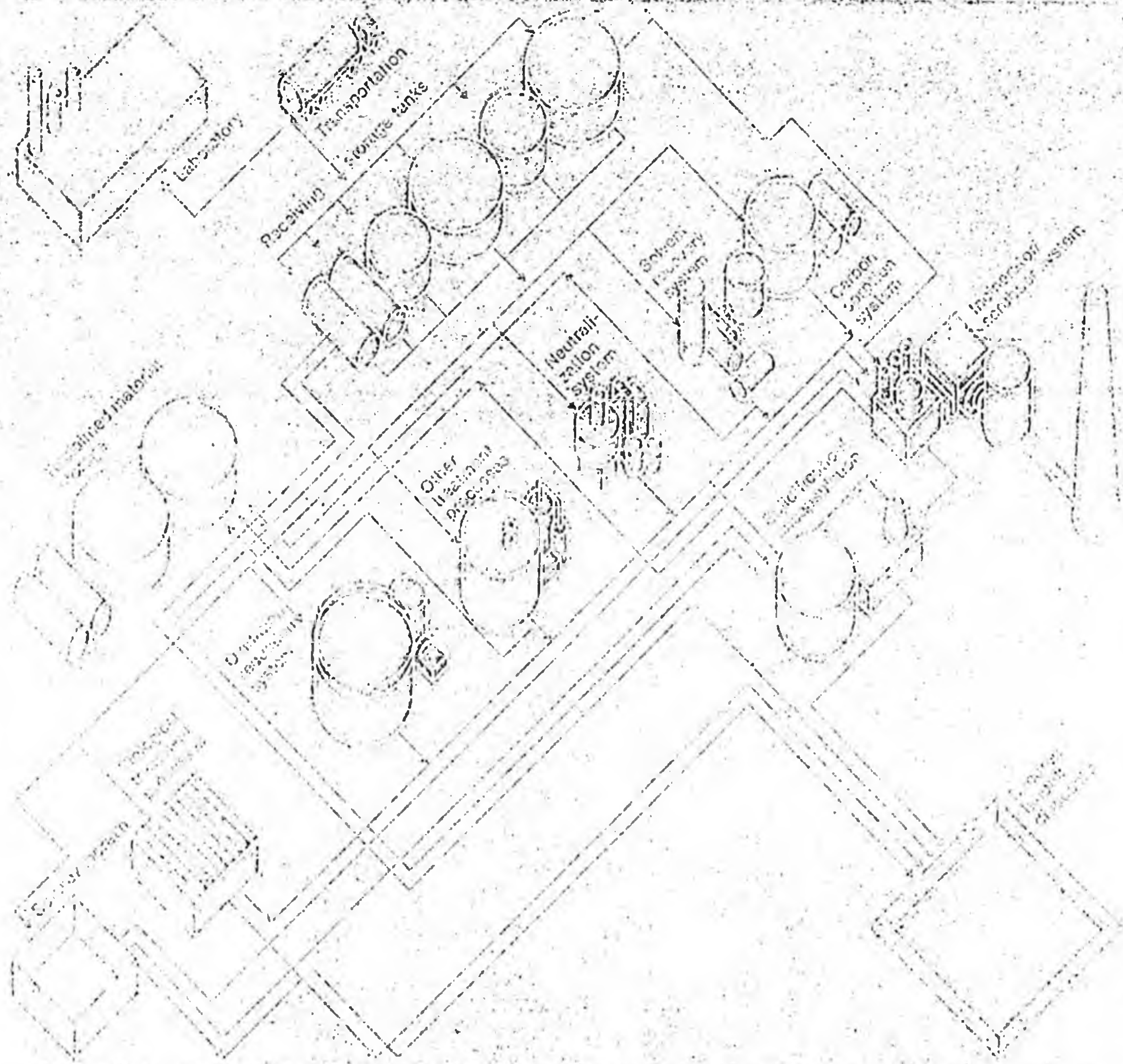
Anaerobic digestion and composting systems can tolerate concentrations of contaminants up to 10 percent and 50 percent, respectively. Of all biodegradation systems, composting is probably the best choice for most organic waste streams, primarily because it is not as sensitive to changes in flow rates, composition, and concentrations of the wastes. Composting uses organisms that can live at relatively high temperatures (45°C and up), and those temperatures and long residence times make bioconversion thorough.

Almost all organic compounds, including halogenated hydrocarbons, are biodegradable. However, there are a few limitations. The compounds in the waste must be nontoxic to the microorganisms. The wastes also must contain some water: enzymes play a key role in the microorganisms' degradation of wastes, and enzymes require water for their activity. Soluble inorganics must be kept to a minimum as they can inhibit the enzymatic conversion process and are generally unaffected by biological treatment.

Nevertheless, biological methods are widely applicable to organic wastes, and operating costs of most methods are low. Depending on the waste stream and the process used, typical costs range from $1 to $20 per cubic meter of waste. The major drawback is that large land areas can be required to hold wastes during the long, slow biodegradation process.

*Adsorption.* This well-established technology removes organic as well as some inorganic contaminants from aqueous streams. The waste stream is brought into contact with porous particles that adsorb the contaminants; the contaminant-bearing particles are then removed from the system. The adsorption process is often reversible, so removed material can be recovered or treated for disposal, and the sorbent can be regenerated and recycled. The costs of such treatment are generally between $5 and $20 per cubic meter of waste treated.

The most common sorbent is carbon. Activated carbon has been used for years to treat drinking and




An integrated hazardous waste treatment and disposal facility, here represented schematically, must be able to handle both large and small quantities of hazardous waste at a reasonable cost [illegible]

[illegible] components are essential to any such operation. First, there must be a well-equipped laboratory, perhaps the most important part of an integrated facility, since here incoming hazardous wastes are analyzed and treatment methods selected. The laboratory oversees the [illegible] of each system in the facility. To minimize operating costs and risks associated with handling the wastes and storing the residues, every treatment operation must function with utmost efficiency. Monitoring the residual landfill leachate and streams from the various processes requires a dedicated laboratory and personnel equipped with the necessary analytical tools.

Second, it requires a sufficient storage space, primarily because incompatible waste streams must often be stored in isolation. Separate [illegible] also useful because one waste stream can sometimes be used to [illegible]. For example, [illegible] can be combined to [illegible] each other.

Secured landfills are designed specifically to contain hazardous wastes, and when operated properly should minimize contamination of the environment.

waste waters, decolorize liquids, control odors, and recover solvents. Activated carbon is obtained from coal, wood, coconut shells, and other organic materials, and is used in either granular or powdered form. The specific raw materials and manufacturing method determine the carbon's structure, adsorption characteristics, and regenerability. Regeneration is usually accomplished by heating the carbon particles until materials held in their pores desorb—a procedure that is expensive because of its high energy requirements. However, this thermal technique may one day be replaced by improved methods, such as critical solvent extraction, which uses milder temperatures and therefore is less costly.

The other common sorbent is resin. Resin has a lower adsorption capacity than activated carbon, but its chemical nature can be manipulated to make it highly selective. Also, resin regeneration does not require such high temperatures; thus, resin may be better than carbon when material recovery is desirable. In combination, the activated-carbon and resin adsorption systems could become widely used, as together they offer flexibility at an acceptable cost.

*Solidification/Encapsulation.* This is the process of deactivating and immobilizing toxic chemicals by incorporating them into the structure of a stable solid compound with high physical strength, minimal leachability, and (ideally) minimal cost. Although solidification/encapsulation is now used for a small fraction of hazardous wastes, it promises to become one of the most important disposal techniques.

Practically all processes for treating hazardous wastes produce some residue, and frequently that residue is also toxic. Therefore, solidification is usually the last treatment operation before waste streams are sent to a secured landfill for storage. Also, for concentrated heavy-metal solutions and hazardous wastes that cannot be incinerated or detoxified by other methods, solidification is the only environmentally sound method of preparing the wastes for storage.

There are four major kinds of solidification technologies: cement-based, lime-based, thermoplastic, and polymerization. Techniques using cement are most common because they are cheap and easiest to use. They are effective principally for inorganic wastes, especially those containing heavy-metal cations such as cadmium, chromium, copper, lead, mercury, and nickel. The alkalinity of the cement stabilizes the heavy metals in the form of hydroxides, much as did the ores from which the metals originated. Asbestos, metal filings, and other materials often present in waste streams add strength to the cement matrix, and companies generally use proprietary additives to make the cement even stronger. However, organic materials in the wastes generally weaken the cement.

A major advantage of cement-based techniques is that wastes need not be dried before processing. On the other hand, the resulting solid matrix is vulnerable to acid leaching and the freeze-thaw and wet-dry cycles of the environment. However, these problems can be overcome by burial beneath the frost line.

Lime-based techniques are similar to cement-based methods in principle and application. They are somewhat less expensive, but the solid matrix is weaker and thus more vulnerable to environmental changes.

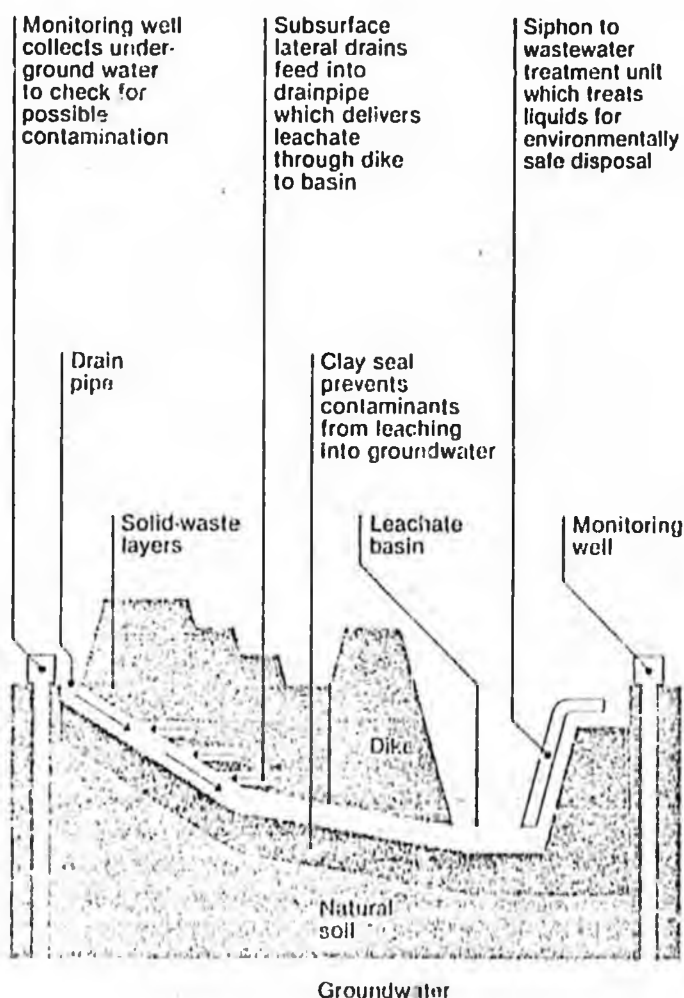
Thermoplastic techniques use bitumen, asphalt, and other materials that soften when heated, bind tightly to waste materials, and solidify when cooled. Wastes frequently must be dried before being mixed with the hot thermoplastic material. The principal advantage is that the binders immobilize waste materials very well, and the resulting solid structure allows minimal leaching, being very resistant to most aqueous solutions and acids. Thermoplastic techniques are thus especially suited to highly hazardous and concentrated wastes. However, the solid structure may be flammable and deteriorate if exposed to organic solvents. Another drawback is that thermoplastic processes have high material and operating costs.

In the polymerization method, a monomer is mixed with the wastes and allowed to polymerize, trapping the toxic materials in the resulting matrix. Because material requirements are lower, this process is less expensive than thermoplastic methods. The process also is applicable to both aqueous and nonaqueous hazardous-waste streams.

Many of the approaches used in solidifying hazardous industrial wastes are based on processes developed for the treatment of radioactive wastes. Those processes have been modified to take into account the larger volumes associated with toxic chemical wastes.

*Secured Landfill.* Secured landfills are sites for the ultimate disposal of liquid and solid wastes, mixtures, and residues from *all* waste-treatment operations. Such sites are designed specifically to contain hazardous wastes, and when operated properly should minimize contamination of the environment.

Past experiences with landfills have been dismal. Many landfills were created in marshlands, abandoned sand and gravel pits, and other sites that have




A secured landfill has a number of essential geological, hydrological, and geographical features. Past experiences with landfills have been dismal, with many sited where they could contaminate underground water. However, secured landfills offer the best method for disposal of many hazardous wastes and are the only viable method for most inorganics. (Diagram: Chemical Manufacturers Association)

hydraulic connections with underground water. Poor strategic planning also meant wastes were often transported great distances. Despite such a bad track record, secured landfills offer the best method for disposal of many hazardous wastes, and the only viable one for most inorganics.

Proper landfill design involves geological, hydrological, and geographical considerations (*see the figure above*). Of utmost importance is location in thick natural clay deposits where the hydraulic transport of leachate to an underground water source is unlikely. Ideally, wastes in the landfill will have been properly solidified, but drums or other containers can be used for storage of liquids and sludges. Individual clay-lined cells may also be required to ensure that incompatible wastes do not come in contact with one another. To ensure proper operation of the site, special techniques that prevent failures are required, as are quick repair methods to be used in an accident. The facility's operating procedure must also include scientific studies that assess the risk of system failure and the impacts of possible accidents on people and the environment.

Recent regulations set by EPA under the provisions of RCRA were designed, in part, to ensure safer construction, operation, and closure of landfills. For example, the regulations require collection, monitoring, and treatment of the leachate. And the owner or operator of a facility is required to provide for post-closure care of the landfill for 30 years or more, as determined on a case-by-case basis. One may argue that such a period of post-closure responsibility is impractical since the operating company may not exist for that long. Moreover, many heavy metals remain toxic forever, so perpetual monitoring should be required. The EPA is now considering establishing some form of national insurance plan to cover such extended monitoring programs.

## Improving Our Options

To encourage proper handling of hazardous wastes, many research organizations and pioneering companies are trying to improve technological options. Some of their efforts are leading to novel ways of using standard techniques. For example, burning halogenated organic wastes at sea—on ships or unused oil rigs—has been shown to be both feasible and less expensive than standard land incineration because exhaust-gas treatment is not necessary.

But many techniques under development are quite different from old ones. Lockheed and EPA have developed a microwave plasma process for detoxification of pesticides and other toxic wastes. Rockwell International is using molten-salt combustion to attain complete and rapid destruction of many toxic organic wastes; molten sodium carbonate rapidly absorbs many toxic emissions from the system, making exhaust scrubbers unnecessary. The Department of Agriculture is developing a method for treating chlorinated hydrocarbon-bearing wastes by simultaneously bubbling oxygen through the wastes and irradiating them with ultraviolet light. This process apparently breaks the chlorine-carbon bonds, and the

**Only with more basic research can we increase the fundamental knowledge needed to develop policies and technologies that provide maximum safety at reasonable cost.**

remaining compounds can be biodegraded by soil microorganisms.

Several companies are developing organisms that thrive on certain hazardous materials. For instance, Hooker Chemical has commissioned Battelle-Columbus to engineer an organism that thrives on chlorinated aromatics, and Koppers has contracted with Genex to develop an organism that detoxifies coal-tar wastes. Battelle Pacific Northwest Laboratories will soon begin field tests of a technique for immobilizing buried toxic-metal wastes. An electric current is passed between electrodes placed in the ground around the wastes, melting the wastes, soil, and rocks into a solid. The vitrified material becomes compact, leaving a hole that can be filled in.

Other new techniques are designed not only to treat hazardous wastes but to recover energy and materials—an important combination as we try to adopt processing techniques that conserve our resources. For example, Chem-Trol Pollution Services has burned chlorinated hydrocarbon-bearing wastes together with conventional fuels in a cement kiln, accomplishing waste treatment while producing cement and saving energy.

Similarly, several U.S. utilities burn wastes in combination with fuel oil to run boilers and generate electricity. In Geisman, La., Borden Chemical Co. is building a French-designed incinerator that burns chlorinated hydrocarbon wastes; the system provides recovery of both hydrochloric acid and a significant fraction of the heat of combustion. The use of water hyacinths—fast-growing plants—for treatment of both industrial and municipal wastes is being explored by Exxon and through a joint effort by EPA, the state of California, and the city of San Diego. While water hyacinths cannot tolerate high salinity, they efficiently degrade many organic materials (especially municipal wastes) and remove heavy metals. The hyacinths can later be harvested and either used for animal feed, composted, or fed to a digester that produces methane to fuel the facility.

Industry and government have set up special programs to study another aspect of the hazardous-waste problem: how to identify specific substances that pose a threat to humans and the environment. In 1975 the chemical industry established the Chemical Industry Institute of Toxicology (CIIT) in Research Triangle Park, N.C., to conduct tests on commodity chemicals, develop toxicological methodologies, and provide postdoctoral training of toxicologists. Thirty-six companies now support the CIIT, which has already produced important results, most notably evidence of the carcinogenicity of formaldehyde. The federal government performs many activities relating to the testing of hazardous chemicals through its National Toxicology Program.

