Chapter 2

Policy Options

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CHOOSING A STRATEGY FOR THE SUPERFUND SYSTEM

OTA finds that a detailed strategy for planning and evaluating the Superfund program has not been formulated explicitly. Instead, a combination of alarmed public responses to events, congressional mandates, Federal policies, and Environmental Protection Agency (EPA) management decisions have resulted in ad hoc program policies. Consequently, a national consensus has not yet emerged on whether Superfund is to be a well planned, multi-decade program, or a short-term, emergency effort.

Congressional] debate on reauthorization of the Superfund program and its funding levels can be viewed in two ways. Both views recognize that much can be learned from the program's early efforts:

- The first view is that the current program is progressing and evolving and becoming more effective, The ad hoc nature of the program provides flexibility to respond to new information and experiences,
- An alternate view is that the early lessons learned from Superfund can be applied now to change the program, and that enough information has been collected to define a more explicit strategy for policy and program implementation.

OTA has examined the accomplishments of the Superfund program to date. Some significant changes have already been made. Although EPA is discussing still more changes in the program and has made some proposals, it is not possible at this time to know what changes will be made and, importantly, how they will be implemented.[1] Thus, a critical choice for Congress centers around how much confidence it and the public have in EPA's determination and institutional capabilities to improve the Superfund program in an evolutionary manner.

The situation is complicated by Superfund's relationship to other national issues. For example, increases in Superfund budgets are related to national budgetary and fiscal issues and the state of the economy. It is inevitable that Superfund will be compared to the progress of Resource Conservation and Recovery Act (RCRA), enacted in 1976, the other major Federal environmental program that deals with hazardous waste, Congress recently culminated extensive examinations of the RCRA program with a reauthorization that includes substantial changes in its policy and implementation, It is not clear whether the Superfund program could evolve into a more effective program in a smoother fashion than RCRA has, but it might.

Many of the findings of this study support the second view—that it is time to change the Superfund program—because: 1) proceeding with the current program poses significant uncertainties and risks, and 2) the absence of an explicit Superfund strategy makes it difficult for Congress to evaluate the long-term consequences of important decisions.

There are three concerns with continuing with the current program. First, a program focused on site-specific problems and needs does not necessarily lead to a national program that

[1] For example, on Jan. 28. 1985, EPA announced proposed revisions in Superfund's National (contingency Plan; the public has an opportunity to respond to the proposal and, hence, it is not known what changes will finally be made. one of the major changes resembles what OTA has stressed in the first part of the two-part strategy: quickly taking more effective initial responses at NPL sites, without requiring State matching funds unless the facility was owned by the State. However, there remains considerable emphasis on using removal for redisposal. Another change would be the circumvention of the Hazard Ranking System, which (I'I'A be] i eves could be i m proved, for sites where health effects were known to be important. Other changes concerning cleanup goals and public participation do not fully address the problems OTA found.

is effective environmentally and economically. This study indicates that as the National Priorities List (NPL) increases (even if only to EPA's projected 2,000 site level), it will no longer be efficient or effective for the program to respond to problems that capture public attention on a site-by-site basis. Nor is it prudent to ignore inter-site effects. The technical and institutional complexities of *individual* uncontrolled site problems should not overshadow the interlocking technical, social, and economic components of the national Superfund system. Conflicts arise between the needs of individual sites and the limits on a national program. The future will demand a thoroughly discussed and explicit Superfund strategy.

Second, there is evidence that the scope of the national uncontrolled site problem has been underestimated. If this is true, an unmanageable environmental crisis might occur years or decades from now. The environmental deficit created today could come due in the future. Many cleanups in the current remedial cleanup program are costly and, because they are not effective in the long term, all too frequently need repeated expensive work at the same sites or on the same wastes. Detailed national cleanup goals or a process to achieve them and to select cleanup technologies and evaluate their performance have not been formulated. In the absence of goals, the least costly alternative may look effective because of the way the cleanup requirements are set. Even best available technology may not be able to achieve adequate or effective environmental protection at some sites over the long term (see chapter 4).

Third, many, if not most, uncontrolled sites have not received significant cleanup attention of any sort other than removal of waste. This may get worse as more sites are added to the NPL, It is likely that *every* site which merits placement on the NPL, because it is found to require a long-term (i.e., permanent) remedial cleanup, would also benefit from an initial response to: 1) provide environmental protection during the long time it is awaiting remedial cleanup, and z) ensure that the site does not get worse during this period. While it may be suggested that some sites may not need initial responses, the benefits of doing so for all NPL sites, if the costs are kept low, are likely to outweigh the costs of not doing so.

However, a case can be made for continuing with the current Superfund program. Chapter 3 shows that, to the extent that the interim strategy modeled by OTA approximates the current program, there are conditions under which the current program can be viewed in a positive manner. Much depends on the values for the average impermanence factor (described in chapters 1 and 3) for the remedial cleanup technologies now being used, It has not been possible for OTA to obtain data on a large number of current Superfund sites to calculate values for the impermanence factor (i.e., basically the extent of unforeseen future costs). However, detailed work on several case studies of Superfund sites (see chapter 1), an analysis of future operating and maintenance costs (see chapter 3), and the conclusion that containment and land disposal technologies are not permanently effective, z indicate that rather high impermanence factors are possible for many sites. OTA believes that the current program's average impermanence factor is likely to be at least 0.5 to 0.7. If this is the case, then the two-part strategy defined below offers time and probably cost advantages over the current program.

If the average impermanence factor were to be low, say about 0.1 or 0,2 (i.e., remedial cleanups that had a low probability of leading to unforeseen future costs), then a decision to continue with the current program would not lead to undesirable consequences. Adopting the two-part strategy would still be a valid option, however, because of the opportunities it affords for institution building, for quickly reducing risk at most sites through initial responses, and because low impermanence actions of the interim strategy could also be used. If, however, the current program continued and it became clear that the average impermanence factor was high, much money and time could be wasted.

'See U.S. Congress, Office of Technology Assessment, *Technologies and Management Strategies for Hazardous Waste Control*, OTA-M-196 (Washington, DC: U.S. Government Printing office, March 1983).

OTA concludes that, in the face of important uncertainties, the two-part strategy is less risky and more fail-safe than Superfund's current ad hoc strategy and less likely to result in ineffective spending.

For all these reasons, OTA finds that: 1) even though some sites are being worked on, from a national perspective *the current strategy can be judged to be both environmentally and economically unsound;* and 2) the two-part or permanent strategy OTA has examined offers a number of advantages.

A Two-Part Strategy

The two parts of OTA's strategy overlap in time, but differ in their focus and priorities.

(I) In the near-term, for perhaps up to 15 years, the strategy would focus on: a) early identification and assessment of potential NPL sites, b) initial responses to *reduce near-term threats at all NPL sites and to prevent sites from getting worse, c)* permanent remedial cleanups for some especially threatening sites, and d) developing of institutional capabilities for a long-term program (see below). A substantially larger Superfund program would be needed in the next 5 years to carry out these efforts. Initial responses that accomplish the most cost-effective and significant reduction of risks and prevent sites from getting worse might cost about $1 million for most sites. This is three times the current cost of immediate removal actions and about 10 percent of EPA's currently projected remedial cleanup costs. Case studies by OTA and others find that both immediate removals and remedial cleanups are ineffective for their intended purposes. Under the two-part strategy, initial responses would emphasize covering sites and temporarily storing wastes and contaminated materials to reduce groundwater contamination and, where technically and economically feasible, excavating wastes to minimize releases into the environment.

(II) Over the longer term, the strategy would perform more extensive site studies and focus on *permanent cleanups,* when they are technically feasible, at sites that pose significant threats to human health and the environment (unless private or State-funded cleanup actions offering comparable protection have taken place). These cleanups would draw on the institution building that occurred during the first phase. Spending large sums before specific cleanup goals are set and before permanent cleanup technologies are available leads to a false sense of security, a potential for inconsistent cleanups nationwide, and makes little environmental or economic sense.

This two-part strategy resembles what is sometimes done in the current program. For example, in the case of the sites in Missouri contaminated by dioxin, large amounts of contaminated soil may be temporarily stored until cost-effective permanent solutions become available. Testing and evaluation of permanent solutions are proceeding.

One of EPA's most experienced Superfund contractors has proposed a strategy almost identical to this one:

> Realizing that there are significant shortfalls in or current knowledge of destruction technologies and that permanent containment is not a solution, I propose the following strategy: Destroy what contamination we can and hold the rest in temporary containment until a permanent solution can be found. a

Similarly, another of EPA's major Superfund contractors has cited the need for a two-phase approach:

> At these complex sites, although not widely recognized, there are typically two distinct phases or remediation. The first is an immediate action which usually lasts from 1 to 2 years. This phase is very site-specific and is very effective for the amount of money spent in that it dramatically and quickly reduces the threat to public health. The second is a complex and expensive long-term action which could last from 2 to 20 years or even 30 years.[4]

[3] William A. Wallace, CH2M Hill, Inc., testimony at hearings before the House Subcommittee on Commerce, Transportation, and Tourism, 1983, Serial No. 98-128,

[4] Gary A. Dunbar, Camp Dresser & McKee Inc., testimony at hearings before the House Subcommittee on Commerce, Transportation, and Tourism, 1983, Serial No. 98-128,

Generic Strategic Goals

OTA suggests four major goals that the two-part strategy or indeed *any strategy for a long-term Superfund program* should be able to meet:

1. provide nationally effective, long-term protection of public health *and* the environment at the lowest possible cost from the threats posed by uncontrolled hazardous waste sites.
2. Rapidly identify all uncontrolled sites and avoid underestimating the national cleanup problem. Use site selection criteria for the NPL that are consistent with the first goal.
3. Assure the public that they are being protected while they wait for remedial cleanups. That is, in the near-term give the highest priority to providing *initial responses at all NPL sites* in order to quickly and sharply mitigate immediate threats to public health and the environment.
4. Address the institutional needs of a long-term program. For example, develop and demonstrate the effectiveness of new permanent cleanup technologies, improve institutional capabilities of Federal and State agencies, resolve scientific uncertainties, improve public participation in decision-making, and develop a detailed strategic plan to implement a decades-long effective Superfund program.

OTA finds that the present program falls short of meeting these goals. Discussion of these goals, the means for their implementation, and the policy issues they raise are given below. References are made to the findings and conclusions of other chapters which the reader can consult for further details.

GOAL 1: COMPREHENSIVE AND EFFECTIVE NATIONAL PROTECTION

Because of urgency and limited resources, the initial Superfund program has fallen short of providing comprehensive and effective protection. This is probably a consequence of the original emergency nature of the program. For example, contrary to the statutory mandate, sites that pose threats to the environment but not to human health do not enter the Superfund system. A different strategy responding to the same conditions and constraints might have brought such sites into the program, but with a different priority and management approach. Loss of natural resources and effects on sensitive elements of the ecosystem, important in themselves, may also lead to substantial indirect effects on human health and welfare. Even for threats to human health, the current system is likely to exclude sites that threaten relatively small numbers of people. Sites that pose uncertain long-term health effects may not be given as high a priority as less ambiguous acute effects.

Congress can meet this goal through clear policy directives, provision of adequate budgets, and effective oversight of Federal programs.

A Long-Term Program

A most important policy issue for Congress to consider is whether Superfund should be continued as a long-term program. If so, the initial steps would include directing EPA to plan for a long-term program and providing it with resources to implement a multi-decade program. Without a commitment to long-term funding, comprehensive protection based on a long-term strategy will be difficult to achieve.

Therefore, Congress might reconsider the current approach of authorizing Superfund for 5-year periods. Should a longer period than 5 years be used for authorization, budgeting could still be done for shorter periods based on the scope of the national problem and the progress of the program,

Funding Levels

Based on the analyses in chapters 3 and 5, OTA concludes that a multi-decade Superfund program could easily require about $100 billion of Superfund resources out of total costs to the Nation of several hundred billion dollars. Note that an NPL considerably smaller than 10,000 sites would not alter OTA's principal conclusions about the need for an improved, better defined Superfund strategy encompassing well understood cleanup goals and the development of new technologies effective over the long term. (See chapter 5 for derivation of the 10,000-site figure.)

The estimate of the costs to Superfund contains many uncertainties. Consequently, the estimate could be too high or too low depending on:

- The number of sites that qualify for the NPL.
  - —OTA's estimate that 5,000 solid waste sites (RCRA Subtitle D sites) may become future Superfund sites might be low; this figure is only about 1 percent of OTA's estimate of the Nation's open and closed solid waste sites. Moreover, improving the site-selection process by, for example, removing the cutoff score for NPL placement and recognizing environmental threats, might lead to more than the 2,000 additional sites estimated by OTA. OTA did not include in its estimate of future uncontrolled sites several categories which even now are being addressed by Superfund and which will almost surely increase in number. Examples are leaking underground storage tanks, mining waste sites, and pesticide contamination sites.
  - –However, it is also possible that OTA may have overestimated the number of sites to be placed on the NPL. In particular, perhaps groundwater problems and threats from solid waste facilities have been overstated. With EPA's current groundwater protection strategy, many aquifers may not be classified so as to require cleanup; this possibility deserves detailed examination by Congress.
- National cleanup goals and the costs of cleanup.
  - —National cleanup goals might lead to levels of cleanup that would be more expensive than indicated by experience so far, and cleanup costs for treatment of wastes may be underestimated, Waste treatment costs are typically two to eight times greater than the immediate costs for land disposal. But the costs of waste treatment technologies may decrease because of technological innovation, and savings may be realized from learning curve and economy-of-scale effects.
  - —Furthermore, the costs of groundwater cleanup are very uncertain. Groundwater problems exist at more than three-quarters of current NPL sites although fewer sites than that may eventually need groundwater cleanup. Experience with groundwater cleanup is scanty and costs may be extraordinarily high, depending on cleanup goals.
  - —Finally, a 10,000-site NPL resulting, in part, from increased site identification efforts might include some sites with far higher cleanup costs than are now typical; for example, very large solid waste landfills which contaminate important aquifers, very large mining waste sites, and deep injection wells. s
- The size of expenditures by private parties and States.
  - —To date, expenditures by private parties and the States have contributed significantly to cleanup (although cost recovery has been extremely low so far), These contributions are discussed below, and could increase or decrease in the future depending on several factors, also discussed below, In particular, under current policies that require matching funds

[5]There are now about 70() deep injection wells which could be receiving hazardous wastes but for which there are not Federa 1 requirements for mon i tori ng nearby underground sources o f dri ki gwat er.

from the States, some States may not provide these funds and consequently large numbers of sites may not get cleaned up under the Federal program.