In addition to testing specific chemicals, these and other organizations are designing new tests that will prove simpler, cheaper, and more accurate than existing methods. CIIT has recently developed a test for carcinogenicity that uses animals instead of cell cultures, allowing for the effects of chemical processes in the animal's body. The National Institute of Environmental Health Sciences has published the results of a two-year study involving 12 nations; it shows that no single test can be used on all potentially carcinogenic compounds, but suggests a series of tests that may be effective. Such procedures will help identify the most threatening wastes and combinations, enabling us to set priorities in tackling waste problems.

In spite of all our past and present work, our fundamental understanding remains limited. We do not know the exact mechanisms by which hazardous compounds damage the human body and the environment, nor do we have the full scientific knowledge needed to design and operate optimal waste-treatment and disposal processes. Indeed, our achievements have mostly resulted from empirical methods. Only with considerable basic research can we increase the fundamental knowledge needed to develop policies and technologies for hazardous-waste management that are scientifically sound and that provide maximum safety at reasonable cost.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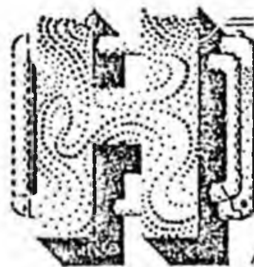
# The Federal-State Dilemma

by Ann Rappaport



AVING the necessary treatment and disposal technologies available is one part of the complex equation for solving the hazardous-waste problem. Ensuring that the technology is appropriately used is the other. Although government has adequate legal authority to require sound waste management, as a practical matter that authority cannot be exercised without substantial public and private support.

Many firms and institutions have not internalized waste-treatment and disposal costs, so adoption of treatment methods may require new investment in equipment or services. While regulations requiring waste management are clearly beneficial to public health, the environment, and the waste-disposal industry, other sectors of the economy foresee dramatic increases in the cost of doing business and are therefore fighting for exemptions and exclusions from regulations.

As directed by the Resource Conservation and Recovery Act of 1976, in May of 1980 the U.S. Environmental Protection Agency (EPA) published a comprehensive regulatory program to set a national pace. States are encouraged to assume responsibility for regulating their own hazardous wastes and ensuring their proper management. After all, individual states are in a better position than the federal government to tailor programs and regulations to local patterns of hazardous-waste generation and hydrogeological features.

An issue now being resolved on a state-by-state basis is the extent to which states may develop programs that go beyond the federal model. These concerns are illustrated by two examples: the manifest system and the exemption level.

*The Manifest System.* This is often referred to as the heart of the "cradle-to-grave" hazardous-waste tracking process established by federal law. The manifest is a shipping document indicating the origin, destination, type, and volume of waste and containing certification from each party that the waste is properly packaged and accurately characterized. All wastes in transit from a waste generator to a waste-handling facility must be accompanied by a manifest, and the facility must return a signed copy to the generator showing that the material has been received.

EPA decided to require that it be notified only when a signed copy from the waste-handling facility had not been received by the generator within 45 days of shipment. This is referred to as an "exception-reporting" system because government is informed that a shipment is in transit only after the waste and/or its paperwork cannot be located.

States such as California, New York, Illinois, New Jersey, Pennsylvania, and Maryland have implemented "load-by-load" tracking systems in which the generator and the facility send copies of all manifests to the state. Such a load-by-load system enables the state to identify trends and enforcement problems, pinpoint industry education needs, ensure that unsound practices are quickly stopped, and augment its data base on waste transactions.

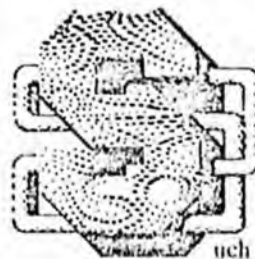
For example, individuals have sometimes inaccurately represented themselves to generators as being licensed to handle hazardous wastes. Under the federal system, a state must rely on annual reports and exception reports to identify a transfer to such an unlicensed party. Thus, a full year of disposal at an illegal facility can occur, with potentially serious consequences to public health and the environment. Under the load-by-load system, the state would receive a manifest indicating the transfer, and state staff could immediately provide a generator with a list of licensees and offer other assistance in interpreting regulations.

Opponents of the load-by-load tracking system argue that the paperwork is burdensome and that the federal system is adequate. Proponents of load-by-load tracking feel the paperwork burden is justified by benefits in protection, enforcement, and education.

*The Exemption Level.* States frequently have elected to be more stringent than the federal government in establishing exemption levels limiting the applicability of hazardous-waste regulations. Except for a few acutely toxic wastes, federal regulations provide that sources generating or accumulating less than 1,000 kilograms per month of hazardous waste need not comply with record-keeping, reporting, and handling requirements, and need not send their waste to an approved hazardous-waste disposal facility. This exemption level was based on the fact that 91 percent of hazardous-waste generators nationwide produce less than 1,000 kilograms per month, contributing only about 1 percent of the total hazardous waste produced each year. A closer look, however, reveals that national statistics may not be a sound basis for state policy.

For example, in the Northeast there are many small companies in the metal-plating, metal-finishing, paint and coating, and other industries that produce small amounts of hazardous waste. Consequently, concern has been growing about the potential effects of a large number of small generators depositing hazardous wastes in municipal landfills, particularly in areas where poorly protected aquifers are a major source of drinking water.

## States Take Different Route



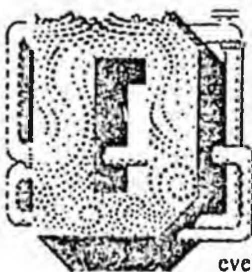
uch concern has prompted Rhode Island to establish a zero exemption, and New Hampshire, Vermont, Maine, and New York to set the exemption limits at 100 kilograms per month. Massachusetts' comprehensive regulatory program is in the draft stage, but a study of available data indicates that at 1,000 kilograms per month, perhaps 25 percent of the waste generated in the state would escape regulation, and at 100 kilograms per month approximately 5 to 7 percent would escape regulation. Obviously, exclusion levels must be practical. As the exemption level goes down, the potential for environmental protection increases, but eventually the limits of program administration are reached. There is clearly a need for compromise between exemption limits and

effective law enforcement in attempting to maintain acceptable public health and environmental protection.

While states are allowed to develop and enforce regulatory programs more stringent than federal programs, they often encounter formidable barriers—particularly lack of resources and influence. Most state governments have traditionally had a harder time than private industry and the federal government in attracting and keeping qualified staff and in obtaining sufficient resources for research and program administration. Each state also needs to attract new businesses and keep old ones, and competition among the states is stiff. Compounding these difficulties are new initiatives to limit government spending and a growing sentiment that government regulation stifles economic expansion and contributes to inflation. These factors can adversely affect both the timing and quality of state efforts to ensure sound waste-handling practices quickly enough to prevent future problems.

Also, industry groups that win exemption from federal regulations will usually oppose state efforts to establish different exemptions or requirements. States seeking to protect a local phenomenon, such as a vulnerable aquifer used for drinking-water supplies, could face real problems if challenged, since few states can match industry resources. States must then look to the concerned public and innovative industries to support strong regulatory programs. Firms that make early investments in source reduction and sound waste handling may rely on government efforts to prompt their competitors into making comparable expenditures.

## The Public's View

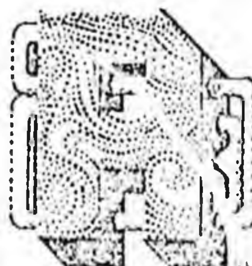


Developing sound and effective programs for hazardous-waste management is complicated by an often emotional public reaction to real and perceived threats. Without scientific data, environmental and health consequences of particular situations are often speculative. As a result, communities adversely affected by chemical contamination often push for conservative remedial actions. In Plymouth County, Mass., for example, a variety of toxic chemicals, apparently leaching from a municipal landfill, reached wells providing drinking water to homes. The levels of contaminants detected were well below the "Suggested No Adverse Response Levels" (SNARLs) established by EPA, based on the limited available epidemiological and toxicological data.

Local decision makers therefore had two choices: they could do nothing, based on the rationale that contaminant levels are far below SNARLs; or they could appropriate $775,000 to provide affected homes with water from an uncontaminated town well. The town chose to pay for the alternative water supply.

Risk-averse behavior of this type is to be expected at the local level. However, when risk aversion is extrapolated to the state or national level, it suggests a scale of corrective actions with a dollar value that far exceeds government's ability to pay. In fact, federal "Superfund" monies allotted for site cleanup are expected to be so meager in many states that only the most serious problems will be tackled. For example, the current list of problems in Massachusetts includes contamination by polychlorinated biphenyls (PCBs, a family of persistent synthetic compounds) of an estuary and major fishing port, possible thallium poisoning of residents in a rural town, and several sites where stockpiled wastes threaten major public sources of drinking water. Thus, the Plymouth County situation and others like it are not serious contenders for federal or state funds. Massachusetts and other industrialized states with many contamination problems clearly lack the resources to provide zero-risk remedies that the public expects. Industries performing their own cleanup operations face the same problem.

## Cost Cuts Cause Criticism



Recognizing serious fiscal constraints, government increasingly looks for ways to minimize costs in providing acceptable solutions to site contamination problems. Sometimes this means taking actions that critics see as government capitulation to industry pressure. For example, in cases where responsible parties can be identified and the threat to public health is not imminent, agencies may negotiate compliance and schedules for remedial action designed to keep the violator solvent and ensure corporate responsibility for cleanup or containment. But where an agency considers the threat to public health imminent, it may take immediate measures to stop polluting activities, running the risk that taxpayers will have to pay for corrective action if the violator declares bankruptcy.

Hazardous-waste regulations now contain details on performance standards, operating procedures, security measures, contingency plans, and a host of other provisions designed to protect public health and the environment. New statutes and regulations also require establishment of trust funds or other mechanisms to prevent taxpayers from assuming the financial burdens for unsuccessful or mismanaged waste-disposal ventures. But skeptics still question the adequacy of regulations and the ability of government or any other group to enforce their provisions.

To overcome such skepticism and community resistance to the siting of new facilities, regulators are encouraging widespread public participation in all aspects of the program: in developing the regulations, in monitoring facilities' compliance with performance standards, and in carefully selecting sites for waste-treatment facilities. These methods have yet to be put to a suitable test on the national level, but community participation in the development of regulations at the state level has already yielded positive results. □

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# Acknowledgement

The National Wildlife Federation gratefully acknowledges the contribution of the many people without whom the full story behind the budgetary attack on the U.S. Environmental Protection Agency could not be told. Some of these people worked for the EPA in previous administrations, Republican and Democratic. Some have spent their professional careers with independent environmental and conservation organizations monitoring the programs now under attack. Special thanks goes to the American Environmental Safety Council (SAVE EPA), and the people who spent countless hours keeping our facts straight: Elizabeth Hayman and Thomas Wall. In the past the contributors to this effort have disagreed with each other on issues of program direction, priorities and strategy. All, however, share a strong commitment to the protection of public health through the sensible implementaiton of our basic environmental laws. The Federation also is grateful for the tireless efforts and good humor of the design and layout staff at Arts & Words including Terry Atkinson, Art Director; Eduino Pereira Production Manager; Ann Bucklew, Shirl Der Nevas, Jim Goodman, Vicki Harrell, Janet Krezell, Geoff Simonds, and Jody Tuvss, as well as Milton Garber and his staff in the NWF print shop. Finally, special thanks go to those who for personal reasons cannot be named here. They are the unsung heroes of this effort.

# Introduction

Last fall sharp actual and planned budget and personnel cuts at the U.S. Environmental Protection Agency (EPA) became the subject of great public concern. It became apparent to the National Wildlife Federation, especially after a series of Senate and House hearings, that sensible decision-making required a careful, analytic, objective statement of EPA's workload and consequent real budget needs.

The Federation asked the American Environmental Safety Council (SAVE EPA) to prepare this 1983 budget for the Agency and to translate its numbers into a clear, English-language statement of its needs. It asked the Council to do so using EPA's own best workload models and data. The Federation staff worked intensively with the Council and roughly 30 program experts, each with extensive experience at the state and/or Federal levels. It especially sought to challenge every fact, number and assertion. It also arranged for independent reviews of the draft chapters by further independent program experts.

It is because so many people, with so much understanding of environmental management, have worked so hard over the last months that this document is, we believe, the first fully independent, detailed, reliable statement of EPA's real program needs. The National Wildlife Federation gratefully acknowledges their contribution

This document does not go into the details typical of a full budget presentation. Its purpose is to give the public a clear, careful, independent analysis of the major issues in this year's EPA budget. It seeks to explain the workloads imposed on EPA by its major environmental responsibilities, many of them recent, and to calculate with the best available analytic techniques and information the resources needed to manage these workloads. The document also compares these needs to both the 1981 baseline year and the Administration's 1983 proposal.

This analysis focuses on EPA's operating budget, which includes its critical research, regulatory, and field implementation/enforcement work. This is the core of the nation's environmental management capacity. The last two chapters quickly cover EPA's two capital programs, wastewater treatment construction grants and the "Superfund" for cleaning up abandoned hazardous waste sites. The capital budget is several times the operating budget, but is less critical to the implementation of most of EPA's statutory mandate.

Our proposals cover resources both for in-house staff (intramural expenses) and for outside procurements (extramural expenses). They are broken down into the following categories:

- Research and Development: This covers all research conducted by EPA laboratories or by outside organizations such as universities or non-profit foundations.

- Abatement and Control: This includes all program activities related to the design and implementation of control programs, including regulation writing.

- State Grants: This category includes all state grants related to the general program area (air, water, toxics, etc.), and generally cover both abatement and control and enforcement activities.

- Enforcement: The Reagan/Gorsuch Administration has abolished the traditional enforcement organization. Budget figures presented here are based on the previous organization, and are designed to illustrate the exact magnitude of proposed cuts in this critical area of EPA's budget.

The following rules have been applied consistently throughout this proposal:

1. We have figured all FY 83 personnel costs based on the implicit costs shown in the Reagan/Gorsuch FY 83 submission of September 1981 *for the subprogram element concerned.* Costs per position vary by the duties assigned: laboratory staff costs include specific allocations for supplies and equipment, enforcement staff costs include higher-than-average allowances for travel. Occasionally, explicit adjustments are suggested, such as for increased travel allowances for field inspectors.

2. Where we have extrapolated extramural costs from one year to another, they have been inflated according to historical data generated by the Bureau of Economic Analysis (BEA) for dates up to the last quarter of 1981, and beyond that by a (conservative) inflation estimate of five percent (5%) per year.

Where a calculation of the staff effort necessary to achieve a program objective is entirely subjective (such as the level of mobile source enforcement needed to encourage voluntary compliance) the subjectivity of that statement is acknowledged. Elsewhere we have generally used EPA's own workload models, pricing, and data supplemented by independent workload analyses where necessary. We are confident that the resulting budget is a fair, objective presentation of real program needs.

# EPA Programs: Needs vs. Reagan Budget

| | 1981 Budget | | Actual FY 83 Needs | | Reagan-Gorsuch FY 83 Budget | |
|---|---|---|---|---|---|---|
| | Permanent Positions | Dollars (000) | Permanent Positions | Dollars (000) | Permanent Positions | Dollars (000) |
| OPERATING BUDGET | | | | | | |
| Hazardous Waste[1] | 992 | 138,872.7 | 2,386.8 | 346,838.9 | 661.3 | 1[illegible],308.5 |
| Toxic Chemicals | 775 | 109,904.1 | 1,775.1 | 255,112.1 | 641.5 | 72,440.7 |
| Clean Water[1] | 2,735 | 319,876.4 | 3,446.6 | 408,784.8 | 1,827.0 | 188,277.9 |
| Clean Air | 1,932 | 255,705.1 | 2,763.8 | 426,888.2 | 1,355.0 | 197,448.8 |
| Pesticides | 925 | 75,943.2 | 1237.3 | 116,674.0 | 669.8 | 50,620.6 |
| Other[2] | 1,473 | 237,772.7 | 1,228.1 | 313,700.5 | 1,066.1 | 146,085.6 |
| Management | 2,576 | 214,802.0 | 3,71[illegible] | 310,750.0 | [illegible],178.3 | 208,479.1 |
| Total Operating | 11,407 | 1,352,876.2 | 16,548.9 | 2,178,748.5 | 8,399.0 | 974,660.3 |
| Superfund | 142 | 78,000.0 | 965.0 | [illegible]690,000.0 | 554.6 | 275,000.0 |
| Construction Grants | | 3,304,837.0 | | | | 2,400,000.0 |

1. For comparison purposes, the hazardous waste and water quality figures have been adjusted to reflect such things as the subsequent expiration of the conventional solid waste program, the transfer of spill response duties from the water office to the new Office of Solid Waste and Emergency Response, and other minor adjustments.

2. Contains drinking water, radiation, noise, and other minor programs, plus certain special items (such as the conventional solid waste program) that have been subtracted from the hazardous waste and water quality media for comparison purposes (see footnote #1).

# EPA: The Real Story

*"This administration does not intend to deny the needed resources to carry out environmental statutes that are on the books."*

**Edwin L. Dale, Jr.**
**Office of Management and Budget**
**December 19, 1981**

The accuracy of Mr. Dale's statement is the subject of this inquiry. It is an inquiry of enormous importance both to those responsible for legislating, implementing and complying with the major environmental and public health laws of the United States and to the public that relies on the protections established by these statutes. These laws, all administered by the United States Environmental Protection Agency (EPA), include the Clean Air Act, the Clean Water Act, the Toxic Substances Control Act, the Resource Conservation and Recovery (hazardous wastes) Act, the Safe Drinking Water Act, the Federal Environmental Pesticide Control Act, and the Comprehensive Environmental Response, Compensation and Liability Act ("Superfund"). Together, they represent the environmental "safety net" which protects each citizen from the by-products and wastes of our high-technology society This includes over 55,000 chemicals (with 600-1,000 additions per year); 50,000 plants discharging wastes into U.S. rivers and streams; another 40,000 firms discharging toxics into our municipal sewer systems; over 160 million tons of air pollutants such as sulfur oxides, carbon monoxides, nitrogen oxides, soot and other particles; billions of gallons of municipal sewage and stormwater run-off; and approximately 20,000 hazardous waste facilities, the repositories for the over 40 million tons of hazardous wastes generated each year. In addition, as many as 35,000 abandoned hazardous waste dump sites require attention. Without effective public control of these waste products our public health, and the health of our basic biological support systems (air, water, soil) cannot be maintained.

Environmental protection, like police protection, costs money. Last fall the National Wildlife Federation commissioned a thorough study of EPA's workload and its consequent 1983 resource requirements. The Federation staff, roughly 30 independent program experts, and the American Environmental Safety Council (SAVE EPA), worked intensively on the study.

Every effort has been made to be as accurate and statistically sound as possible. For purposes of comparison we used as a baseline a clearly verifiable figure: the Congressionally-approved EPA operating budget for FY 1981 of $1.353 billion. Since it is still unclear how the current FY 1982 budget resolutions will be implemented within EPA on a program-by-program basis, it is impossible to use 1982 figures as a basis of substantive program comparisons. Moreover, the 1981 budget, which describes the level of protection provided the public until September 30, 1981, is the most logical base against which to compare the Reagan Administration's cumulative budget cuts.

This budget has computed EPA's FY 1983 minimum funding needs, both in personnel and in money, on the basis of state-of-the-art budgeting principles. Where they exist, we have used EPA's own workload analyses to compute program needs, including the excellent analysis done for the hazardous waste program. Throughout, we have adjusted for inflation using the deflator for government goods and services to date and have assumed only a five percent inflation in the future. Fully recognizing the state of the economy and the need for budget restraint, we have assumed that many of the new toxic programs will stretch out the transition to full implementation until 1984-85. We have also cut existing programs where possible and assumed efficiencies elsewhere.

In comparing these estimates of EPA's real program needs with the Administration's proposed 1983 budget, we've generally used Administrator Gorsuch's detailed budget proposal, with its thorough program and workload information (not available in the Congressional submission). For summary charts, however, we have used the President's final totals. Because the final budget is three percent smaller than the Gorsuch proposal, the resource levels identified in this document as the "Reagan-Gorsuch Budget" will sometimes be a bit higher.

On the basis of this analysis, we have reached the inescapable conclusion that Mr. Dale's statement is wrong. In fact, it is dead wrong: if EPA is forced to accept these cuts, EPA will be unable to implement many of the laws that are essential components of the nation's environmental safety net. If Congress accepts the Reagan-Gorsuch budget, the country will face the following programmatic results:

- EPA will be cut in half - just as its workload doubles. It doubles because it is in the early 1980s that all the programs enacted to protect the public from environmental toxics must be implemented. The older problems, e.g., sulfur, continue.

- The nation's environmental research and management institutions, already badly hurt, will disintegrate. Given the very long time required to rebuild such complex institutions, let alone their credibility, we can expect a decade of rising environmental and public health risks.

We should not legislate such fundamental *de facto* statutory repeal through the budget process. If, as a nation, we conclude that the cost of protection from exposure to toxic chemicals and other pollutants is too high, Congress should defer or repeal significant portions of the wave of toxics legislation just now reaching the point of field implementation. In any event, the public should be involved in this debate. The present attempt to cloak programmatic decisions in the budget process makes public debate impossible.

This volume tries to provide a careful, independent analysis of the resources needed to make our environmental safety net a reality, not a legislative mirage. In 1983 these costs add up to $2.18 billion, a 40 percent inflation-adjusted increase over 1981. It also briefly touches on several possible ways the Congress could pay for providing this protection.

The major resource increases required in EPA's 1983-85 budgets flow directly from the scientific discoveries and consequent legislative actions of the last decade. In 1970 the country decided to clean up the air and water. The resulting regulatory program worked. Today we have much lower levels of the sorts of pollution we decided to control—e.g., sulfur in the air and biological oxygen demand in the water—than we otherwise would have. For example, whereas the air would have been roughly 50 percent more sulfurous in 1980 than in 1970 without environmental regulation, in fact it contained 17 percent less sulfur. However, continued economic expansion requires additional controls just to stay even. On the basis of the existing control program (i.e., without new controls) by 1990 we will emit 50 percent more sulfur than we do now.

By the mid-1970s science demonstrated that hundreds of toxic pollutants were an even more serious environmental and health threat. As a result, Congress promptly redesigned the nation's environmental safety net. It directed EPA to take on toxics in addition to the "traditional" pollutants through revisions to the Clean Water, Clean Air, and Safe Drinking Water Acts. It strengthened the pesticides law. It required EPA to review and control, when necessary, all 55,000 chemicals existing and the roughly 1000 new chemicals introduced each year (The Toxics Substances Control Act). It ordered EPA to regulate over 42 million tons of hazardous waste from initial shipment through permanent safe disposal. Finally, and most recently, it gave EPA responsibility for cleaning up hazardous spills and abandoned waste dumps ("Superfund"). In the several years since this legislative assault on toxics was enacted, EPA has established the scientific, regulatory, and initial organizational foundations necessary to implement these programs.

Now, over the first years of the 1980s, EPA must go "on line," i.e., actually bring environmental toxics under control in the field. Doing so, on top of the Agency's existing tasks, doubles its workload. For example, the number of industrial firms for which specific effluent limitations must be negotiated and then enforced more than doubles to 90,000, and the hazardous waste law requires EPA and the states to control the waste management practices of another 120,000 firms. Moreover, almost all this new toxics work is technically complex and therefore resource-intensive.

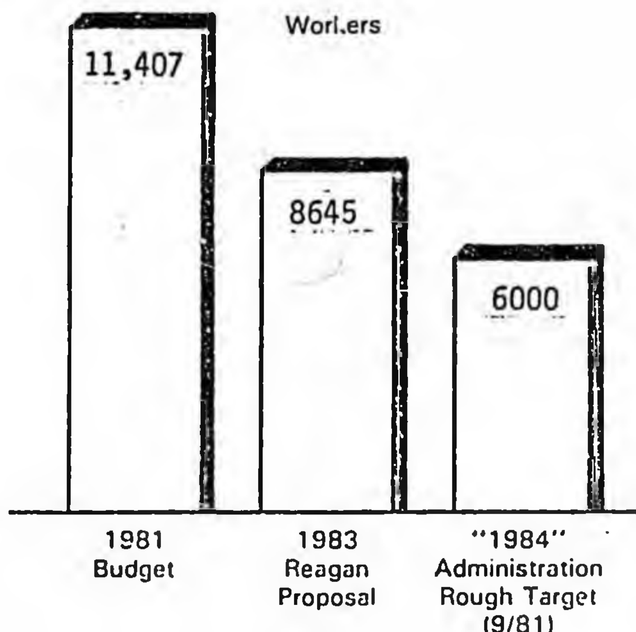
*In the face of this doubling workload, the Reagan 1983 budget proposal would cut the EPA's 1981 purchasing power in half.* (See Chart I.) This proposal would cripple the "traditional" programs, such as clean air and clean water, supported by the 1981 budget levels. It would make control of environmental toxics entirely illusory.

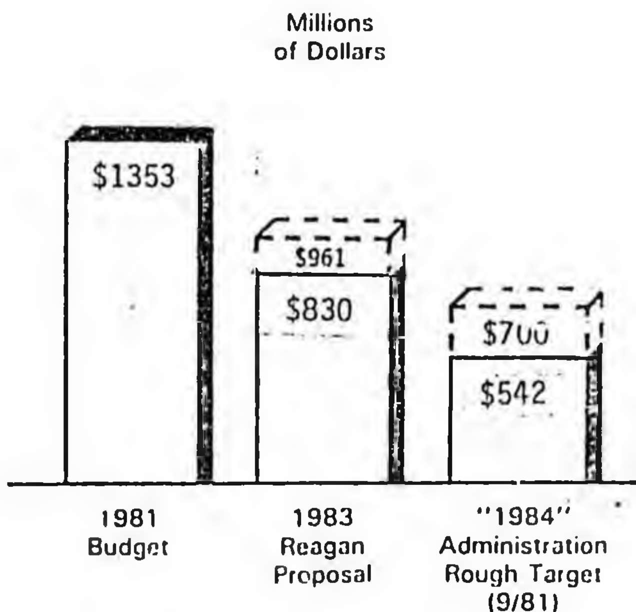
Since Adminstrator Gorsuch plans to reduce her headquarters staff to the proposed 1983 budget level by June, 1982, we know exactly what these reductions mean in terms of existing program management. Unless legal objections force postponement of the plan, by June 30 over 90 percent of the headquarters staff the Reagan Administration inherited on January 24, 1981, will have (1) been made to quit, (2) been fired, or (3) been downgraded to less attractive jobs less well suited to their skills. In other words, in only a year and a half, two-thirds of the staff built up over a decade will be gone and almost no one remaining will be doing a job with which they are familiar.

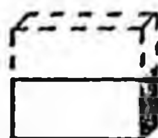
Since last September the Administration apparently has also been working on a "1984" budget it hopes to implement in 1983. This budget would cut EPA's 11,400 permanent workers and $1,353 million of 1981 to roughly 6,000 workers and $700 million ($546 million once adjusted for inflation). (See Chart I.) This budget represents just short of a 50 percent cut in personnel and almost a two-thirds reduction in purchasing power.

**Chart I**

## The Administration Proposes Cutting EPA in Half




*Half the Agency cannot do twice the job. Accepting the Administration's proposal means the destruction of the country's institutional capacity to understand and manage the environment—not just for 1983 but for the rest of the decade.* Once these complex, heavily scientific institutions are gone, it will take many years of strenuous and very extensive effort to recreate the capacity and credibility so easily and quickly demolished:

- The budget that pays for research outside EPA (20 percent of the 1981 Agency budget) will be cut by two-thirds. This means an abrupt loss to the field of roughly 1,500 senior researchers and 4,000 to 5,000 of their associates and graduate students, the sudden closing of university laboratories, and the loss of the continuity of data bases. If the country decides several years hence it wants to regenerate its environmental research capacity, it will take two to three years to work that decision through the Federal budget process and to rebuild the structure of EPA supervisors and scientists capable of managing private research grants and contracts. Then it will take several more years for the universities to hire the senior researchers and then junior staff and graduate students, and to negotiate and actually perform the needed research. A decision to rebuild in 1984 would not get a flow of research results equivalent to the present program until 1990.

- This budget's fourfold increase in workload per employee (twice the work, half the workers) means that EPA must lose enforcement credibility with both the states and industry. It simply won't be able to cover the ground. In hazardous wastes, for example, the Reagan budget would cut the 1981 workforce (then devoted to start-up planning) 33 percent just as the program must start dealing with its 120,000 firms in the field. Once EPA begins losing its field credibility, it will be caught in a virtually irreversible downward spiral of lost credibility, lessening voluntary compliance, therefore quickly multiplying field workload, and consequent further loss of credibility. Once hundreds of thousands of people believe that these laws are little enforced, anyone seeking to rebuild an acceptable compliance rate will have to affect the behavior of these footdragging firms, not just the few percent that require enforcement attention now. That is a task that will take a good many years—even assuming enormously expanded resources.

These consequences tend to reinforce one another. For example, the loss of scientific capacity hurts enforcement, and the loss of credibility in both fields further adds to the Agency's demoralization and consequent loss of the core of excellent, spirited civil servants that have grown with the Agency since its creation in the early 1970s. (Already, the quitting

rate agency-wide is roughly 30 percent on an annualized basis.) Such a loss of scientific expertise is particularly alarming in light of the Reagan Administration's announced intention to base regulations on "good science".

If America is left without competent environmental management through the 1980s, its citizens will suffer:

- The average citizen's exposure to environmental toxics will increase well over 50 percent, and will probably roughly double in ten years. The volume and number of toxic pollutants grow especially rapidly because they are the byproducts of one of the economy's chief growth thrusts—the continuing chemical revolution.

- Air and water quality will deteriorate. Consider the impact of 50 percent more sulfur in ten years on acid rain, visibility and smog.

- We will go into the next decade still startlingly ignorant of what we are doing to the environment, what it is doing to us in return, and how we might most effectively manage those impacts.

Business is also at risk. An incompetent, backlogged EPA will not be able to make prompt permitting or regulatory decisions that will hold up under challenge. Moreover, as several industry representatives have pointed out, EPA will no longer be capable of balanced, sophisticated regulation when the political pendulum eventually swings back towards enforcement of environmental legislation.

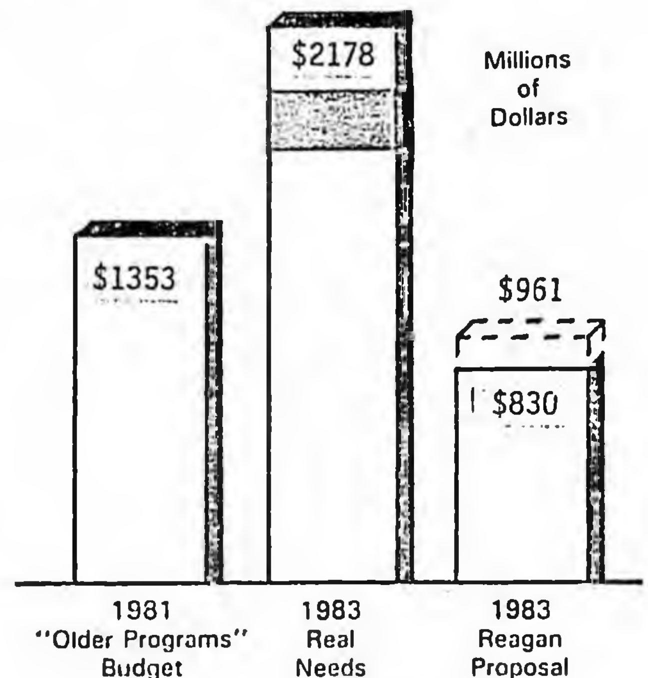
If Congress decides not to accept this future, if it decides that it does want an environmental safety net in place, it must make that decision now. EPA needs a $826 million increase over its FY 81 budget if it is to seriously provide field protection to the public against environmental toxics in 1983. After correcting for inflation, that's a 40 percent increase over FY 81. Full implementation in FY 84-85 will require substantial further resources. In contrast, the Administration's proposal is 39 percent below the inflation-adjusted 1981 base and 55 percent below what is needed to take on both the traditional pollutants and the new toxics job. (See Chart II.)

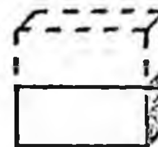
Most of the rest of this volume explains, program by program, why this increase is needed. A few of the key needs that will go unmet without such an increase are:

- Ensuring that hazardous wastes get to safe, permitted disposal sites, not future Love Canals—a task that requires working with 120,000 firms. This new program requires $180.3 million.

## Chart 2

## The Administration's Proposal Covers Less Than Half FY 83's Need




- Weeding out these substances from the 55,000 chemicals in U.S. commerce that are dangerous, especially those with which the public has extensive contact—and then taking the necessary regulatory action. Also reviewing (and controlling where necessary) up to 1,000 new chemicals a year. Also a new program. Added resources required: $123.3 million.

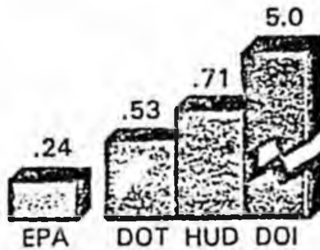
- Getting priority toxic discharges out of the water: $96.3 million.