Coping With Uncertainty

There is no analytic way to resolve all uncertainties. Chapter 3 addresses the consequences of making important policy decisions in the face of uncertainty. OTA's analysis indicates that there are substantial costs and risks in underestimating future Superfund needs. Prevention is far less costly than remedial action when it comes to hazardous waste problems. Furthermore, technically speaking it is possible to conceive of a situation where, as EPA says, the system could be "overwhelmed. " Simply put, releases of hazardous substances from many uncontrolled sites could cause pollution so widespread that it would either be technically impossible, very costly, or too time-consuming to redress. In particular, contamination of underground drinking water, if indeed it could ever be cleaned up, would be an exceedingly expensive and lengthy job. The *task is to reduce risk while developing information and technology to reduce uncertainty.*

Funding Increases Over Time

If OTA is correct that a much larger, longer program will be necessary, how might Congress reshape Superfund? A much larger Superfund program cannot be implemented immediately. To the contrary, many of OTA's findings from case studies and other work (see chapters 5, 6, 7, and 8) indicate that capabilities are strained at the *current* level of funding. Thus, although very large amounts of money will be needed for the program, in the near-term funding could be increased gradually as policies are developed and institutional capabilities improved. This is an important dimension of the two-part strategy examined by OTA. The first part of the strategy might last up to 15 years. (In OTA's model discussed in chapter 3, a period of 15 years is used, but this figure should not be regarded as certain or as rigid.) A major uncertainty during part one of the strategy is how fast sites are added to the NPL; this will determine, to a large degree, annual budget needs, The second part of the strategy, with its emphasis on permanent cleanups, might last for as long as 30 to 410 years, The major uncertainties are cleanup goals and the costs of cleanup, with costs depending in part on goals.

For example, under the two-part strategy, funding might build up from current levels of about $300 million to $400 million annually to perhaps $800 million for the first year of the initial period, *$1.2* billion for the second year, and $1.6 billion for the third year. Afterwards, funding might be stabilized at about $2 billion to $3 billion per year to address more costly permanent cleanups. These figures would result in a total spending of about $7 billion to $10 billion for a 5-year period, These near-term increases in annual spending are very large. But the efforts stressed in the first part of the strategy are those that EPA is best able to implement; they require fewer technical specialists than the later period with its emphasis on remedial cleanups rather than initial responses, Moreover, as discussed later, these figures would include significant sums devoted to improving institutional capabilities.

Spending by Responsible Parties

Higher levels of cost recovery and non-Federal spending are likely in the future. Even so, projections of future Superfund needs seem overly optimistic about these two contributions. Optimism about cost recovery is hard to justify from the experiences so far, with recovery amounting to about 1 percent of Superfund commitments. A recent audit by EPA's Inspector General criticized EPA's system to identify and track the status of cost recovery cases and to file a cost recovery case before the 3-year statute of limitations expires. However, recovery may improve when more sites, such as industrial surface impoundments, having only a single or several responsible parties are tackled.

Although responsible parties have spent considerable sums to date on cleanups (about **$300**

million), there are obstacles to and uncertainties about their future spending. These center around uncertain future liabilities after cleanup. Incentives may be required if responsible parties are to maintain or increase the pace of cleanup, However, it is not necessarily desirable to have more non-Superfund cleanups without effective cleanup goals and Federal oversight to ensure environmentally effective work. Even for sites cleaned up by responsible parties under agreements with EPA or States there appears to be little effective technical oversight, and already it is clear that a "quiet market" exists for cleanups. These are done by or for responsible parties, usually on their property, without government involvement, and usually before public awareness is awakened, (These cleanups are not included in the *$300* million estimate given above. Their total is unknown, but probably large.) One interesting and positive aspect of this situation is that some new cleanup technologies are being given a chance to prove themselves under field conditions. However, it is not clear that information about positive and negative results is being disseminated.

Matching Funds From States

The issue of the States' share of the national cleanup effort is also important in considering funding decisions, Beyond initial studies and investigations, States must pay 10 percent of cleanup costs and all operating and maintenance costs after the first year. The States have spent perhaps 15 percent of Superfund funding to date. Some suggest removing or reducing the current requirements for matching funds from the States.

The chief reason to consider such a change is that many sites might not receive cleanup because some States are unwilling to provide the required matching funds. In December 1982 the head of the Superfund program said that about **50** Superfund sites had received no attention because States had not provided their shares of the money, an estimated $97 million. In February 1983 the same official said that 42 States do not have the money to complete cleanups, Although the situation may not be as severe today because of the improved economy, it still appears to be a problem. Should OTA's estimates of future needs be correct, the problem could get considerably worse. This is especially true if a large number of municipally owned and operated solid waste facilities become Superfund sites, because the current matching requirement for these sites is at least 50 percent of cleanup costs. Thus, an increase in the matching State share might sharply curtail cleanups.

The current dependence by States on Superfund for remedial cleanups is shown by data from a survey conducted for EPA. For fiscal year 1983, $103.7 million (82 percent) of a total of $126 million (for 37 responding jurisdictions) came from Superfund, and projections for fiscal year 1984 indicated that $201 million (76 percent) of a total of $263.2 million [for 35 responding jurisdictions) would come from Superfund. This survey also found that for fiscal year 1983 through fiscal year 1985 a total of $293 million was available in State budgets for dealing with uncontrolled sites. Of that, $194 million (66 percent) was available for cost sharing under Superfund (these data are for 42 States and the District of Columbia). This would indicate more than enough potential to adequately meet the matching requirements currently in effect (i. e., Superfund spending of about $2 billion for those three years). However, it should be noted that there are considerable differences among the States; some States with substantial numbers of NPL sites have strong, well-funded programs (e.g., New York, New Jersey, California, and Illinois).

Information on State budget surpluses suggest that it is not necessary to remove or reduce requirements for matching funds from States. The National Governor's Association reports that the 50 States will end fiscal year 1984 with $5.8 billion in budget surpluses and that for fiscal year 1985 the total surplus will be $4.3 billion. From 1979 through 1984, the total States' surpluses amounted to $43.5 billion. Although there are significant variations among the States, with some having small, unreliable, or no budget surpluses, the data sug-

gest that money alone does not explain the difficulties some States have in supplying matching funds to clean up Superfund sites.

Therefore, a policy change may be viewed as unnecessary because many States have the potential to supply the matching funds; indeed, a number of States have developed a variety of means to do so, Moreover, the obligation currently placed on the States to pay for all future operating and maintenance costs provides considerable incentive to use either lower cost initial responses or more permanent remedies rather than containment at the site.

The reasons why some States have been less enthusiastic about helping to pay for Superfund cleanups include: a) spending priorities that give cleanups low rank; b) uncertainty about the Federal program, with a "wait-and-see" attitude about changes in the matching funds requirement; c) dissatisfaction with the Federal program and the States' limited role in deciding policy; d) conflicts among State agencies and between legislatures and executive branches that result in inaction; e) the influence of hazardous waste-related industries on State decisionmaking or the perceptions of potential negative impacts on industry; and f) obstacles to establishing highly technical programs, such as limits on salaries or hiring freezes.

Other Uses of Superfund

It must be emphasized that OTA has considered only the hazardous waste site cleanup function of Superfund in estimating future needs. Should other major uses be mandated for this program, such as for victims compensation or cleanups of Federal sites, these would have to be taken into account. Moreover, OTA has not considered uncontrolled sites under the responsibility of Federal agencies which, although placed on the NPL, do not now qualify for funding from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Program Duration and Equity

Program duration is an important factor and it probably will become more of an issue. It will likely take several decades to address even a 2,()()()-site NPL. OTA has assumed that about 50 years is the longest practical program, but it is not clear how the public will respond to such a long program.