EPA can't fund this new workload, let alone the Administration's proposed cuts, from internal efficiencies. Even before the toxics workload wave, EPA workers typically had very much more work to do than employees with similar functions elsewhere in government. (See Chart III.) Nor were they poorly

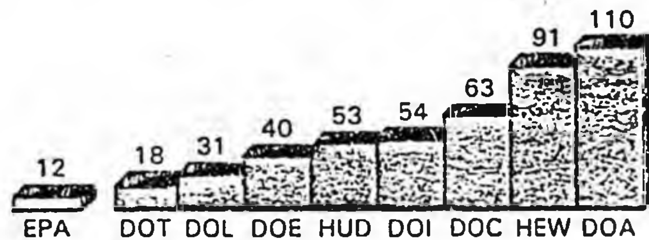
**Chart 3**

# EPA Has Had More Work per Worker Than Other Agencies

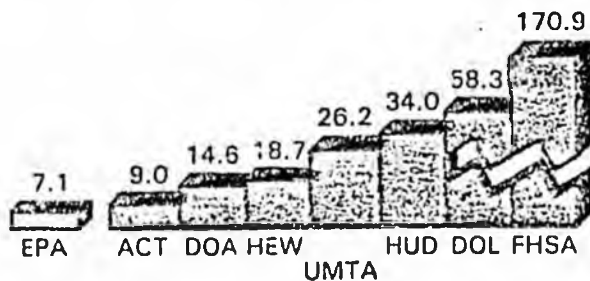
EPA Has Fewer Positions per $M Construction Outlay



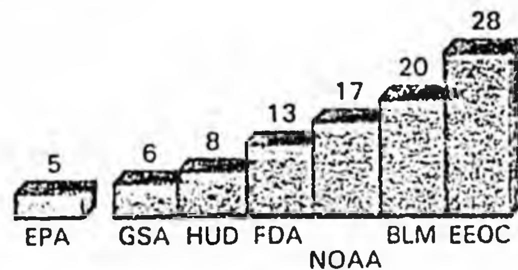

EPA Has Fewer Lawyers per Significant Regulation



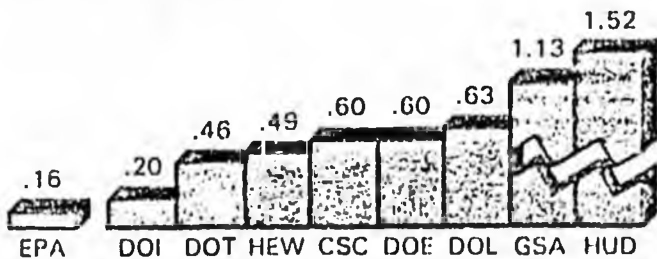

EPA Has Fewer Auditors per 1000 Grantees



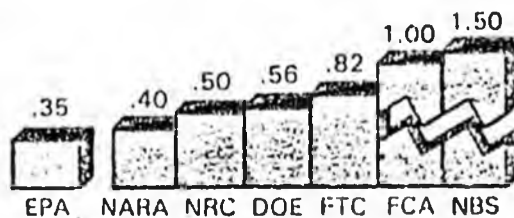

EPA Has the Least Administrative Management per 100 Employees



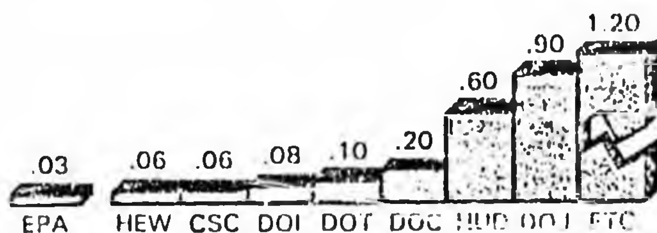

EPA Has The Smallest Percentage of Management and Operation Staff



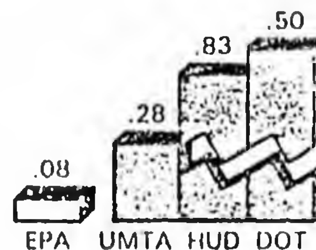

EPA Has Smallest Percentage of Library/Information Staff per Professional User




EPA Has Fewer Evaluation Dollars as a Percent of Operating Budget




EPA Has Fewer Positions per Active Construction Project




Source: U.S. EPA budget submission, 1981, based on studies by the Office of Management and Budget, the Office of Personnel Management, independent contractors, and EPA

managed. Donald Lambrow, the author of *Fat City: How Washington Wastes Your Taxes*, a book President Reagan sent his cabinet members, listed EPA, the IRS and the SEC as Washington's best-run agencies "for maintaining scandal-free administrations as well as conducting themselves with a high degree of professionalism and competence."

The very idea of an increase is startling this year. Congress and the public have been presented with a budget framework where the only apparently legitimate issue is cutting. And the deficits driving that perspective are real enough. If Congress decides to do the job of protecting against both traditional and toxic pollutants, it will also have to decide how to pay the bill. Here is a sampling of some attractive possibilities:

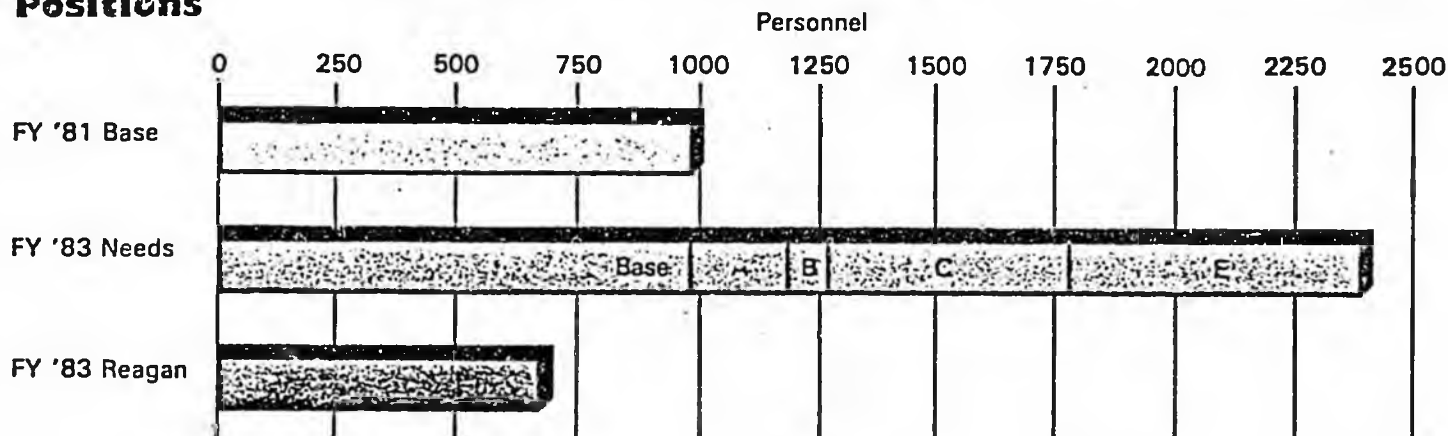
- It could cut out several large capital projects such as dams with low cost-benefit yields.
- It could review some of the $265 billion a year of revenue foregone to various tax loopholes.
- It could impose an "acid rain tax" on major sources of sulfur based on historical emissions but allowing credits for reductions due to coal cleaning or the installation of control equipment. This may be an effective way to reduce emissions inexpensively from older plants, is not a threat to Eastern coal, and is worth several billion dollars.
- It could increase the cigarette tax for high tar and nicotine brands only, thereby encouraging both industry and consumers to switch. A four cent tax on the most dangerous top seventy-five percent of all cigarettes sold would raise $930 million.
- It could stretch out Agency capital expenditures to preserve core operating programs.
- It could implement Section 110(a)(2)(k) of the Clean Air act which requires permittees to pay the cost of permit review and issuance. To date, this requirement has been ignored.

There are, of course, many other possibilities.

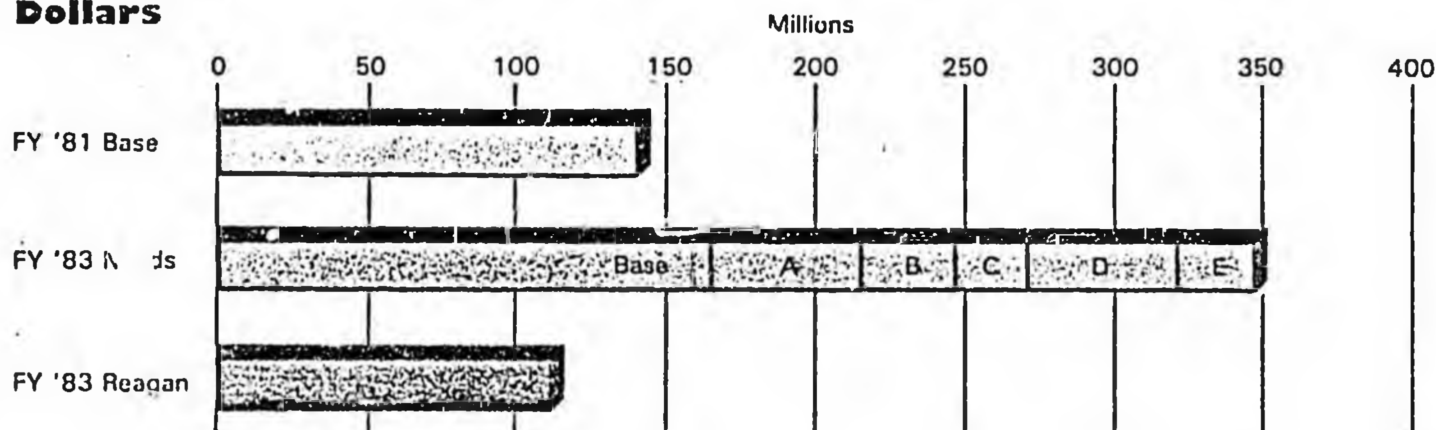
The Administration's 39 percent cut in EPA's budget saves the equivalent of $2.68 per capita each year. Increasing the budget to make toxics implementation possible would cost $2.50 per capita. Is the protection worth such insurance premiums? Poll after poll reports that most Americans are willing to pay for clean air and water and that they are almost unanimous in their anxiety to have more done to protect them from toxics.

Now Congress must decide.

## Positions




## Dollars




## Budget Summary

| | Permanent Positions | Extramural ($000) | Total ($000) |
|---|---|---|---|
| 1981 Base (Adjusted for Inflation) | 991.7 | 107,726.3 | 166,573.1 |
| A. Research on how hazardous substances in dumps interact, how they move and change, and how to get rid of them safely | 191.6 | 44,996.8 | 49,566.4 |
| B. Writing rules on how hazardous disposal facilities are to be designed and operated | 73.0 | 30,142.2 | 34,246.0 |
| C. Making sure that actual sites are safe and issuing permits for them; running the manifest system that ensures that hazardous waste really goes from source to safe disposal | 513.5 | 4,260.0 | 24,160.9 |
| D. Grants to states to help pay for hazardous waste program development | – | 48,605.0 | 48,605.0 |
| E. Enforcing hazardous waste rules on all sources, transporters and disposal sites; dealing with violators; investigating discrepencies in waste shipment manifests | 617.0 | 1,463.2 | 23,687.5 |
| Total Increment | 1,395.1 | 129,467.4 | 180,265.8 |
| Program Total | 2,386.8 | 237,193.7 | 346,838.9 |

# Managing Hazardous Wastes

# 2

*Our society generates about 42 million tons of wastes each year that are a threat to human health due to their toxicity, nondegradability, persistence in nature or susceptibility to biological magnification (bio-accumulation). These hazardous wastes, which come in every imaginable form, include inorganic toxic metals; salts, acids or bases; synthetic organics; flammables; explosives, and pathological, biological and radioactive materials. Until now about 80 percent of these wastes have been scattered about quite unsafely in dumps, in shallow ponds dug out back of a factory, in a nearby woods or wetlands, down old mines or quarries, just about anywhere. No one knows just how many of these dangerous time capsules we have about us, or how much damage has already been done to the land, to both surface and groundwaters, to ourselves. However, we've begun to pay the consequences (e.g., Love Canal), and Congress and President Ford resolved in 1976 to bring irresponsible handling of hazardous wastes to an end. That year's legislation required comprehensive control of these wastes from the point of generation through shipment, storage, treatment, and final disposal. Although this law was passed in 1976, and although comprehensive implementing regulations finally followed in 1980 and early 1981, effective control has yet to begin.*

Recognizing the great dangers to the public of continuing to let tens of millions of tons of dangerous waste be scattered carelessly about the environment, Congress enacted the Resource Conservation and Recovery Act of 1976 (RCRA). RCRA requires EPA to track hazardous wastes from "cradle to grave" and to ensure their ultimate safe disposal. After years of scientific and legal preparation, this massive, complex program--easily as large as the traditional air or water programs – now must be put into effect. It is an enormous task. The most likely estimates tell us that EPA must control:

- the wastes from the 90,000 "producers" that each generate more than 1000 kilograms a month;
- the activities of some 10,000 transporters of hazardous waste;
- the design and operation of at least 14,000 and possibly as many as 20,000 facilities for the storage, treatment or disposal of hazardous waste.

It must begin to do this even though the base of knowledge about hazardous waste and its safe management is still rudimentary and the regulatory structure supporting the program is still incomplete.

Love Canal is not simply the name of an unfortunate community; it has come to symbolize the national resolve not to mortgage our future again by cutting corners in the present disposal of toxic wastes. Although EPA has the task of making real that resolve, it has never been given the resources to do so properly. The costs of good management, including government costs, are far less than the costs of remedial action in the future, not to mention the hidden and unpredictable costs of human disease and environmental damage. But the program we now have is inadequate for the job.

Our knowledge of hazardous waste is primitive. Partly in consequence we have not been able, despite several years of effort and several court deadlines, to regulate the chief waste streams. Fully 30 percent of the total wastes covered by the program remain unregulated. They include residues from the organic chemical industry, which are usually likely to contain substances having carcinogenic or other toxic characteristics, and which are relatively difficult to analyze, identify, and control. Once they are covered, the program's workload will grow more than 30 percent because of their complexity and risk. Neither the states nor EPA have the resources to ensure that wastes are tracked as already required by law, let alone the technical skills and staff to evaluate the safety of the thousands of disposal facilities awaiting licensing.

As recently as fiscal 1978 the Agency had, in effect, no real hazardous waste budget. A detailed EPA analysis of the resources required to start a minimally credible program clearly shows that the hazardous waste budget must grow to several times the FY 81 level. To make sensible permitting guidance possible and to develop the practical remedies required, a $49.6 million investment in research is necessary. In

addition, at least 73 permanent staff are needed to design the implementation program and write the guidance documents. The biggest increases must come in the front line, including a 617 position increase in EPA's hazardous waste enforcement staff and a $48.6 million added investment in state grants. Instead, Mrs. Gorsuch's September 1983 budget proposal would have cut the staff 33 percent and its purchasing power 31 percent.

## Research

While air and water pollution have been studied for some time, the disciplined study of what happens when toxic chemicals are disposed of on land has barely begun. Virtually nothing was spent on hazardous waste research prior to 1979.

We do not know what various industry waste streams contain. We have no reliable models of how liquid wastes move through the earth, or what happens to their complex toxic mixtures over time. Thus we cannot set the standards each industry needs for waste management. This is particularly costly and frustrating for industry, which cannot develop sensible or secure control strategies until such standards are established. We also do not know nearly enough about the design and operation of hazardous waste facilities—landfills, incinerators and the like—nor do we have the investment in engineering research to develop better and cheaper disposal technologies for the future. As a result, we have developed few remedies, and we don't know how long they will work.

The problems are as complex and urgent, and the backlog of undone research needs are as extensive as they are in the air or water programs. We need a $100 million research effort to close these pressing gaps. Such an effort would be comparable to research expenditures on air and water, but smaller than the resources committed to analyzing the environmental risks associated with energy production and developing the necessary control technologies. It would be three times higher than the funds proposed by the Reagan-Gorsuch budget.

## Setting Standards

RCRA directs EPA to develop standards for each type of hazardous waste facility—landfills, surface impoundments, incinerators, etc. These standards define the design of such facilities and tell how they must be operated in order to preserve public health. They also guide permit writers in determining which sites and facilities are safe and which must be closed down. Although a number of standards had been promulgated by 1981, the Gorsuch Administration withdrew almost all of them. The facility review and permitting process has stopped and no guidance exists as to what constitutes safe and acceptable practice. As a result, either no decision is made or inspectors must make high risk, high cost decisions that are difficult to justify if challenged.

Developing these hazardous waste guidelines is an extremely difficult, detailed, slow process requiring the most intricate scientific, technical, and economic analysis. The Agency needs the hiring flexibility to bring on a number of highly skilled professionals to accelerate and improve its standard-setting process. The costs of poor products or of further uncertainty and delay far exceed the budgetary costs.

To move this job forward, EPA needs an increase of 20 wor[illegible]s and $25 million in contract support. Witho[illegible] minimum commitment, essential stand[illegible] will not be established in FY 83. The Reagan-Gorsuch budget would reduce the 1981 authorization for this effort by 13.7 workyears and 1.5 million contract dollars.

## Managing Hazardous Wastes

Although no one knows for certain, there may be 20,000 hazardous waste facilities now operating in this country. At present these are only required to comply with very simple "good housekeeping" rules. RCRA intended that (1) the design and operation of each facility be individually reviewed, (2) those meeting standards be issued permits, and (3) those failing to do so be closed. This permit review was intended to be conducted on an expedited schedule, for until these reviews are complete there can be no assurance of public safety.

The permitting process is politically sensitive, technically very difficult, and therefore necessarily complex. The facility owner must first submit detailed information on facility design, types of wastes handled, and normal operating procedures. Competent engineering and other technical personnel must then review this information and preliminarily determine whether the facility is in compliance with standards or not. The staff then must visit each site, following up by requiring further tests if necessary. The public must be given an opportunity to be heard. EPA has estimated that a landfill permit will require 226 work days, an incinerator permit 122-208 work days, and a storage site permit 64 work days. If local fears politicize the process, it can take *much* longer.

Congress intended that permitting be completed in three to five years, and few residents near one of these facilities want to wait a decade before someone competent reviews its safety. Getting the job done in five to six years would require 260 workyears if there are 14,000 facilities and 375 if there are 20,000. This budget uses the lower figure for 1983, subject to further review in FY84. The Reagan-Gorsuch budget would reduce existing manpower to a level that, according to EPA's own analysis, would require ten years to permit all estimated sites. But that analysis assumes that there are only about 14,000 facilities, and if there turn out to be 20,000 such operators, which people with the program believe to be more likely, than some communities will not have anyone review their facilities until the mid-1990s. Moreover, unless EPA can hire some of the rare experts, e.g. geohydrologists, necessary to this work, neither it nor the states, which can't afford such people, are likely to be able to ensure an effective review even when one is done.