In developing the two-part strategy, OTA stresses the importance of taking initial responses that are effective in managing immediate risks, but that, in most cases, are not cleanups. Nevertheless, there is an inherent tension in a program that places priority on taking initial responses at all sites, while most sites wait a long time for permanent cleanup. This is why it is necessary to develop detailed plans to decide when sites receive a permanent cleanup, to develop goals to decide whether all sites need permanent cleanup, and to involve the public early in the entire process, from site identification through initial response and remedial cleanup.

Some may view an initial period where few permanent cleanups occur as unacceptable. But there are two basic reasons to support this approach. *First, it is both technically and economically impossible to permanently clean up all sites—even for an NPL of only 2,000 sites—in the near term, certainly not within 20 years.* Cost-effective permanent cleanup technologies for some problems do not yet exist; there is not enough information on most sites to make decisions about permanent cleanup; there are no detailed national cleanup goals; and there are not enough people to implement a large permanent cleanup effort,

Second, the current Super fund program does not offer equity, as it assures neither rapid reduction of risk at all NPL sites nor permanently effective cleanups. Furthermore, the way particular sites are chosen for cleanup in the current program is not clear. EPA has said that the hazard ranking scores given sites as part of the site selection process for the NPL do not establish exact priorities for responses, However, according to EPA's latest data on the 538 NPL sites the site scores seem to have an effect; for example, 30 percent of all sites on the NPL are receiving some type of remedial attention, but out of the top 50 ranked sites 60 percent are receiving attention. For the next

50 sites, **40** percent are receiving attention, and for the remainder just over 20 percent. This may be viewed with some concern because of criticisms of the Hazard Ranking System (HRS).[6]

There is evidence that decisions to take action at a site also depend on which EPA Region the site is in, the resources available from the State, the ability of the local community to present a forceful case for action, and news media attention, The time it takes for EPA to get responsible parties to agree to pay for cleanup may also have some effect, but perhaps more on the nature of the cleanup than on when it takes place.

Financing Superfund

This study has focused on estimating future needs rather than on analyzing how to raise funds for the program. In suggesting to Congress that a much larger, longer Superfund program may be necessary, OTA is sensitive to broader financing issues. A multibillion dollar Superfund program raises issues about potential impacts on the national economy and the Federal budget which are beyond OTA's capabilities to examine.

When Congress was considering CERCLA, various financing mechanisms were examined for Superfund. In 1980, Congress adopted a tax on chemical and petroleum feedstocks supplemented by general tax revenues. Discussions on the extension and expansion of Superfund have examined a number of other approaches. OTA has analyzed only one of these, a tax on the generation and/or the management of newly produced hazardous wastes—generally referred to as a "waste-end *tax."* This approach was considered but judged unworkable in 1980. A brief comparison of the feedstock tax, waste-end tax, and general tax revenues as funding sources for Superfund is given in table 2-I.

Note that there are limits to the amount of money that could be raised from feedstock and waste-end taxes, perhaps $1 billion to $2 billion annually from both, Feedstock taxes raise concerns about adverse secondary impacts on industry, such as a loss of international competitiveness. With a waste-end tax, the tax base will gradually shrink as waste reduction efforts proceed. Thus, although a combination of all three sources is possible, a larger Superfund program increases the likelihood of reliance on general tax revenues to a greater extent or

[6]See chapter 5. Also "Workshop on Selection of Hazardous Waste Sites for Superfund Funding," U.S. Senate Committee on Appropriations, March 1982.

Table 2-1.—Summary Comparison of Several Major Financing Schemes

	Feedstock tax[a]		Waste-end tax[b]		General tax revenues[c]
	Current	Expanded	Low	High	
Fairness:					
Very few companies pay most of the taxes	Improved	Good, many parties pay	Improved if land disposal gets high tax		Parties most directly responsible for problems do not bear burden
Administrability:					
Easy, established	Probably easy	Probably easy on basis of States' experience	Possibly more enforcement necessary		Very easy
Secondary impacts:					
None apparent	Might reduce international competitiveness of some companies	None likely	Provides economic incentive to reduce wastes and shift away from land disposal, thus capacity to raise basic revenue declines		With large amount may have undesirable effect on Federal budget

[a]Based on taxes imposed on chemical and petroleum feedstocks which can be expanded by increasing tax rates and number of materials taxed
[b]Based on taxes on hazardous wastes generated or managed, and may vary according to how wastes are managed and what hazards wastes pose; if the rates are high enough current management decisions may be affected *Low* is less than about $10 per dry ton *high* is about $30 to $50 per dry ton
[c]Currently a small fraction (12.5 percent) from this source but much larger amounts could be raised

SOURCE: Office of Technology Assessment

adopting some new, broadly based tax. This also becomes more likely if non-cleanup uses of Superfund are mandated.

Waste-End Tax Approach

OTA examined the waste-end tax option because it concluded in its 1983 report on hazardous waste that a waste-end tax was an important option to deal with the national hazardous waste problem. Its importance stems from its potential to generate funds while it serves as an economic incentive to reduce waste generation and shift management away from land disposal. However, to use a waste-end tax as an economic incentive, the tax must be structured carefully. This means varying tax rates depending on the nature of the waste, the way it is managed, or both. Moreover, the tax rates must be sufficiently high to act as an economic incentive. This requires an understanding of current market conditions and management policies.

Many of the original objections to using the waste-end tax have less force today. Because of the gradual development of the RCRA program, many States have found it practical to use a waste-end tax. OTA, EPA, and others have concluded that a Federal waste-end tax could be made administratively manageable. T For example, for the past several years EPA found that State income from waste-end taxes as a percent of projected revenues were: California, 89 percent; Connecticut, 71 percent; Illinois, 83 percent; Ohio, 98 percent; Minnesota, 102 percent; New Hampshire, 107 percent; New York, 101 percent; and South Carolina, 96 percent. For comparison, EPA reports that collections from the feedstock tax ranged from 78 to 84 percent of projected revenues from 1980 to 1983.[8]

But there remain different viewpoints on whether to structure the tax to provide an economic incentive for changing waste generation and management practices, or to use it simply to generate revenues, OTA has concluded that the benefits of using a waste-end tax for preventing more Superfund problems are likely to outweigh the costs of implementing such a measure. It is possible to structure a waste-end tax both to raise substantial revenues in the near-term and to act as an economic incentive to modify waste disposal practices and reduce waste generation.

To act as an economic incentive, that is, to affect waste generation and waste management practices significantly, tax rates would have to be about $30 to $50 per ton of hazardous waste. This is because of the current costs faced by waste generators: about $50 to $100 per ton for most land disposal, and usually from $200 to $800 per ton for waste treatment. Most of the 20 States that have adopted waste-end taxes have relatively low rates (see table 2-2). Only six States have maximum tax rates high enough to significantly affect waste disposal practices. The States have not encountered major problems in implementing waste-end taxes, although at the beginning some States made rather imprecise estimates of revenue generation.[9] Note that States are concerned about whether a Federal waste-end tax could seriously reduce State sources of revenue, This could be dealt with by explicitly allowing States to have their own waste-end taxes or by providing for a deduction to Federal taxpayers for waste-end taxes paid to a State.