The Agency also needs added personnel to oversee the manifest system. This system, designed to track wastes from generator through transporter to final disposal, is the law's chief defense against the terrible damage that has been done repeatedly by irresponsible generators or "midnight dumpers." EPA estimates that there will be an average of 18.2 shipments under manifest from the typical generator every year—which means there will be 15 *million* shipments of hazardous waste annually.

Properly managing this vast traffic would require 400 additional workyears at the combined Federal and state levels, at least during the first several years of program start-up. The Reagan-Gorsuch budget provides 2.6 workyears to supervise the manifest system in the 17 states in which EPA has responsibility for running the program.

## Enforcement

The hazardous waste program must deal with 120,000 firms, many of which are small, independent operations. Most of them have never been regulated by an environmental office. Where they have, poor voluntary compliance records are common. A credible enforcement effort is therefore more vital to this program than to most others in EPA, especially during the program's first years, when the participants' expectations will be formed.

The enforcement workload includes the following tasks:

- identifying and bringing into the regulatory system the estimated 21,000 subject firms that have never informed EPA of their existence;
- making inspections and dealing with the 20 percent expected to identify serious violations;
- acting against the two percent of all waste shipments that will entail an exception or discrepancy.

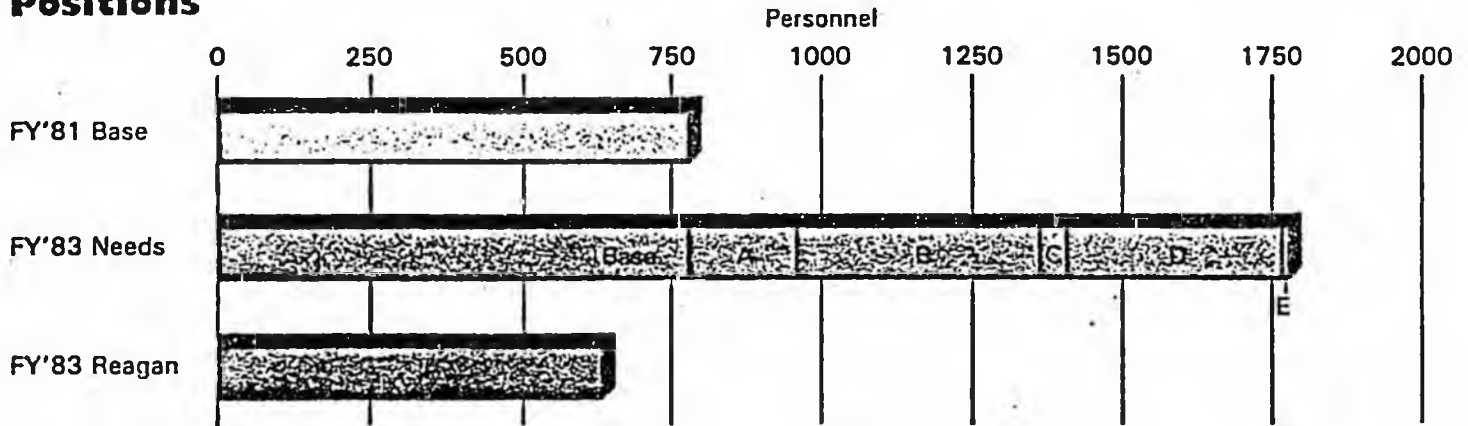
These and other tasks add up to an enforcement program requiring roughly 700 workyears. That this number is larger than the 570-member water enforcement staff reflects the nature of the workload: the large number of regulated concerns, the technical complexity and uncertainty of the field, and Congress's specific requirement that it be regulated more intensively than its predecessors given the risks involved and the prevalence of irresponsible practices. The Reagan-Gorsuch budget allows 46 workyears for hazardous waste enforcement, a decline of 45 percent from the 1981 level.

## State Grant Support

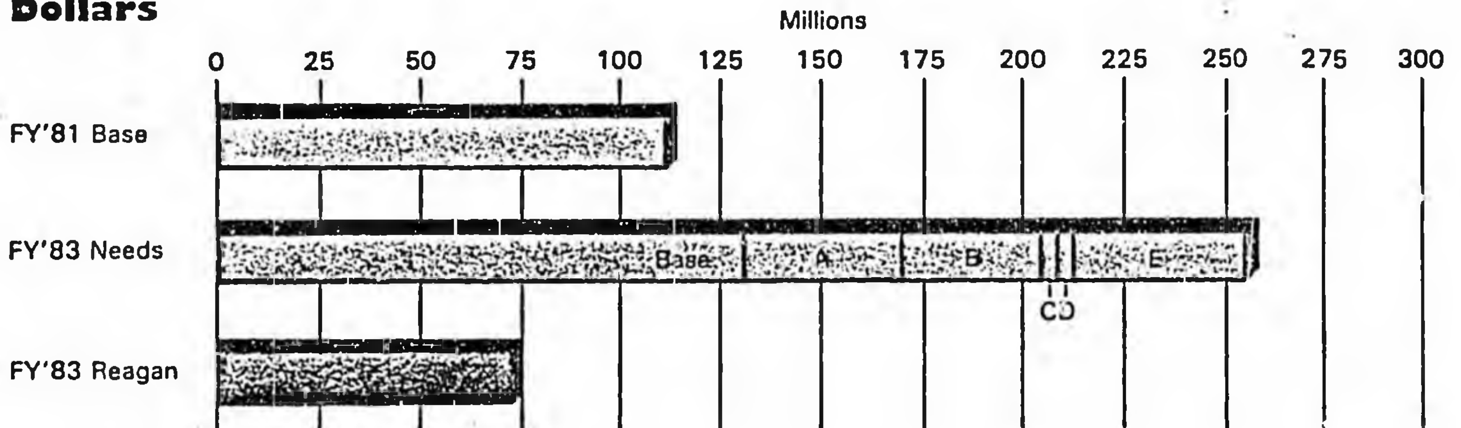
If the states are to hold up their end for permitting alone, they will require another 887 positions in FY 83, which at state labor rates translates to approximately another $30 million. Adequate funding for program development and enforcement will add another $18 million, bringing the total to $87.1 million.

Under the law, if states refuse to accept a program, responsibility reverts to the Federal government. The Reagan-Gorsuch budget calls for a complete phase-out of the Section C hazardous waste grants over the next five years, after which time the states will have to fund this politcally-charged program completely unassisted, a burden hardly likely to encourage strong state commitment.

## Positions




## Dollars




| **Budget Summary** | Permanent Positions | Extramural ($000) | Total ($000) |
|---|---|---|---|
| 1981 Base (Adjusted for Inflation) | 775.4 | 86,662.9 | 131,813.1 |
| A. Research to develop better ways of testing the risks posed by suspect chemicals. | 162.3 | 23,338.9 | 37,129.5 |
| B. Reviewing 100 substances judged as being potentially the most dangerous and exercising control where warranted. | 406.1 | 20,337.2 | 36,009.8 |
| C. Reviewing 100 proposals from manufacturers wanting to make new chemicals or use existing ones in major new ways, and following up where necessary. | 49.2 | 3,084.2 | 4,982.8 |
| D. Enforcing at least 20 toxic chemical rules—finding such chemicals and ensuring that they are removed from environment to safe disposal. | 375.0 | 1,936.5 | 5,050.2 |
| E. Grants to states to help them run toxics control programs. | 7.1 | 40,000.0 | 40,126.7 |
| Total Increment | 999.7 | 88,696.8 | 123,299.0 |
| Program Total | 1,775.1 | 175,359.7 | 255,112.1 |

# Controlling Toxic Chemicals

*Toxic chemicals are poisons. However, most chemicals are not toxic. Prior to passage of the Toxics Substances Control Act of 1976 (TSCA) no federal program existed to screen toxic from non-toxic chemicals and protect the public from those chemicals found to endanger public health. TSCA controls the use of toxic chemicals in two ways. First, it requires EPA to gather information, test, and (if necessary) limit the use of toxic chemicals* before *they are placed on the market. This is called premarketing review. Second, TSCA requires EPA to review all chemicals already in use and to regulate those that pose unreasonable risks. TSCA promises the public the first comprehensive screening for, and follow-up control of, dangerous chemicals. It also encourages industry to research the health implications of its own products as they are being developed, and it avoids investments in products that later prove harmful.*

Over the last decade, the chemical revolution has transformed our environment as well as our economy. As our use of chemicals has grown, so has the presence of their toxic byproducts in the environment. Our consequent accelerating exposure to these byproducts has become a significant environmental health risk.

There are over 55,000 chemicals in commerce. In addition, at least 600, probably closer to 1000 new chemicals will come to EPA for premarketing reviews next year. We don't know what the vast majority of these chemicals do to living creatures. We don't know where they enter the environment, or how they travel through it, or where they may be accumulating. We don't know how they change after they enter the environment, how they interact with other chemicals, or what new risks are created by these changes and reactions. Cloaked in such ignorance, the possibility of a catastrophic mistake is significant.

In 1976 the Ford Administration and Congress took action. The Toxic Substances Control Act (TSCA) represents the first systematic attempt to evaluate and control the manufacture of toxic chemicals. The Act requires EPA to identify and prevent "unreasonable risks," and requires industry to test chemicals for safety and report the results to EPA before manufacturing a new chemical or using specified chemicals in significant new ways.

For the last several years the EPA toxics program established the research, organizational, and legal foundations necessary to regulate this extremely complex field. It took two years after the passage of TSCA merely to find out—for the first time ever how many chemicals were in use in the U.S. More work was then necessary to build up the computer capacity to identify and compare these tens of thousands of chemicals structurally; to gather the information and build the staff required to conduct risk assessments and other tasks; to focus in on the roughly 2000 (3.5 per cent) of these chemicals requiring priority attention; and to complete the legal framework for a regulatory process. By 1981 this work was largely complete, and the Toxic regulatory program came "on line."

The Toxics program now faces a full agenda. By 1982, and certainly by 1983, the Toxic Substances Control staff should be conducting the research required to support faster, cheaper, and more accurate evaluations of chemical risk; should carefully review roughly 100 new chemicals per year; should complete at least preliminary risk evaluations of the first group of several hundred of the most risky of the existing chemicals; and should carry out the field and enforcement work required to ensure that the public actually receives the protection promised by the Act once real dangers have been identified.

Almost every step—research, risk assessment, regulation, and enforcement—is difficult and resource intensive. Because the economic stakes of taking action against an existing chemical are high, Congress requires EPA to conduct both a scientific assessment of the risks and an economic evaluation and then balance the results. Field implementation will be no easier because each chemical requiring control will have its own unique group of users and exposed populations.

If TSCA is to achieve its promise, it will need very substantially increased resources over these first years of implementation. Specifically, (1) research, especially to develop better ways of testing the risks of suspect substances reliably and inexpensively, will require 162 new staffers and \$23.3 million; (2) review and field control of 100 existing priority suspect substances will cost 406 extra people and \$20.3 million, and (3) review and field follow-up (as necessary) on 100 new chemicals will cost 49.2 new

workers and $3.1 million. In contrast, the Reagan-Gorsuch budget would cut the TSCA staff 17 percent, its research budget 36 percent, and its real ability to buy outside research and services by 56 percent.

## Research

We are barely beginning to understand what we don't know in this area. For example, we have only a very incomplete, sketchy understanding of the full spectrum of toxic chemical effects. Much of what we know is related to tests for cancer, and much of that is based on relatively unreliable short-term tests. Almost no work has been done regarding long-term toxic chemical effects on the brain; the nervous, cardiovascular, or excretory systems; human inheritance, or unborn children. However, we know enough to understand that this vast undone job is urgently needed.

If TSCA is ever to be fully implemented, toxicity testing must be made cheaper, faster, and more reliable. That's as important for the chemical industry as for EPA. Just the development of reliable and economic tests for the full range of health effects is a major task that will require substantial resources.

An adequate research budget designed to develop cheaper, more reliable tests for a variety of effects, to develop better test standards, to fund work on finding how chemicals "travel" through the environment, how they interract and are changed, where they accumulate, and what their ultimate fate is, and to exert more effective quality control over the private laboratories that accomplish most testing, would require 350 permanent positions (up about 160 over FY 81 levels), supported by a $86.2 million budget including $56.5 million for use by private laboratories. In contrast, the Reagan-Gorsuch budget proposes to cut the real purchasing power of EPA's toxics research by 36 percent.

## Controlling Existing Chemicals

The most ambitious aspect of the Toxic Substances law is the requirement that EPA screen existing chemicals to determine which pose unreasonable risks and, where necessary, regulate those that do. This task has never been adequately funded and the Agency has consequently done little more than promise eventual control of existing chemicals.

Workload calculations indicate that a serious effort to control existing chemicals would require an additional 406 workyears and $20.3 million. This level of resources would allow the Agency to test most of the current backlog of the most suspect chemicals in five to six years. That won't finish the job, however, because the initial list of 2000 suspects is being continually augmented as reports of industry testing, scientific research, health problems experienced by particular groups of workers and consumers, and the review of analogous chemicals suggest additional substances for review.

The screening process is complex. It involves:

- a preliminary determination of what information is available and what additional information needs to be collected;
- preparation of testing and/or information collection rules to require industry to provide the additional information required. Statutory simplification could cut the costs of this inefficient requirement, possibly significantly.
- preliminary risk assessments to determine where the risks exist;
- required engineering and economic analyses; and
- preparation of support documents for the specific regulations being issued.

## Review of New Chemicals

TSCA requires industries to notify EPA before manufacturing a new chemical or using a chemical in a significant new way. Effective review of such premanufacturing notifications (PMNs) is the most powerful tool EPA has to identify potentially dangerous chemicals before they enter commerce and to take whatever steps are necessary to control or limit their contact with workers, consumers, and the environment. For 1983, we estimate that EPA will be notified of nearly 1,000 new chemicals, of which approximately one half will be exempt from further review due to the absence of potential hazard or the lack of significant exposure. The remainder, however, will require several levels of increasingly rigorous scientific review leading, in approximately 30 percent of the cases, to further testing, regulatory action, or voluntary agreements by manufacturers to test or restrict use. We estimate that a sound ne[illegible] chemical review program will require an additi[illegible] 49 permanent positions and $3.1 million in FY [illegible] This investment will protect public health and the environment from the risk of poorly tested, inadequately controlled, and potentially dangerous new chemicals.

## Enforcement

Enforcement of the toxic program's rules, if the initial experience with PCBs is any indication, is a potentially immense undertaking. The PCB control effort has so far required the work of approximately 50 people for over 5 years. Enforcement required (1) the termination of this chemical's manufacture, (2) the identification of PCBs in equipment all over the country, (3) their removal to safe storage areas, (4) the identification of safe incineration facilities, (5)

tests for human or animal uptake, (6) technical help to state and local officials, and (7) the pursuit of legal remedies where necessary.

There are roughly 2000 priority existing chemicals awaiting review. Since, as noted above, at least a hundred others will be added to the priority list each year, the staff would have to process roughly 500 priority substances a year to work its way through this backlog in five years, or 200 a year if a 10 year review cycle were acceptable to Congress. Only then could review of the other 53,000 chemicals in use begin.

Probably six to eight hundred of the existing priority list of 2000 will eventually require field work. (Six hundred have been specifically identified by other public bodies as dangerous or highly suspect substances.) Thus, if the Agency were in fact to review 500 priority existing chemicals a year, it might well generate 350 control actions a year. Almost all would require field follow-up.

If every one of these 350 actions required as much field work and took as long to do as the PCBs rule, this program would require as much effort as the rest of the Agency's programs combined. Fortunately, most actions will probably require less work. A few will require more. For example, if the Agency decided that formaldehyde was unsafe, it and the states would have to deal with 11 major applications (including home insulation) and many minor ones. Although we can expect significant efficiencies as the number of chemicals covered increases and as industry and government learn how to manage such cases, this remains a huge job—if we take seriously the clear intent of the law.

Given the number of cases now in the risk assessment/regulatory pipeline and the time required to process such cases, we estimate that the enforcement office will have to deal with 20 existing chemical actions in 1983. The number should jump to at least 35 in 1984 and could easily be several times that. If the existing distribution of heavy to modest workload actions remains constant (1 to 3), and adjusting for the states doing an increasing proportion of the work and for likely economies of scale and experience, the EPA enforcement staff responsible for implementing these toxics decisions should add 375 permanent positions in 1983 and 600-650 in 1984. The states, at least those with major toxic chemical enforcement problems, should be given sufficient grant funds to build the staff and facilities to take an increasing proportion of the field load: $40 million in 1983 (including start-up funds for necessary technical facilities) and $55-60 million in 1984.

Probably by 1984, and certainly by 1985, the Agency should be implementing toxic control programs in the field. During 1983 and 1984 the Agency and states should build the organizational and support framework to support the very large field staff needed to allow the country to gain ground for the first time on the growing backlog of suspect but ignored substances in the environment. This requires a level of effort of about the same order of magnitude as the traditional air and water quality enforcement staffs.

By 1983 EPA should also have to have the capacity to follow up on its new chemical decisions. Chemicals approved subject to production or use restrictions, for example, need periodic checks to make sure that the restrictions are being respected. Because it will be hard to get state help initially, and because several hundred new chemical requirements should be in place by mid-1983, EPA will need 90-100 new staff members to do the job.