Several illustrations of a Federal waste-end tax are given in tables 2-3, 2-4, and 2-5. These are based on 1981 EPA data that are imprecise and may not be valid today because the Federal RCRA and Superfund programs have increasingly influenced waste management practices. The tax rates chosen were based on industry concerns, the costs of waste management options, and what some States found effective. These examples show how the degree of hazard of a waste can be used, and how dif-

[7] U. S, En\ ironmental Protection Agency, Office of Policy Analysis, '*Survey of States' Experience With Waste-End Taxes, " September 1984; Howard J, Hoffman, "Workabilit y of the Waste-End Tax," testimony before the House Ways and Means Committee, July 25, 1984.

[8] "Survey of States' Experiences With Waste-End Taxes, " op. cit.

[9] For more detail on States' experiences and waste-end taxes, see the EPA report referenced above and testimony of Joel S. Hirschhorn on behalf of OTA for the hearing record of the Senate Committee on Environment and Public Works, Sept, 10, 1984,

Table 2-2.—Summary of State Waste-End Tax/Fee Systems

State	Treated wastes taxed	Higher rate for offsite management	Generators pay	Facility operators pay	Highest possible tax rate[a] (per ton)
Alabama	X	X	X	X	$10.00
California			X	X	$45.66
Colorado	X			X	$ **2.00**
Connecticut	X	X	X		$10.00
Illinois	X	X		X	$ 6.60
Indiana				X	$ 1.50
Iowa	X	X		X	$50.00
Kansas	X	X	X	X	$ 5.00
Kentucky	X	X	X		**$11.00**
Louisiana	X	X		X	$10.00[b]
Maine	X	X		X	**$33.00**
Minnesota	X	X	X		**$70.40**
Mississippi		X		X	**$ 9.00**
Missouri	X		X	X	**$26.00'**
New Hampshire	X	X	X		**$36.60**
New York	X	X	X		$12.00[d]
Ohio		X		X	**$ 8.99'**
South Carolina				X	**$ 7.00**
Tennessee	X		X		**$ 7.00**
Wisconsin				X	**$ 0.135**

a More than one tax rate may be applied to achieve per ton rate
[b] Dry weight ton
[c] The 2 percent charge on disposal receipts is not included
[d] Higher rates may soon be implemented
[e] Based on 1982 disposal charges and 6 percent charge on disposal receipts

SOURCE Office of Technology Assessment

Table 2-3.—illustration of Applying a Hazardous Waste-End Tax by Management Activity

Tax category	Annual quantity[a] (million metric tons)	Scenario 1 Tax rate	Scenario 1 Revenue ($ millions)	Scenario 2 Tax rate	Scenario 2 Revenue ($ millions)
Well injected waste	**32.0**	**$ 5/tonne**	**$ 160**	**$** 3/tonne	$ 96
All other[b] land disposed waste	**22.4**	**$50/tonne**	**1,120**	$30/tonne	672
Treated waste	176.0	$ 2/tonne	352	$ 1/tonne	176
Total revenue			$1,632		$944

[a] Waste quantities data from National Survey of Hazardous Waste Generators and Treat merit, Storage and Disposal Facilities Regulated Under RCRA in 1981 prepared for the EPA by Westat Inc April 1984
[b] Land fills surface impoundments land application etc

SOURCE Office of Technology Assessment

Table 2-4.—illustration of Applying a Waste-End Tax to Land Disposed Waste: Degree of Hazard Based on Toxicity (waste quantities in millions of metric tons)

***Land disposal** excluding well injection:*			
Toxic waste[b]	$50/tonne	19.8	$ 990.0
Nontoxic waste[d]	$10/tonne	1,3	13,0
Well injection:			
Toxic waste[c]	$ 5/tonne	8.3	41.5
Nontoxic waste[d]	$ 3/tonne	17,7	53.1
Total revenue			$1,097.6

[a] Waste quantities data from National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981 prepared for the EPA by Westat, Inc April 1984 Waste quantity considerations
— Survey only requested top 10 waste streams so quantities based on waste type differ from total disposal quantifies
— Survey results are subject to statistical reliability assumptions
— 4200000 tonnes of injected waste and 100,000 tonnes of all other land disposed wastes were assumed to be nontoxic no hazardous waste code was explicitly assigned in data
— Generation land disposal and waste definitions may have changed since 1981
b Landfills surface Impoundments land application etc
[c] As defined in 40 CFR 261 24, 261 302261 33
d Wastes that are only ignitable corrosive and /or reactive

SOURCE Office of Technology Assessment

Table 2-5.—Illustration of Applying a Waste-End Tax to Land-Disposed Waste: Degree of Hazard Based on Reportable Quantities (RQ) (waste quantities in millions of metric tons[a])

Tax category	Tax rate	Scenario 1 Quantity[b]	Scenario 1 Revenue ($ millions)	Scenario 2 Quantity[b]	Scenario 2 Revenue ($ millions)
Land disposal[c] excluding well injection:					
RQ = 1	$50/tonne	<0.1	$ 1.5	18.0	$ 900.0
RQ > 1,	$10/tonne	21.1	211.0	3.0	30.0
Well injection:					
RQ = 1	$ 5/tonne	0	0	6.1	30.5
RQ > 1	$ 3/tonne	*26.1*	*78.3*	20.0	60.0
Total revenue			$291		$1,020-

a Waste quantities data from "National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981," prepared for the EPA by Westat, Inc., April 1984 Waste quantity considerations:
– Survey only requested top 10 waste streams so quantities based on waste type differ from total disposal quantities
— Survey results are subject to statistical reliability assumptions.
— 4,200,000 tonnes of injected waste and 100,000 tonnes of all other land disposed wastes were assumed to be RQ > 1; no hazardous waste code was explicitly assigned in data
— Generation, land disposal, and waste definitions may have changed since 1981
b Reportable quantity designations from the *Federal Register*, vol 48, No 102, May 25, 1983, proposed Rules
" Only those wastes with a proposed reportable quantity of 1
. . Wastes with a proposed reportable quantity of 1 plus wastes with presumed reportable quantity of 1 pending reassessment
c Landfills, surface impoundments, land application, etc

SOURCE. Off Ice of Technology Assessment.

ferent types of waste management can be taxed. Where judgments have been necessary, OTA has used data that reduce revenue estimates in its examples. One way to deal with estimates that might be overly optimistic and with a trend toward increasing waste reduction and shifting away from land disposal is, within limits, to steadily increase the tax rate (as California has done). For example, the tax rate for each category might be increased by 10 percent annually until some limit was reached.

Reducing the Generation of Hazardous Wastes

If a waste-end tax is successful as an economic incentive, the tax base will shrink over time as less waste is produced and as it is managed in more desirable ways. Thus, a waste-end tax to raise money for Superfund has limits. Nevertheless, the more serious the national uncontrolled site problem is perceived to be, the stronger is the reason to use an approach that will reduce the number of new uncontrolled sites. To a large degree, the need to encourage waste reduction has been better recognized by some States than by the Federal Government. A handful of States (e.g., Massachusetts, Illinois, North Carolina, and Minnesota) have started efforts to foster waste reduction, particularly by smaller companies. Most of these efforts emphasize information and technology transfer, and local technical assistance. The connection between hazardous waste reduction and the Superfund program is likely to become sharper if the program is seen more as a long-term, high-cost effort.

GOAL 2: ACCURATE ESTIMATES OF THE NATIONAL PROBLEM

The importance of accurate estimates of the national cleanup problem for planning purposes is discussed in chapter 3. Substantial risks and penalties result if the problem is underestimated; for example, if too small a future NPL is assumed, or if the future costs of impermanent cleanups are ignored, or if the costs of more permanent cleanups are underestimated. The findings in chapter 5 on future NPL sites, the case studies given in chapter 1 and elsewhere, chapter 4 on the difficulties of developing national cleanup goals, chapter 6 on the limitations of current cleanup technologies, chapter 7 on problems in implementing the

Table 2-2.—Summary of State Waste-End Tax/Fee Systems

State	Treated wastes taxed	Higher rate for off site management	Generators pay	Facility operators pay	Highest possible tax rate[a] (per ton)
Alabama	X	x	x	x	$10.00
California			x	x	$45.66
Colorado	X			x	$2.00
Connecticut	X	x	x		$10.00
Illinois	X	x		x	$6.60
Indiana				x	$ 1.50
Iowa	X	x		x	$50.00
Kansas	X	x	x	x	$5.00
Kentucky	X	x	x		$11.00
Louisiana	X	x		x	$10.00[b]
Maine	X	x		x	$33.00
Minnesota	X		x		$70.40
Mississippi		x		x	$9.00
Missouri	X		x	x	$26.00[c]
New Hampshire	X	x	x		$36.60
New York	X	x	x		$12.00[d]
Ohio		x		x	$ 8.99[e]
South Carolina				x	$ 7.00
Tennessee		x	x		$7.00
Wisconsin				x	$0.135

a More than one tax rate may be applied to achieve per ton rate.
b Dry weight ton.
c The 2 percent charge on disposal receipts is not included.
d Higher rates may soon be implemented,
e Based on 1982 disposal charges and8 percent charge on disposal receipts

SOURCE: Office of Technology Assessment,

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a Waste quantities data from " National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981 ," prepared for the EPA by Westat, Inc , April 1984.
b Landfills, surface impoundments, land application, etc.

SOURCE: Office of Technology Assessment,

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– Generation, land disposal, and waste definitions may have changed since 1981.
b Landfills, surface impoundments, land application, etc.
c As defined in 40 CFR 281.24, 281.30-2261.33.
d Wastes that are only ignitable, corrosive, and/or reactive.

SOURCE: Office of Technology Assessment,

Table 2.5.—illustration of Applying a Waste-End Tax to Land-Disposed Waste: Degree of Hazard Based on Reportable Quantities (RQ) (waste quantities in millions of metric tons[a])

Tax category	Tax rate	Scenario 1 Quantity[b]	Scenario 1 Revenue ($ millions)	Scenario 2 Quantity[b]	Scenario 2 Revenue ($ millions)
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Total revenue			$291		$1,020

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[b] Reportable quantity designations from the *Federal Register,* vol. 48, No. 102, May 25, 1983, Proposed Rules.
- •Only those wastes with a proposed reportable quantity of 1.
- †* Wastes with a proposed reportable quantity of 1 plus wastes with presumed reportable quantity of 1 pending reassessment.

[c] Landfills, surface Impoundments, land application, etc.

SOURCE: Office of Technology Assessment.

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uncont rolled sites even if they are in compliance with RCRA regulations-and standards, which often they are not.[10] EPA agrees that Superfund wastes have been brought to leaking RCRA facilities, This situation has been described as a "toxic waste merry-go-round. "[11]

Several other aspects of using removals for redisposal merit attention. First, there is little doubt about EPA's reliance on such removals. In establishing a priority list of 31 activities for all of EPA during fiscal year 1985, the first priority is given as, "Stabilize imminent threats at uncontrolled hazardous waste sites through *Superfund removal actions.*"[12]

Second, the head of the Superfund program noted recently that with regard to the use of RCRA facilities "the requirement for inspection is not applicable to removal actions due to time constraints, "[13] However, if removal is part of a remedial action, an inspection is necessary if there has not been one within the past 12 months,

Third, in EPA's January 1985 proposal for a revised National Contingency Plan there is evidence that removal for redisposal will not necessarily be limited in the future. For example, EPA gives some examples where RCRA regulations would not be applicable which seem to ignore the basic nature of the waste: 1) a case where RCRA wastes are indiscriminantly disposed on a roadway, and 2) contaminated river beds. Apparently a waste that might be prohibited from land disposal, but which became a Superfund waste in a transportation accident or through purposeful midnight dumping, could be land disposed, and a river sediment contaminated with polychlorinated biphenyls (PCBs) could also be land disposed even though PCBs would not normally be allowed to be so managed. Finally, it is also stated that interim measures might not have to be consistent with existing standards, "If the selected remedy is not the final remedy for the site, it might be impractical or inappropriate to apply other environmental standards. " This raises the possibility of Superfund wastes being taken to a RCRA facility which is not in compliance with existing regulations.

Finally, it should be noted that the States also perform a considerable number of removal actions at uncontrolled sites without the use of Superfund. Removal of wastes for redisposal is typical for small sites where hazardous materials are easily accessible from the surface, A survey of States performed for EPA found that in 1981 and 1982 for 29 responding States there were 350 immediate removals; there were 106 Federal removals for these same States in that period, and nationwide in that time there were 212 Federal immediate removals. (There are also other types of removals in the Superfund program.)

Better Use of an Improved Hazard Ranking System

Choosing the correct initial response is an important decision, which could be helped if the initial site evaluation were improved. Currently preliminary assessments, site investigations, and the Hazard Ranking System are limited to arriving at a score to determine eligibility for the NPL. There is little linkage between the initial hazard assessments and subsequent studies to decide on action at the site. If the early assessment system were improved, it could help determine the appropriate initial response more rapidly, Costly and lengthy studies could be avoided in the first part of the strategy.

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[10] This conclusion about land disposal sites for Superfund wastes is supported by the analysis in chapter 5 on operating hazardous waste facilities. The recently reauthorized RCRA with its plan ned prohibition on the land d isposal of some hazardous wastes will not necessarily eliminate redisposal. Tile prohibitions may not take effect for some years. EPA may also be able to grant waivers for Superfund wastes, especially for situations where it would take time to verify that the wastes were covered by RCRA prohibitions.

[11] Some compan ies are making considerable money from waste removals even though they themselves have been responsible parties at Superfund sites, Even though they may not have paid for cleanup, they have been funded by the government to take wastes and dispose of them and, for the Stringfellow and Seymou r sites, the redisposal sites have either been shut down or fined by EPA for substantial violations of existing RCRA regulations.

[12] U.S. Environmental protection Agency, memo randu m by Alvin 1.. Alm, "Development of Operating Year Guidance for FY 1985 and FY 198[;, " Nov. 2, 1 %43.

[13] Will iam N. Hedeman, J r., "The Pursuit of Consistent Decision mak i ng U rider Su perfu nd, paper presented at American Bar Association Conference, 1984.

Technical Issues

The widespread use of initial responses would raise several technical issues. To what extent can above ground temporary storage be effective? There are a variety of existing technologies to store waste in a safe and cost-effective way. For example, containerization as used in transportation and traditional storage of chemicals would be possible for small amounts of waste. Stronger materials with greater corrosion resistance have been developed for such containers. Containers can be placed in structures that are protected from the weather. For larger amounts, bulk storage in tanks, vaults, and other structures is possible. Here, too, much conventional storage technology exists in the chemical and petroleum industries,

Considerable opportunities to use offsite storage facilities, perhaps even some constructed on a regional basis to manage Superfund wastes, may be possible, Indeed, this may be necessary when there is not enough space at the NPL site. However, the use of offsite facilities raises the issue of public opposition to siting new hazardous waste management facilities, as well as problems obtaining RCRA permits for facilities, Furthermore, some States will not want to receive wastes from other States, There is no simple solution to this, but it does suggest that some initial responses may be contingent upon the State or local community providing a site or storage facility for Superfund wastes, Finally, innovative ideas are being developed for temporary storage (see chapter 6).