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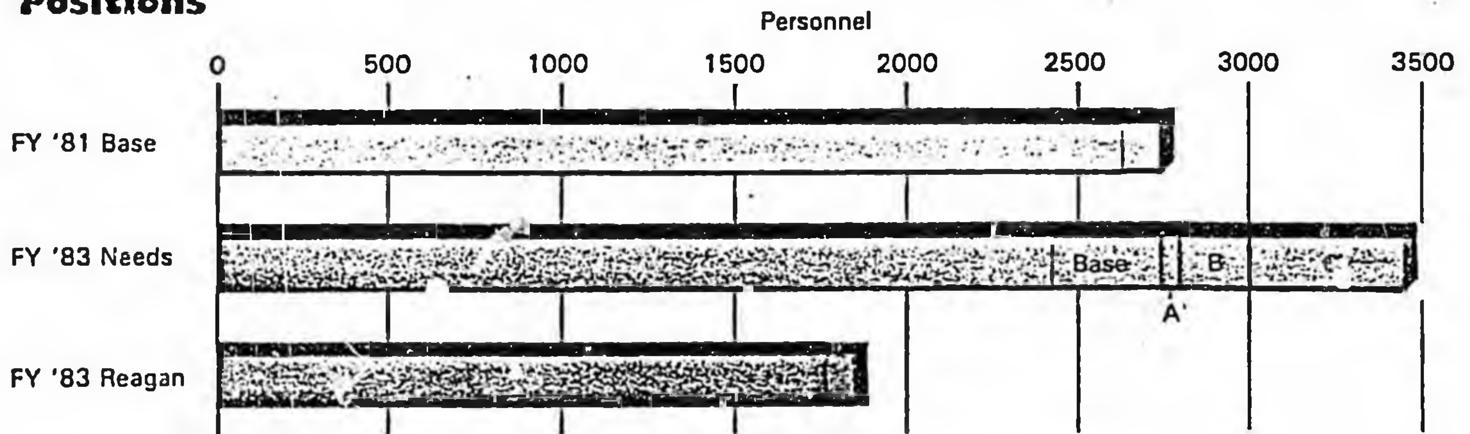
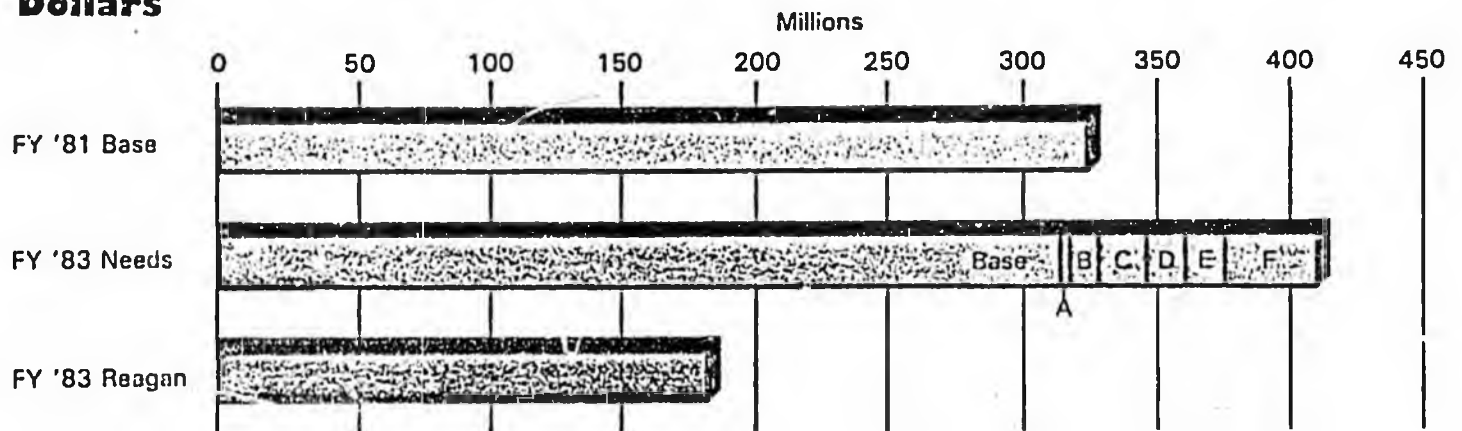
If the Congress is determined to see the Toxics Substances law take effect, it will have to make a major resource commitment. It could also insist that a minimum number of suspect chemicals, both new and old, be reviewed and acted on each year. If it does not intervene, the Administration's program is clear: the Agency will suspend its efforts to implement the existing chemicals part of the Act, and its proposed 1983 budget will cut the purchasing power of the Toxic Substances Control program over fifty percent.

## Positions




## Dollars

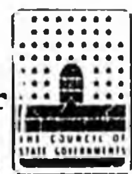



## Budget Summary

| | Permanent Positions | Extramural ($000) | Total ($000) |
|---|---|---|---|
| 1981 Base (Adjusted for Inflation) | 2,729.9 | 184,811.0 | 312,470.0 |
| A. Developing better tools for monitoring t[illegible] in water and assuring the quality of sampling procedures | 16.[illegible] | 1,500.0 | [illegible],517.9 |
| B. Determining how toxic effluents from 40,000 industrial sources must be treated before entering sewage systems, and writing the appropriate pre-treatment permits | 200.0 | 3,800.1 | 12,0[illegible]2.4 |
| C. Enforcement of pre-treatment standards | 500.0 | 600.6 | 18,281.7 |
| D. Grants to help states issue pre-treatment permits | – | 15,000.0 | 15,000.0 |
| E. Grants to help states enforce pre-treatment rules | – | 15,000.0 | 15,000.0 |
| F. Grants to states for exploring the extent of groundwater pollution, developing control strategies, and writing rules to prevent it | – | 33,502.8 | 33,502.8 |
| Total Increment | 716.7 | 69,403.5 | 96,314.8 |
| Program Total | 3,446.6 | 254,214.5 | 403,784.8 |

APRIL 1982

# Waste Management in the States




The Council of State Governments

## The Council of State Governments

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## WASTE MANAGEMENT IN THE STATES

States continue to struggle with the problems of waste disposal at a time of federal budget cuts and increasing regulatory authority. The purpose of this report is to provide an overview of the key issues and the state/federal statutes affecting the management of solid, hazardous and low-level wastes. This report was compiled from existing reports and a survey conducted by The Council of State Governments during September 1981. Individual states should be contacted for more detailed information.

### SOLID WASTE/RESOURCE RECOVERY

Beginning with the enactment of the Solid Waste Disposal Act and continuing with the Resource Recovery Act of 1970 and the Resource Conservation and Recovery Act of 1976 (RCRA), Congress recognized that such traditional solid waste disposal methods as open dumping, landfilling, uncontrolled incineration and ocean burial were environmentally and economically unacceptable. These laws directed the federal government to develop and encourage the use of better systems for the disposal of solid waste. Subtitle D of the RCRA established a broad-based national program to improve solid waste management through the development of state and regional solid waste management plans. The Act offered federal financial assistance to states interested in developing and implementing a solid waste management plan. The state plans, under federal guidelines, identify respective responsibilities of local, state and regional authorities, and encourage resource recovery and conservation and the application and enforcement of environmentally sound disposal practices. By November 16, 1981, 34 states had submitted their adopted state plans to the Federal Environmental Protection Agency (EPA) for approval. One state plan, Iowa, has received federal approval. Thirteen other states and four U.S. territories are in the process of developing or adopting a state plan, with one state, New Mexico, choosing not to participate under the Subtitle D program.

Another major element of RCRA's Subtitle D program is the open dump inventory. The inventory is designed to inform Congress and the public of the extent of the open dump problem and also provide states with a listing of problem sites which need correction. The first national listing of open dumps appeared in 1981 and identified 1,029 existing dumps.

Although the federal government has, under RCRA, provided grant assistance to states for their solid waste management programs, federal support has been reduced from $14 million in federal fiscal 19[illegible] to $8 million in fiscal 1981. Further cutbacks have resulted in the elimination of all federal Subtitle D funds for fiscal 1982. Many of these cutbacks can be attributed to the shifting of federal and state programs from solid waste to hazardous waste management. This will confront many state solid waste

This report was prepared by Leslie Cole, Environmental Resources and Development, Office of Research and Management Services, The Council of State Governments, Lexington, Kentucky.

programs with severe financial problems. As a result, some states will assume a minimum level of effort and activity in their solid waste management programs. Many other states are seeking increased legislative appropriations as an alternative source of program funds. Other funding sources now under consideration in several states are license/permit fees, disposal surcharges and taxes, inspection fees and increased fines.

States which have implemented statewide solid waste/resource recovery authorities have felt less impact from the loss of federal funds. The authorities are considered something of a hybrid--part governmental agency and part private corporation. Similar to a government agency, they may issue tax free obligations to meet the large capital requirements of solid waste facilities. As a private enterprise, the obligations issued are secured only by the financial viability of the project. The solid waste facilities are generally self supporting through service charges and user fees. Regional or multi-county solid waste authorities exist in Texas, Georgia and Vermont. State authorities exist in Louisiana, Connecticut, Puerto Rico, Delaware, Rhode Island and Wisconsin. Other states, such as New York, Maryland and Ohio have state authorities whose scope also encompasses other areas of environmental concern. Many of the authorities are also active in resource recovery facility development.

Although resource recovery is not a new idea, technological advances and the rising costs of land disposal have made the concept economically feasible. Under RCRA, Congress recognized the important role of resource recovery in solid waste management. Of the eight objectives under Subtitle A, five refer to resource recovery as a practice that should be developed and encouraged. Faced with increasing environmental, economic and energy pressures, states are considering resource recovery as one of today's most workable solutions to the high costs and physical limitations of landfills and the establishment of new open dump sites.

State resource recovery efforts range from high technology energy resource recovery projects to much simpler source separation and waste reduction. Source separation first became popular in the 1970s. According to EPA there are now over 1,000 community recycling centers. One of the most successful source separation programs, Arizona's Beverage Industry Recycling Program (BIRP), was established in 1971 and now operates 14 centers around the state. Similar Beverage Industry Recycling Programs are now operating in New Mexico, Maryland and Kentucky. Another litter reduction program which has encountered wide success in over 200 communitites is the Clean Community System--a behavioral approach to the litter problem based on teaching the public not to litter. Other state approaches to promote and encourage recycling include the development of state recycling associations in Nebraska and Colorado and the popular use of state and regional waste exchanges.

The general purpose of a waste exchange is to put waste users in touch with waste producers in order to minimize disposal expense and recover as much value from waste as possible. A number of waste exchange programs which were originally begun and funded by government agencies are now operated by private sponsors such as Chambers of Commerce and Trade Associations. Industry waste exchanges were established by industries or associations to provide a direct service to industry and an indirect environmental and resource service to the general public. Twenty-three states currently participate in some form of

state or regional waste exchange.

Many of these state litter reduction efforts were alternatives to a mandatory beverage container deposit law. The first deposit law was enacted by Oregon in 1972. As of November 19, 1981, nine states--Connecticut, Delaware, Iowa, Maine, Michigan, Oregon, Rhode Island, Vermont and Massachusetts--had passed mandatory deposit laws. Delaware's bottle bill has not yet gone into effect pending appropriations. The Virgin Islands has similar legislation pending. Two states, Nebraska and Washington, have enacted legislation which levies a tax on litter prone goods. The revenue generated from the tax is used for litter programs and grants to local communities developing recycling programs. California and Connecticut repealed similar legislation and Connecticut allowed its litter material tax to expire earlier this year. Additional state resource recovery efforts include tax incentives and loan and grant programs. North Carolina provides tax incentives to individuals or corporations who purchase resource recovery or recycling equipment or construct resource recovery facilities. Oregon offers tax credits, 5 percent per year for 10 years, for eligible resource recovery projects. Connecticut, Washington, Nebraska, Pennsylvania, Minnesota, California and New Jersey all provide some form of loan or grant assistance for resource recovery activities including city and county waste to energy systems. According to the American Iron and Steel Institute, there are over 100 cities and counties operating, building or developing waste to energy facilities. Although some of these facilities have been eligible for state grants and loans a majority have been financed by public means, usually tax exempt long-term bonds. The Connecticut Solid Waste/Resource Recovery Authority has four waste-to-energy projects in various stages of development. Delaware, Rhode Island, Louisiana and Wisconsin authorities are also in the process of constructing or developing city and regional systems. Oregon, Tennessee, Washington, Illinois, New Jersey, New York, Ohio and Maine provide state financial assistance for the construction and operation of resource recovery facilities through the issuance of bonds.

Although a few state resource recovery programs are self supporting, most have relied on federal financial support. Unfortunately, recent cutbacks have also eliminated federal funding for state resource recovery programs for fiscal 1982 ($4 million in 1981). In light of this, many states are considering funding alternatives for their resource recovery programs. Maine recently passed a bond issue in support of resource recovery activities and facility development while West Virginia and the Virgin Islands are exploring bonding alternatives. Many states are prepared to request additional state legislative appropriations for program funding. New Jersey recently passed a landfill tax which will be used to develop, over a long period, a 30 million dollar resource recovery program. Other states are considering similar taxes and fees in an effort to protect and preserve their resource recovery programs.

HAZARDOUS WASTES

RCRA was the first comprehensive federal legislation to deal with the hazardous waste issue. Under Subtitle C of the Act, the EPA was directed to establish a national program to regulate hazardous wastes from the "cradle to grave." Furthermore and similar to the provisions of the Clean Water Act and the Clean Air Act, the law enables states which have promulgated appropriate

statutory and regulatory programs to operate and enforce the federal hazardous waste program. Federal monies were made available to encourage state participation. Federal funding for Subtitle C of RCRA rose from $30 million in fiscal 1981 to $41.7 million in fiscal 1982.

Under the Subtitle C of the RCRA, EPA approves state hazardous waste management programs in two phases. Phase I authorization gives states the right to control transportation and generation of hazardous wastes within their borders and to regulate existing Treatment, Storage and Disposal (TSD) facilities. Phase II authorization grants states authority to issue permits to hazardous waste facilities. As of January 26, 1982, 28 states had received EPA authorization for Phase I of their hazardous waste management programs and five states had applied for final authorization. Where states have not established HWM (Hazardous Waste Management) programs or the programs do not meet federal standards, EPA is required to assume regulatory control.

On May 19, 1980, EPA published the first set of standards under Subtitle C of RCRA. Phase I regulations contain "self-executing, largely administrative and operational standards which existing hazardous waste facilities must meet during interim status." Phase I regulations also include the listing of wastes considered hazardous, the establishment of a state manifest system and the establishment of an initial set of performance standards for TSD facilities.

EPA defines hazardous wastes through four characteristics: ignitability, corrosivity, reactivity and toxicity. EPA regulations also list 500 wastes as hazardous. If a waste exhibits one or more of the characteristics or is found on the list, it is deemed to be a hazardous waste for regulatory purposes. Current EPA regulations allow some exemptions for small-quantity generators; however, inclusion of this provision into a state program is not required. States seeking Phase I interim authorization have incorporated, with slight modification (at least eight states have indicated their substances list is more stringent than the federal list), EPA's identification and definition standards of hazardous wastes into their state's HWM program. Other states, such as Washington and California, have adopted an alternative approach which defines hazardous wastes on the basis of its "degree of hazard" by specifying, in their respective programs, different standards of control for different hazardous wastes. EPA has begun to analyze whether the hazardous waste regulations under RCRA can be adjusted to control specific wastes based on waste type, the usual management technology, and the surrounding environment. The EPA "degree of hazard" analysis is expected in February 1982, with standards adjusted to this approach by 1984.

Another major element of Phase I authorization is the development of a manifest system for tracking a waste shipment to its designated destination. In general, the manifest system requires the generator to use only licensed transporters and to designate only a permitted TSD facility to take delivery of wastes. Currently, 35 states provide for a manifest system in their HWM programs, however, citing a lack of uniformity among the states manifest documents, EPA plans to make final, by April 1982, a prescribed uniform manifest form to achieve standardization and efficiency in the manifest system. The New England states were the first to implement a regional manifest system in 1980 to provide uniformity and improve the overall management of hazardous wastes between the states. This regional manifest has

allowed states in the New England region, for example, Connecticut, to track shipments of waste through their states.

The Phase I interim status regulations also require creation of closure and postclosure plans as well as financial responsibilities. Under the financial responsibility regulations, which were to take affect on October 13, 1981, owners and operators of 14,300 existing facilities seeking interim status must show evidence of at least $1 million of liability insurance per occurence or $2 million per year for "accidental occurences" to cover claims awarded by courts for property damage and personal injury caused by releases from hazardous waste facilities. The rules also would require another 4,400 land disposal facilities to insure against long-term waste seepage accidents at a limit of $3 million per claim or $6 million per year for "non-sudden" occurences. However, EPA is now considering a proposal to suspend permanently federal requirements for liability insurance and has deferred the financial regulations effective date to April 13, 1982, pending a decision. A majority of the states require proof of financial responsibility and hold an owner or operator of a HWM facility liable for damages. However, since some states statutes, such as Texas and Massachusetts, have incorporated RCRA's financial regulations by reference, their status is also pending the EPA decision.

In January 1981, Phase I regulations were supplemented by more technical Phase II standards. Phase II standards include technical and environmental performance criteria designated to guide EPA in issuing permits.

EPA divided Phase II state interim authorization into three components, A, B and C.

Phase II A. -- standards for granting permits for storage and treatment facilities, effective July 13, 1981.

Phase II B. -- standards for permitting hazardous waste incinerators, effective July 22, 1981.