An associated issue is: over what length of time will storage be effective? Any container or storage structure will have some finite engineering lifetime. Generally speaking, it should be possible to safely store wastes for 5 to 20 years. Moreover, above ground storage provides the important advantage of accessibility, That is, it is relatively easy to visually inspect containers and structures to detect damage or leakage. Many types of monitoring devices are also available.

EPA could develop information on above ground storage and other initial response techniques for general use by contractors, States, and companies, Some R&D in this area might be warranted.

Another issue is waste treatment. Some hazardous materials might be treated immediately to render them as harmless as possible, Over the past several years there has been considerable unused waste treatment capacity at many facilities, Furthermore, in some cases it might be cost effective to build onsite treatment facilities immediately; regional treatment facilities serving the Superfund program are also possible, If initial responses are used for all NPL sites, it is likely that the private waste treatment industry will respond to the demand. However, this could lead to problems with siting new facilities.

The issue of determining the extent of an initial response is discussed in chapter 4. Simple generic standards could be developed to satisfy the two primary goals of these actions.

Economic Issues

The advantages of initial responses at all sites depend on keeping the the costs are kept low relative to permanent cleanup costs (see chapter 3). On average, initial responses should cost about *10* to 20 percent of permanent cleanup costs, If the cost of initial responses are too high, they would resemble the current high-cost impermanent cleanups. But if the costs are too low, the actions would be no more effective than current removal actions, As a result of examining the costs of specific technical actions (see chapter 6), OTA finds that initial response costs would probably average about *$1* million per site. This is about three times greater than the costs of immediate removal actions (i.e., an average of $302,000 per action for 165 sites from December 1980 through February 1984). Impermanent remedial cleanups (consisting of initial remedial measures, surface cleanups, phase one remedial cleanups, and final remedial cleanups) typically cost from $5 million to *$10* million per site, but additional costs may be incurred later.

Questions may arise concerning who is responsible for operating, maintaining, and mon-

itoring an initial response before permanent cleanup is achieved. Since so many NPL sites are likely to receive only initial responses for some time, the public must be assured about several things: 1) that the initial response measures are effective, and that there are no significant uncertainties about their continued effectiveness over the limited period of time before cleanup, and z) that the site will receive a remedial cleanup. Therefore, a policy to assure adequate funds for each site to cover future costs may be necessary. Where possible, these could be obtained from responsible parties. Perhaps the costs of initial responses should not require matching State funds. Furthermore, an explicit program is needed to gather information on the site for remedial cleanup as is a decision making process to determine objectively the timing of the remedial cleanup.

Lastly, there are circumstances that will tend to favor the rapid use of a remedial, permanent cleanup. First, there will be some sites that are so bad that it would be unacceptable to delay permanent cleanup. Second, some responsible parties may want to resolve the cleanup cost issue as soon as possible.

Possible specific congressional actions to address Goal 3 are:

- Simplify the categories of responses to NPL sites to initial responses and remedial cleanups. Modify the statute to allow initial responses to have costs exceeding $1 million.
- Require initial responses at all NPL sites to be initiated within one year of placement on the NPL.
- Require EPA to establish simple generic standards to determine the extent of an initial response by setting goals to deal with immediate threats and to prevent the site from deteriorating.
- Require EPA to establish procedures to assure communities that sites will be selected for remedial cleanups in an equitable and objective manner.
- Direct EPA to perform an analysis of the potential demand for new storage and treatment facilities for Superfund wastes and recommend ways to address obstacles to siting and permitting these facilities.

GOAL 4: IMPLEMENTATION NEEDS OF A LONG-TERM PROGRAM

Because it is almost inevitable that Superfund will be a long-term program, Congress may wish to consider ways to improve the Superfund delivery system.

Resolve the Cleanup Goals Issue and Address Scientific Uncertainties

The discussion in chapter 4 on establishing cleanup goals demonstrates the difficulty of resolving the issue of "How clean is clean?" It appears necessary to elevate policymaking on the degree of cleanup to the statutory level and clarify the role of the Federal Government in determining levels of cleanup performed by States and responsible parties.

It is vital to obtain more information on health and environmental effects, both laboratory and epidemiological data. Without more complete information, it will be difficult to implement any approach to establish national cleanup goals and determine the magnitude of the national problem. Although it is impossible to remove all scientific uncertainty, the goal should be to steadily reduce uncertainties over time. In this regard, although cleanup actions cannot wait indefinitely, the two-part strategy does offer some opportunity to significantly improve the information base before large sums of money are spent,

Specific options for congressional consideration are:

- Establish an interagency group (e.g., EPA, Department of Interior, and the Department of Health and Human Services) to re-

port periodically to Congress on the state of information on health and environmental effects of uncontrolled sites, gaps in the data base, and proposed means to address these deficiencies. Such an effort would benefit from the participation of people from outside the Federal Government.

- Increase spending on laboratory and field research to obtain more data on health and environmental effects,
- Direct EPA to develop and implement a classification system based on the present and future use of NPL sites to help establish cleanup goals and determine other site management priorities. Classification based on reuse, restoration, and rehabitation of the site could help determine the extent of cleanup and the applicability of health and environmental effects in the cleanup decision.
- Direct EPA to better define how the Superfund program evaluates the performance and effectiveness of remedial cleanups financed under Superfund, by the States, and by private parties, over both the short and long terms. This should include explicit attention to unintended consequences involving transfer of hazardous chemicals among environmental media, transfer of risks among populations, and residual contamination.

Technology

The results of chapter 6 on cleanup technologies support the need for greater Federal involvement in the research, development, and demonstration (RD&D) of innovative cleanup technologies. For the first 5 years of Superfund, EPA will have spent about $25 million on cleanup RD&D. Although some conventional containment, disposal, and treatment technologies will continue to be used, and may be improved, substantial opportunities exist to advance treatment technologies that are geared to the needs of cleaning uncontrolled sites. These technological advances offer the promise of permanently effective cleanups for a variety of uncontrolled site problems and, possibly, reduced cleanup costs over time.

OTA has identified a number of innovations that have advanced beyond the laboratory stage. The chief problem is that some institutional barriers stand in the way of using these innovative technologies, It is in the environmental and economic interests of the Nation to foster a competitive market for cleanup technologies. For example, currently the major alternative to land disposal and waste containment is incineration, which has a long history in the management of newly generated hazardous waste. But even though it can be effective in treating Superfund wastes, the costs are high, and regulation may be inadequate (e.g., few standards for air emissions of toxic chemicals), Other technical approaches are less familiar to the regulatory community and waste generators and face more severe obstacles to their evaluation and use.

A number of specific Federal initiatives could prove effective:

- Analyses of cost effectiveness could be directed to include: a) a clear statement of the total cleanup objectives for the site; b) a discussion of whether alternative technologies have proven capabilities or uncertainties for the application under consideration; c) a discussion of which (if any) innovative technological approaches might be demonstrated at the site and how demonstration would aid the national cleanup effort for similar sites; d) an estimate of all short- and long-term costs for each alternative which takes into account: i) uncertainties about effectiveness in meeting the cleanup objectives, and ii) the likelihood that further cleanup and corrective actions will be required; and e) a discussion of technical and economic needs and uncertainties, including institutional considerations, for long-term monitoring, operation, or maintenance of the site.
- Federal support could be substantially increased to help private companies and universities develop and demonstrate innovative permanent cleanup technologies, These are the most costly phases of technological innovation, but they are necessary to prove technical feasibility under

operating conditions and to obtain accurate cost data. Demonstrating a particular application of a new technology often requires several million dollars. The work should focus on techniques that can reduce permanent cleanup costs, A program funded at the level of perhaps $25 million to $50 million annually for some years could pay off handsomely for a long-term Superfund program. These funds would be in addition to what EPA now spends on R&D. Special attention should be given to small businesses; these firms face major problems in getting money and coping with institutional barriers, even though they often have attractive innovations. It should be noted that increased spending in this area would also benefit the RCRA program because some cleanup technologies could also treat newly generated hazardous waste.

- EPA could be directed to develop protocols by which technologies can be evaluated by the government and companies; such protocols should address different generic types of problems at uncontrolled sites (e.g., decontamination of soil, groundwater, or buildings; destruction of wastes). Without evaluation protocols, innovations struggle with the Catch-22 of not being able to prove themselves and not being used because they are not proven.
- EPA could be directed to help companies: a) obtain samples from uncontrolled sites, and b) conduct field demonstrations and pilot cleanups at NPL sites to better establish technical performance and reliability and provide more accurate estimates of actual costs. If public resistance to the use of new technologies is feared, incentives could be considered, such as a high priority for cleanup and financial support for direct citizen involvement in the cleanup effort. However, the public may be quite receptive to new technologies, provided they are kept informed and have some voice in the decisions (see chapter 8).
- EPA could be directed to develop incentives for responsible parties to use or demonstrate innovative cleanup technologies,
- EPA could be directed to provide a simplified means of determining whether residues from waste treatment operations qualify as RCRA hazardous wastes; those that are not can be disposed of simply and at low cost.
- EPA could be directed to expeditiously establish appropriate RCRA regulations for waste storage and treatment facilities of particular importance to Superfund efforts.
- EPA could be directed to expand its information and technology transfer functions and make better use of what has been and will be learned from cleanups throughout the Nation, There does not appear to be any central repository of information and insights obtained by EPA's Regions and contractors, who often repeat the similar work at different sites.

Technical Staffs, Support, and Oversight

Chapter 7 shows the need to improve the capabilities of EPA and the States to implement Superfund and, particularly, to carry out various oversight functions. EPA has a responsibility to oversee its Regions, its contractors, the States, and private parties carrying out cleanups. The States must oversee its contractors and, sometimes, local government units. Increased funding may be required. Also, more appropriately trained and experienced technical professionals are needed in a number of critical disciplines, plus an assurance that the most qualified contractors are used. Working with hazardous waste is a relatively new area and, therefore, many technical specialists do not have the specific experience with hazardous waste necessary for cleanups. For example, hydrogeologists maybe experts about the flow of water but not about the movement of contaminants, which can be much more complex.

Options for congressional consideration are:

- Provide Federal funding for training programs in disciplines of particular importance to Superfund, such as hydrogeology, toxicology, environmental engineering, and chemistry. Emphasis should be placed

on continuing education and training programs to increase the pool of *experienced* specialists who know how to deal with the specific problems of hazardous waste sites. A program costing perhaps $5 million to $10 million annually for some years could yield great benefits in the long term.
- Provide increased funding, perhaps $25 million to $50 million annually, to EPA to build up its in-house professional staff and emphasize the need to carry out technical oversight. There has been a steady drain of experienced people from EPA's Superfund program to its contractors and the private sector, whose cleanup work often receives little EPA scrutiny.
- Provide direct grants to States to develop and expand their technical staff. This would be similar to the RCRA grants program. Over a period of perhaps 5 years, such grants could do much to strengthen the States' capabilities and perhaps their willingness to participate in the national program. As with the RCRA program, some formula could be devised to determine how much money a State received; for example, basing the amount on its number of sites in EPA's national inventory of uncontrolled sites, on its number of NPL sites, on the number of cleanups where it has assumed the lead role, and on its number of cleanups funded without Federal funds. Nationally, such a grants program might require from $25 million to $50 million annually. This compares to $80 million annually authorized for RCRA Subtitle C and D grants to States for fiscal year 1986 through fiscal year 1988. Total annual Federal spending on RCRA is roughly one-quarter of current annual Superfund spending.
- Direct EPA to reexamine how it selects and uses contractors and involves government agencies at Superfund sites. The performance of contractors on work already completed and underway in the Superfund program needs to be evaluated. The already rapid expansion of the Superfund program often has resulted in poor technical performance by contractors eager, but not necessarily qualified, to enter this market. Another possibility is to use a single contractor for a site, rather than a succession of contractors who each start from scratch. EPA could examine its procurement procedures and place more emphasis on technical qualifications rather than cost proposals.
- Improve the relationships between EPA and State agencies by providing more opportunities for the States to participate in decisionmaking (even though they may only be paying for 10 percent of the costs) and in policy development.

Detailed Strategic Planning

Detailed strategic planning is fundamental to any long-term program. In the case of the Superfund program, this is a particularly difficult problem because there are so many interrelated technical, social, and economic factors to consider (see chapter 3). The two-part strategy stressed in this study is not the only possible alternative strategy. Nor has OTA considered in detail the myriad problems facing implementation of any long-term strategy. If it did not wish to change Superfund now, Congress could direct EPA to submit a detailed strategy (or several options) for a long-term Superfund program. The proposal should make clear how critical decisions about the choice of sites to be cleaned are to be made, the specific criteria by which the performance of the program can be measured, and how institutional capabilities assure that funds are spent efficiently and effectively.

The inherent conflict between the current cost-effectiveness and fund-balancing provisions of the CERCLA statute must be addressed. As discussed previously, there is often an inherent conflict between what is viewed as necessary on a site-by-site basis and what is possible for the national program, What may be a cost-effective cleanup to provide maximum protection at a single uncontrolled site may be unreasonable considering the resources that are available from the national program for other sites. As the Superfund grows (even

if only to the 2,0(10-site NPL envisioned by EPA), this inherent conflict will become more acute. The problem intensifies even more when costly permanent cleanups are deemed necessary for some sites, particularly for groundwater cleanup. To some degree, the current program has trapped itself. If it stressed more permanent cleanups, it could not take so many actions. It tries to get many sites into the pipeline. But the actions are ineffective and meanwhile the number of sites increases steadily. The pipeline never seems to end. Any strategic plan must address this issue and introduce objectivity and equity into decisions about the allocation of scarce resources to address many sites over time.

Public Participation

Chapter 8 supports the need to involve the public more directly in decisionmaking in all phases of the Superfund program—from site identification and selection for the NPL, to choosing an initial response and remedial cleanup, to measuring the effectiveness of the cleanup measure. Congress could consider making CERCLA more similar to other environmental statutes, such as RCRA, by mandating specific roles for the public in the decisionmaking process.

Whatever is done, however, it must be recognized that the interests of affected communities often conflict with the limits and goals of a national program. But it is possible that early and steady public participation in decisionmaking could lead to more effective site cleanup and a more effective national program. It is necessary, however, to consider whether such participation might incur delays. This potential problem could be addressed by trying to resolve conflicts equitably and expeditiously through, for example, mediation, binding arbitration, and ombudsmen. More specifically, Congress may wish to consider providing funds to communities and other groups to help them obtain independent technical expertise so, even when they lack economic and technical resources, they can fairly evaluate the technical complexity and options available to decisionmakers. Where this has been done, it has proved beneficial.

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