Phase II C. -- standards for permitting land disposal facilities, pending.

However, EPA has temporarily suspended Phase II A and B standards for existing incinerators and storage surface impoundments due to industry comments on retrofitting existing facilities and 1980 amendments to RCRA which require EPA to distinguish between new and existing facilities. In addition, EPA has yet to issue regulations under Phase II C, land disposal facilities. While the Agency first proposed standards for permitting land disposal facilities on December 18, 1978, due to the receipt of hundreds of critical comments, EPA decided to develop revised regulations. On February 5, 1981, EPA published its revised proposed landfill regulations with final rules to be promulgated no earlier than the beginning of 1982, later amended to 1983.

However, through a suit brought about by Illinois, two environmental groups and the National Solid Waste Managment Association, U.S. federal district court Judge Gessell ordered on November 13, 1981 that regulations "setting design and operation standards for existing hazardous waste land disposal facilities must be issued by the EPA by February 1, 1982." EPA and the Department of Justice will appeal the Court's decision. In another ruling, Judge Gessell declined to order EPA to reverse its decision to

suspend temporarily the standards for issuing permits for existing surface storage impoundments and incinerators.

Of the five states seeking Phase II authorization to issue permits for storage and treatment facilities and incinerators, Texas and Georgia are also seeking authority to write land disposal permits although EPA regulations do not currently allow for that.

Phase III standards or final authorization will resolve complex technical issues and establish detailed requirements for design, construction and operation of facilities. For states seeking final authorization, RCRA regulations require the administration of a strict enforcement program which generally includes within a compliance evaluation program: reports and notices, an independent inspection and surveillance program, entry, inspection and monitoring authority, and proper evidence gathering procedures. Most states provide for civil and criminal fines; however, many states have moved toward classifying hazardous waste violations as felonies. Twenty states have amended their statutes to provide for felony status.

In addition to the minimum requirements under Subtitle C of RCRA many states are also active in facility siting, comprehensive planning and emergency response.

One of the major issues related to siting is permitting authority. In most states an existing department issues the permit; however in several cases, a state-level board consisting often of state-level agency heads issues the permit. Five states have developed a state-level siting board specifically for hazardous waste facilities. The nine-member Connecticut Siting Council allows three electors from the affected municipality and one from the neighboring municipality most affected to sit on the council. The council, following receipt of a complete application and hearings, has the authority to grant or deny a certificate of public safety and necessity. The Michigan site approval board, in another approach, is comprised of permanent statewide members and temporary additional members selected from the affected area. The board acts on site construction permit applications that have been approved by the State Department of Natural Resources and has final authority. Two on-site facilities were recently sited by the Michigan approval board.

The way siting legislation deals with local governments varies significantly between states. Seventeen states provide state-level preemption of local zoning ordinances while eight states specifically give local governing bodies approval over hazardous waste land disposal facilities. Illinois Hazardous Waste Regulations require final approval of sites by county or municipal governing bodies.

In some cases, states provide for mediation and arbitration to resolve siting conflicts. Florida, for example, has an appeals procedure set up for dealing with conflicts. Under Florida law if the Department of Environmental Regulation issues a permit for a hazardous waste facility on technical grounds and if the local government finds the facility inconsistent with local plans, the permittee may seek a variance from the local plan. If the local government denies a variance, the permittee may appeal to the Regional Planning Council for a recommendation. If the Regional Planning Council recommends that a variance be granted, the permittee may appeal to the

Governor and Cabinet to grant the variance.

Fourteen states currently provide for public involvement in the ownership and operation of hazardous waste facilities. Virginia, under its HWM program, allows the state to own and operate an HWM facility, while states such as Georgia and Texas have established quasi-public state authorities to own, operate and lease HWM facilities.

Several states are also active in comprehensive planning in order to assess and evaluate hazardous waste issues and problems and develop, in general, state siting, resource recovery, funding policies and program strategies. A majority of the states have undertaken waste surveys to determine the scope of the hazardous waste problem.

Although RCRA and additional state actions have made great progress in establishing comprehensive safeguards against the release of hazardous wastes into the environment, they have not dealt with the problems of past waste disposal practices. Many inactive and abandoned hazardous waste disposal sites have proven to be a serious threat to public health and the environment.

In December 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This law, known as Superfund, created a five year, $1.6 billion fund which will be used to clean up about 400 sites nationwide. The fund will be paid for by a tax on generators (87.5 percent) and federal appropriations (12.5 percent). EPA has identified 115 of the worst dumpsites and targeted the locations for clean-up under Superfund. The sites are located in 45 states and territories, with the 16 sites in Florida, 12 in New Jersey, eight in New York and Pennsylvania and 26 state and territories have one site on the list.

A major concern to some states is the preemptive language of Superfund. The present controversy focuses on section 114(c) of the Superfund legislation, which provides:

> Except as provided in this Act, no person may be required to contribute to any fund, the purpose which is to pay compensation for claims for any costs of response or damages or claims which may be compensated under this title. Nothing in this section shall preclude any State from using general revenues for such a fund, or from imposing a tax or fee upon any person or upon any substance in order to finance the purchase or prepositioning of hazardous substance response equipment or of other preparations for the response to a release of hazardous substances which affects such State.

The Exxon Corporation and four other corporations required to pay taxes under the New Jersey Spill Act brought suit in federal district court in New Jersey alleging preemption and seeking a refund of taxes paid. On July 27, 1981 the suit was dismissed holding that the corporations have an affective and efficient remedy for their grievances in state courts. In an effort to seek federal court approval of the tax New Jersey later sought a declaratory judgement that the provisions of the State Spill Compensation and Control Act of 1979 are not preempted by the federal Superfund Act of 1980. New Jersey lost its bid for federal court approval when the U.S. district court of the District of Columbia dismissed the suit on November 10, 1981. Five

petrochemical companies have resumed the battle on December 18, 1981 asking a state tax court to bar the state from collecting the surcharges. The awaited outcome on the New Jersey case leaves the legal status of many state funds in question. Florida has reacted by adding language to its state fund indicating that it will not be used in a manner inconsistent with CERCLA. State laws authorizing the establishment of trust funds often spell out the funding source. California recently enacted Superfund legislation in response to a 1980 state survey which identified 67 hazardous wastes sites in need of cleanup. The $100 million dollar fund, to be collected over the next ten years, will be supported entirely on industry-paid fees on hazardous waste disposal. Thirty states have some type of spill or trust fund to provide funding for an assortment of hazardous waste management activities. Several states can activate their funds to provide for emergency response and cleanup. Other funds, such as Kentucky and Massachusetts, have been set up to also encourage volume reduction and alternatives to land disposal of hazardous wastes.

Although most states encourage the recycling of all wastes and many require alternative options to be considered prior to land disposal, few actually provide incentives to recycle hazardous wastes. Utah, Montana, South Carolina, Washington and Michigan exempt or partially exempt generators from regulation under the state hazardous waste management program if the wastes are recycled. Florida and Missouri provide fee and tax exemptions for generators who recycle. Oregon provides a 100 percent tax credit on capital costs for projects recovering usable material or energy from wastes and New Jersey funds low-interest, state-subsidized loans for equipment and other capital expenditures related to recycling residentially generated waste oils. New Jersey municipalities which recycle residential waste oils receive a separate state rebate derived from a tax on landfills. Many states have also become involved in state and regional solid/hazardous waste exchanges in an effort to recycle wastes. The New York Waste Exchange Law authorized New York State Environmental Facilities Corporation (a public benefit corporation) to study and establish a statewide effort in order to reduce the quantities of hazardous wastes that need ultimate disposal.

Other state recycling efforts include research and development. Illinois has earmarked 25 percent of its Hazardous Waste Fund to be used for research in order to reduce, recycle or detoxify hazardous wastes in the state and Oklahoma has set up a separate Resource Recovery Division to research and encourage recycling.

## LOW-LEVEL NUCLEAR WASTE

Before 1954, the management and use of atomic energy and radioactive materials were largely confined to the federal government, however, the Atomic Energy Act of 1954 enabled private entities to operate nuclear facilities and use radioactive materials. Although the Atomic Energy Commission (AEC) was charged to carry out the regulations of the act, many states voiced concern over public health and safety and expressed an interest in state regulation of atomic energy and radioactive materials. In response to the states concern, section 274 of the Atomic Energy Act was passed in 1959 and gave the governor of a state the right to enter into an agreement program with the AEC and later the Nuclear Regulatory Commission (NRC) and assume certain regulatory

authority over radioactive by-products, source materials, and small quantities of special nuclear materials. Low-level waste would fall under the regulatory purview of the states participating in the program (low-level wastes are defined as industrial, medical or research waste contaminated with small amounts of radioactive material). To enter into the agreement program a state is required to pass enabling legislation authorizing the governor to enter into such an agreement and have a state radiation control program compatible with regulations and standards set by the AEC.

Low-level wastes were not generated in significant quantities by the private sector until the 1960s. At that time most radioactive wastes were disposed of at federal government sites. However, as larger volumes of low-level radioactive wastes were produced, the need for commercial disposal sites increased. Between 1962 and 1971, six commercial low-level waste burial sites opened: Maxey Flats, Kentucky; West Valley, New York; Sheffield, Illinois; Barnewell, South Carolina; Richland, Washington; and Beatty, Nevada. Government facilities which generate and dispose of low-level waste on site are: Oak Ridge National Laboratory, Tennessee; Los Alamos National Laboratory, New Mexico; Idaho National Engineering Laboratory; Hanford Reservation, Washington; and Savannah River Plant, South Carolina. There are also government disposal facilities in Texas, New Mexico, Ohio, New York, Kentucky, Tennessee and Missouri.

Under the state agreements with the AEC, state authorities have regulated five of the six disposal sites under the federal/state agreement program. As of November 15, 1981, 26 states had agreement state status and 18 others have have enabling legislation. The non-agreement states have also developed radiation control programs in an effort to protect the public health and safety of its citizens regarding those radiation sources which are not controlled by the federal government. By 1979, three of the six low-level waste commercial sites had closed. The three states in which commercial facilities are currently operating, Nevada, South Carolina and Washington, have sinced exerted considerable pressure on the states which send waste to their respective commercial sites by limiting the types and amounts of out-of-state wastes to be accepted. Furthermore, over the past five years, at least 25 states have placed restrictions on the disposal of radioactive wastes within their borders.

Recognizing the nation's needs for developing additional low-level disposal sites, Congress passed the Low-Level Radioactive Waste Policy Act of 1980. Under the act, states are responsible for providing low-level radioactive waste disposal capacity for wastes generated in their states, except for wastes generated by the military or federal research and development activities. To carry out that responsibility the act authorizes states to enter into regional compacts to establish and operate regional disposal facilities for low-level radioactive wastes.

To date, more than 20 states have completed or are conducting studies of their low-level waste management requirements. During the last nine months, groups of states in each region of the country have met to discuss regional management of low-level wastes. The Northwestern states are the first to seek federal approval of a regional low-level waste compact. The Northwest Compact established an eight-state region with a low-level waste disposal facility located at Hanford, Washington. Washington, Idaho and Oregon have adopted the

compact and Utah has joined by executive order, pending action by the 1982 legislative session. Alaska, Hawaii and Wyoming are expected to submit the agreement in their next legislative session. The Northwest Compact provides that all party states conform to the host state's packaging and transportation laws. The act also provides for the management of hazardous chemical wastes and states that "in consideration of the state of Washington allowing access to its low-level waste disposal facility by generators in other party states, party states such as Oregon and Idaho which host hazardous chemical waste disposal facilities will allow access to such facilities by generators within other party states." These bills provide that effective July 1, 1983, if Congress approves the Northwest Compact, then "no facility located in any party state may accept low-level waste generated outside of the region comprised of the party states unless the low-level waste committee votes otherwise." Because some states wastes are forbidden and not all states' wastes could violate the Commerce Clause, Congress must consent to this provision before it becomes law.

The Southern states expect to have a draft low-level waste compact ready for submission to state legislatures by January 1982. Other meetings concerning the regional siting of low-level facilities have been held in the Midwest and New England. The status of potential party states of low-level radioactive waste interstate compacts (as of January, 1982) is as follows <1>: Northwest--Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Washington, Wyoming;* Rocky Mountain--Arizona, Colorado, Nevada, New Mexico, Utah*, Wyoming;* Midwest--Delaware, Illinois, Indiana, Iowa*, Maryland, Kansas*, Kentucky, Michigan, Minnesota*, Missouri*, Nebraska*, North Dakota*, Ohio, Virginia, Wisconsin; Central--Arkansas, Iowa*, Kansas*, Louisiana, Minnesota*, Missouri*, Nebraska*, North Dakota*, Oklahoma; Southeast--Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee; Northeast--Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Going Alone--California, Texas; Unaffiliated--South Dakota, West Virginia, District of Columbia, Puerto Rico, Virgin Islands, Guam, Northern Mariana Islands, Trust Territory of the Pacific Islands.

Other areas of state regulation of low-level materials include transportation and emergency response. While some states have left radioactive material transportation regulation to the federal government others have been active in providing regulatory authority in areas such as pre-notification, financial responsibility, and surveillance, monitoring and inspection. Twenty states have adopted pre-notification requirements, 12 states have defined financial responsibility transporter limits, and 24 states have enacted some form of transporter monitoring, surveillance and inspection program. The most frequent transportation actions by states are the adoption of federal DOT regulations and requiring some form of registration, fee payment, permit or license.

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<1> National Association of Attorney Generals
* States potentially belonging to more than one compact.

The Three Mile Island incident and recent experiences of improper disposal and storge of hazardous wastes at Love Canal and the Valley of the Drums accelerated state concern regarding emergency response planning. Many state emergency response programs are directed at nuclear reactor incidents, but several states have developed or expanded their emergency response to consider all radioactive and hazardous materials incidents. Currently, 45 states provide some kind of state emergency response program.

## SUMMARY OF STATE SOLID WASTE AND RESOURCE RECOVERY PROGRAMS

| State or other jurisdiction | Solid Waste | | Resource Recovery | | | | |
|---|---|---|---|---|---|---|---|
| | State solid waste management plans | State solid waste/resource recovery authorities | State used oil recycling programs | Industrial waste exchange programs: State operated | Industrial waste exchange programs: Industry/private operated | Bottle bill legislation enacted | State litter control program |
| Alabama | *,o | ... | x | ... | — | i | x |
| Alaska | # | ... | x | ... | ... | ... | x |
| Arizona | * | ... | ... | ... | pdg | ... | ... |
| Arkansas | o(a) | ... | ... | ... | ... | ... | ... |
| California | o | ... | x | ... | = | ... | x(b,r) |
| Colorado | *,o | ... | ... | ... | — | ... | x(b,e) |
| Connecticut | *,o | x | ... | ... | ... | x | x(b,r) |
| Delaware | # | x | ... | ... | ... | pdg | ... |
| Florida | *,o | ... | i | ... | — | ... | ... |
| Georgia | o(a) | x | ... | ... | — | ... | x |
| Hawaii | (c) | ... | x | ... | ... | ... | x |
| Idaho | # | ... | ... | ... | ... | ... | x |
| Illinois | *,o | ... | x | — | ... | ... | ... |
| Indiana | *,o | ... | x | — | ... | ... | x |
| Iowa | o(a) | ... | ... | ... | — | x | ... |
| Kansas | *,o | ... | x | — | ... | ... | ... |
| Kentucky | *,o | ... | x | ... | ... | ... | ... |
| Louisiana | *,o | x | ... | ... | ... | ... | ... |
| Maine | *,o | ... | x | ... | ... | x | ... |
| Maryland | # | x | x | ... | — | ... | ... |
| Massachusetts | *,o | ... | x | ... | ... | x | ... |
| Michigan | *,o | ... | x | ... | = | x | ... |
| Minnesota | *,o | ... | x | ... | — | ... | ... |
| Mississippi | *,o | ... | ... | ... | ... | ... | ... |
| Missouri | *,o | ... | x | ... | — | ... | ... |
| Montana | * | ... | x | ... | ... | ... | ... |
| Nebraska | # | ... | ... | ... | — | ... | x(b) |
| Nevada | # | ... | ... | ... | ... | ... | ... |
| New Hampshire | (g) | ... | x | ... | ... | ... | ... |
| New Jersey | # | ... | x | ... | — | ... | x |
| New Mexico | " | ... | ... | ... | ... | ... | ... |
| New York | # | x | x | — | ... | ... | ... |
| North Carolina | *,o | ... | ... | ... | — | ... | ... |
| North Dakota | *,o | ... | ... | ... | ... | ... | ... |
| Ohio | *,o | x | pdg | — | = | ... | x |
| Oklahoma | *,o | ... | ... | ... | ... | ... | ... |
| Oregon | *,o | ... | x | — | = | x | ... |
| Pennsylvania | *,o | ... | x | — | = | ... | ... |
| Rhode Island | *,o | x | x | ... | ... | x | ... |
| South Carolina | # | ... | ... | ... | ... | ... | ... |
| South Dakota | *,o | ... | ... | ... | ... | ... | x |
| Tennessee | *,o | ... | pdg | — | — | ... | x |
| Texas | *,o | x | ... | ... | — | ... | ... |
| Utah | * | ... | x | ... | ... | ... | ... |
| Vermont | *,o | x | ... | ... | — | x | ... |
| Virginia | o | x | ... | ... | ... | ... | x |
| Washington | *,o | ... | ... | ... | — | ... | x(b) |
| West Virginia | # | ... | ... | ... | ... | ... | ... |
| Wisconsin | *,o | ... | i | ... | ... | ... | ... |
| Wyoming | # | x | ... | ... | ... | ... | ... |
| American Samoa | *,o | ... | ... | ... | ... | ... | ... |
| Guam | # | ... | ... | ... | ... | ... | ... |
| No. Mariana Is. | # | ... | ... | ... | ... | ... | ... |
| Puerto Rico | # | x | ... | ... | ... | ... | ... |
| Virgin Islands | # | x | ... | ... | ... | pdg | ... |

Key:
* - Completed plans awaiting federal approval.
o - Completed plan adopted by state.
# - Plan in draft stages.
" - No subtitle D program.
x - Active program.
i - Inactive program.
pdg - Pending.
— - Information exchange.
= - Material exchange.
(a) - Federal approval.
(b) - State litter materials tax.
(c) - Completed plan awaiting state adoption.
(r) - Tax repealed.
(e) - Tax legislation expired, not renewed.
(g) - Completed plan awaiting adoption.

Source: Compiled by The Council of State governments, November, 1981.

HAZARDOUS WASTE MANAGEMENT IN THE STATES

| State or other jurisdiction | State[2] hazardous waste management programs | State hazardous waste management plans | Siting Hazardous Waste Facilities: Permitting/Approval Authority: State level department | State level board | State level siting board | Siting Provisions: State ownership/ operation | State preemption | Local veto | Transportation: State manifest system | Enforcement: Felony Status |
|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | * | pdg | ... | x | ... | ... | ... | ... | x | x |
| Alaska | # | ... | x | ... | ... | ... | ... | ... | ... | x |
| Arizona | + | ... | x | ... | ... | x | x | ... | ... | ... |
| Arkansas | * | x | x | ... | ... | ... | ... | x | x | ... |
| California | * | x | x | ... | ... | ... | ... | ... | x | ... |
| Colorado | + | x | x | ... | ... | ... | ... | x | ... | ... |
| Connecticut | (* pdg) | ... | x | ... | x | ... | x | ... | x | x |
| Delaware | * | x | ... | ... | ... | ... | ... | ... | x | ... |
| Florida | (* pdg) | x | x | ... | ... | ... | x | ... | ... | x |
| Georgia | * | x | x | ... | ... | x | x | ... | x | x |
| Hawaii | + | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Idaho | x | pdg | ... | ... | ... | ... | ... | ... | ... | ... |
| Illinois | (* pdg) | x | x | ... | ... | ... | ... | x | x | x |
| Indiana | + | ... | ... | x | x | ... | x | x | ... | ... |
| Iowa | * | x | ... | ... | ... | ... | x | ... | x | ... |
| Kansas | * | pdg | x | x | ... | x | x | ... | x | x |
| Kentucky | * | x | x | ... | ... | ... | ... | x | x | x |
| Louisiana | * | ... | x | x | ... | ... | ... | ... | x | ... |
| Maine | * | x | ... | x | ... | ... | x | ... | x | x |
| Maryland | * | x | x | ... | x | x | x | ... | x | x |
| Massachusetts | * | x | x | ... | ... | ... | ... | ... | x | x |
| Michigan | + | x | x | ... | x | ... | x | ... | x | ... |
| Minnesota | + | x | x | ... | x | x | x | .. | ... | ... |
| Mississippi | * | ... | ... | x | ... | ... | ... | ... | x | ... |
| Missouri | + | x | x | ... | ... | ... | ... | ... | x | ... |
| Montana | * | x | x | ... | ... | x | ... | ... | x | ... |
| Nebraska | e | x | x | ... | ... | x | ... | x | ... | ... |
| Nevada | + | pdg | pdg | ... | ... | x | ... | ... | x | x |
| New Hampshire | * | ... | x | ... | ... | ... | ... | ... | x | x |
| New Jersey | (* pdg) | ... | x | ... | pdg | ... | pdg | ... | x | x(c) |
| New Mexico | + | ... | x | ... | ... | ... | x(b) | ... | x | ... |
| New York | (* pdg) | pdg | x | ... | x | x | ... | x | pdg | x |
| North Carolina | * | x(a) | x | x | ... | x | x(b) | ... | x | ... |
| North Dakota | * | ... | x | ... | ... | ... | ... | x | ... | ... |
| Ohio | (* pdg) | ... | x | ... | ... | ... | x | ... | x | x |
| Oklahoma | * | ... | x | ... | ... | ... | ... | ... | x | ... |
| Oregon | * | x | x | ... | ... | x | ... | ... | x | x |
| Pennsylvania | * | ... | x | ... | ... | ... | x | ... | x | x |
| Rhode Island | * | pdg | x | ... | ... | ... | ... | ... | x | x |
| South Carolina | * | ... | x | ... | ... | ... | ... | ... | x | ... |
| South Dakota | + | x | ... | x | ... | ... | ... | ... | ... | ... |
| Tennessee | * | ... | x | x | ... | ... | ... | ... | x | x |
| Texas | * | ... | ... | x | ... | ... | ... | ... | x | ... |
| Utah | * | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Vermont | * | x | ... | ... | ... | ... | ... | ... | x | ... |
| Virginia | * | x(a) | x | ... | ... | x | x | ... | ... | x |
| Washington | + | x | x | ... | ... | x | ... | ... | x | pdg |
| West Virginia | e | x | ... | ... | ... | ... | ... | ... | ... | x |
| Wisconsin | * | ... | x | ... | ... | ... | x | ... | x | ... |
| Wyoming | x | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| American Samoa | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Guam | + | pdg | pdg | ... | ... | pdg | ... | ... | pdg | pdg |
| Puerto Rico | (* pdg) | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Virgin Islands | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| D.C. | pdg | pdg | x | ... | ... | ... | ... | ... | x | ... |

Key:
* — EPA interim authorization (Phase 1).
x - Active state program.
i - Inactive.
+ - Adopted state regulations.
# - State regulations in development and draft stages.
(a) - Under state solid waste plan.
(b) - Under state eminent domain statutes.
pdg - Pending.
(c) - Some regulations are enforced under misdemeanor status, some under felony status.
(e) - State regulations completed and pending adoption.
Source: Compiled by The Council of State Governments, November, 1981.
[2] Updated January 26, 1982.

## HAZARDOUS WASTE FUNDS

| State or other jurisdiction | State Hazardous Waste Trust and Spill Funds | Source of fund | Major scope of fund |
|---|---|---|---|
| Alabama.......... | Hazardous Waste Management Fund | F(o) | Administrative costs. |
| | Perpetual Care Fund | F(o) | Monitoring beyond the active use of the site. |
| Alaska............ | ... | ... | ... |
| Arizona........... | Hazardous Waste Trust Fund | F(o) | Operation, maintenance, perpetual care. |
| Arkansas.......... | ... | ... | ... |
| California........ | Hazardous Substances Account | T(g) | Match federal superfund monies, cleanup, incident contingency fund, victim compensation fund, health studies, emergency equipment. |
| Colorado.......... | Hazardous Waste Disposal Fund | L,P | ... |
| | Emergency Response Cash Fund | L | Emergency response. |
| Connecticut....... | Emergency Spill Response Fund | L,R | Oil and hazardous spills |
| Delaware.......... | ... | ... | ... |
| Florida........... | Hazardous Waste Management Trust Fund | L,T,F(o),R,P | Reduce hazard at abandoned sites. |
| Georgia........... | Hazardous Waste Trust Fund | F(o),B* | Maintenance of abandoned sites. |
| Hawaii............ | ... | ... | ... |
| Idaho............. | ... | ... | ... |
| Illinois.......... | Hazardous Waste Fund | F(o) | Take action against long term danger, research and development of recycling. |
| Indiana........... | Hazardous Substances Emergency Trust Fund | T(g) | Emergency response, match under superfund. |
| | Environmental Management Special Fund | F,P | Multipurpose environmental response. |
| Iowa.............. | ... | ... | ... |
| Kansas............ | Perpetual Care Trust Fund | F(o),L | Cleanup and monitoring. |
| Kentucky.......... | Hazardous Waste Management Fund | F(g)(o),R | Emergency response, postclosure, monitoring, and maintenance. |
| Louisiana......... | Hazardous Waste Protection Fund | B*,L | Perpetual care, assure financial responsibility. |
| | Abandoned Hazardous Waste Site Fund | excess $,L | Match federal funds, cleanup at abandoned sites. |
| | Environmental Emergency Response Fund | R,L,P | Environmental emergency responses, match federal funds. |
| Maine............. | Hazardous Waste Fund | F(g),F(t*) | Emergency response. |
| Maryland.......... | Oil Disaster Containment Cleanup & Cigy Fund | F(o),P,R | Oil and petroleum products spills. |
| | Hazardous Substance Control Fund | F(o),L | Hazardous substances in water cleanup. |
| Massachusetts..... | ... | ... | ... |
| Michigan.......... | Disposal Facility Trust Fund | F,(o) | Long term care of closed facilities. |
| | Hazardous Waste Service Fund | L,R | Emergency response. |
| Minnesota......... | ... | ... | ... |
| Mississippi....... | ... | ... | ... |
| Missouri.......... | Hazardous Waste Fund | F(g),F(o),L | Administrative costs, cleanup. |
| Montana........... | ... | ... | ... |
| Nebraska.......... | ... | ... | ... |
| Nevada............ | State Emergency Fund | L | Emergency response. |
| New Hampshire..... | Hazardous Waste Cleanup Fund | F,P,L | Cleanup. |
| New Jersey........ | Spill Compensation Fund | F(o),L | Cleanup of spills. |
| New Mexico........ | Hazardous Waste Emergency Fund | L,R,P | Cleanup, disposal, containment. |
| New York.......... | Hazardous Waste Remedial Fund | L | Emergency response. |
| | Environmental Protection & Spill Comp. Fund | F | Oil spills only. |
| North Carolina.... | ... | ... | ... |
| North Dakota...... | ... | ... | ... |
| Ohio.............. | Hazardous Waste Facility Mgmt. Special Acc. | F(g) | Administration, closure, abatement, grants. |
| | Emergency Response Spill Fund | L,P | Emergency response to spills. |
| Oklahoma.......... | ... | ... | ... |
| Oregon............ | Hazardous Waste Account | F(g) | Perpetual care. |
| Pennsylvania...... | Solid Waste Abatement Fund | P,R,B* | Emergency situations, spills. |
| Rhode Island...... | Hazardous Substance Emergency Fund | L,R | Abandoned site spills. |
| South Carolina.... | Hazardous Waste Contingency Fund | F(g) | Emergencies at permitted landfills. |
| South Dakota...... | ... | ... | ... |
| Tennessee......... | Hazardous Waste Trust Fund | B* | Cleanup, perpetual care. |
| | Perpetual Care Trust Fund | F(o) | Containment of abandoned site. |
| Texas............. | Disposal Facility Response Fund | L | Match federal superfund monies. |
| Utah.............. | ... | ... | ... |
| Vermont........... | Oil and Hazardous Spill Contingency Fund | L,R | Response to spills, hazardous substances. |
| Virginia.......... | ... | ... | ... |
| Washington........ | ... | ... | ... |
| West Virginia..... | ... | ... | ... |
| Wisconsin......... | Hazardous Waste Fund | F(o) | Closing and longterm care. |
| | Hazardous Substances Spill Fund | L,R | Cleanup and disposal. |
| Wyoming........... | ... | ... | ... |
| D.C............... | Pending | ... | ... |
| American Samoa.... | ... | ... | ... |
| Guam.............. | ... | ... | ... |
| No. Mariana Is.... | ... | ... | ... |
| Puerto Rico....... | ... | ... | ... |
| Virgin Islands.... | ... | ... | ... |

Key:
F - Fees
L - Legislative appropriations
P - Penalties
R - Reimbursements
B* - Bond forfeiture
T - Taxes
B - Bond supported
o - Operator
g - Generator
t* - Out-of-state transporters

Source: Compiled by The Council of State Governments, November, 1981.

RADIOACTIVE MATERIAL MANAGEMENT IN THE STATES

| State or other jurisdiction | State radiation control program | State Emergency Response Programs: Nuclear reactor specific | State Emergency Response Programs: All radioactive materials incidents | Transportation: Federal source of transportation requirements adopted by states | Transportation: Requires registration fees, permits, licensing, certificates | Regulation: Commercial low level waste disposal facilities | Regulation: Regulation of radioactive waste disposal |
|---|---|---|---|---|---|---|---|
| Alabama | x(a) | x | x | DOT | L | ... | ♦ |
| Alaska | x | ... | ... | DOT | R | ... | + |
| Arizona | x(a) | x | x | DOT | L | pdg | pdg |
| Arkansas | x(a) | x | x | DOT | P | ... | ... |
| California | x(a) | x | x | NRC,DOT | R | ... | ... |
| Colorado | x(a) | x | x | DOT | L | ... | o |
| Connecticut | x | x | ... | ICC | P,F | ... | b |
| Delaware | x | x | x | DOT(s) | P | ... | o |
| Florida | x(a) | x | x | DOT(s) | F | ... | I |
| Georgia | x(a) | x | x | DOT(s) | P,L | ... | ... |
| Hawaii | x | ... | ... | ... | ... | ... | o |
| Idaho | x(a) | ... | ... | DOT(s) | L | ... | ... |
| Illinois | x | x | x | DOT(s) | P,C | pdg | # |
| Indiana | x | ... | x | ... | ... | ... | ... |
| Iowa | x | ... | x | DOT | ... | ... | ... |
| Kansas | x(a) | ... | x | DOT(s) | R | ... | o |
| Kentucky | x(a) | x | x | DOT(s),NRC(s) | L | I | o |
| Louisiana | x(a) | x | x | DOT | L | ... | H |
| Maine | x | x | i | DOT(s) | P | ... | o |
| Maryland | x(a) | ... | x | DOT(s) | ... | ... | ... |
| Massachusetts | x | x | x | DOT(s) | ... | ... | ... |
| Michigan | x | x | x | DOT(s) | R,F | ... | ♦ |
| Minnesota | x | ... | x | DOT(s) | ... | ... | o |
| Mississippi | x(a) | x | x | ... | ... | ... | o |
| Missouri | x | x | x | ... | ... | ... | ... |
| Montana | x | ... | x | ... | L | ... | # |
| Nebraska | x(a) | ... | x | DOT | L | ... | ... |
| Nevada | x(a) | ... | x | DOT(s) | P,L | S | L,F |
| New Hampshire | x(a) | ... | ... | DOT | ... | ... | b |
| New Jersey | x | ... | x | ... | C | ... | ... |
| New Mexico | x(a) | ... | x | DOT | ... | ... | + |
| New York | x(a) | x | x | DOT(s) | P | I | + |
| North Carolina | x(a) | x | x | DOT,NRC | ... | ... | ... |
| North Dakota | x(a) | ... | x | DOT | L | ... | o |
| Ohio | x | ... | x | DOT(s) | ... | ... | ... |
| Oklahoma | x | ... | x | ... | ... | ... | + |
| Oregon | x(a) | x | x | DOT | L | ... | - |
| Pennsylvania | x | x | x | DOT(s) | P | ... | ... |
| Rhode Island | x(a) | ... | ... | DOT,NRC | P | .. | ... |
| South Carolina | x(a) | x | x | ... | P | S | L |
| South Dakota | x | ... | x | (DOT,pdg) | ... | ... | #,- |
| Tennessee | x(a) | ... | x | DOT | ... | ... | ... |
| Texas | x(a) | ... | x | DOT,NRC | F,L | pdg | #,* |
| Utah | x | ... | x | DOT | ... | ... | ... |
| Vermont | x | x | x | DOT(s) | R | ... | ♦ |
| Virginia | x | x | x | DOT | R,C | ... | b |
| Washington | x(a) | x | x | DOT,NRC | L | S | P,F,C |
| West Virginia | x | ... | x | DOT,NRC | ... | ... | ♦ |
| Wisconsin | x | x | x | DOT | ... | ... | ... |
| Wyoming | x | ... | ... | DOT(s) | L | ... | ... |
| D.C. | x | ... | x | ... | ... | ... | ... |

Key:
(a) - Federal/state agreement
DOT - Department of Transportation
NRC - Nuclear Regulatory Commission
ICC - Interstate Commerce Commission
AEC - Atomic Energy Commission
(s) - Specific titles
F - Fees
P - Permits
L - Licensing
R - Registration
C - Certificates
x - Active state program
i - Inactive
♦ - Bans disposal of all radioactive waste generated outside state.

\# - Bans disposal of high level waste.
o - Requires legislative approval prior to disposal of radioactive waste.
\+ - Requires consultation and concurrence before disposal is permitted.
I - Requires disposal operator to meet specific technical and environmental criteria.
\- - Requires Governor's approval prior to disposal.
" - Bans all radioactive waste disposal within the state.
S - Commercial disposal site.
H - Requires Asst. Secretary of Office of Environmental Affairs approval prior to disposal.
b - Bans disposal of high-level waste, low level radioactive waste disposal requires prior legislative approval.

Source: Compiled by The Council of State Governments, November, 1981.

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1 Solid wastes
2 Hazardous wastes
3 Solid & Hazardous wastes

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1 Solid wastes
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STATE WASTE MANAGEMENT OFFICIALS

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1 Solid wastes
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STATE WASTE MANAGEMENT OFFICIALS

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1 Solid wastes
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