

Legal Incentives For Reduction, Reuse, And Recycling: A New Approach To Hazardous Waste Management

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Although hazardous waste is one of the nation's most serious problems, neither the states nor the federal government has developed an optimal solution. Current hazardous waste laws and management practices are based on two misguided notions: that sustained hazardous waste production is inevitable, and that disposal-oriented technology is a panacea for hazardous waste problems and therefore should be the focus of legal and scientific attention. Several states have begun to reject these assumptions and have enacted laws encouraging reduction, reuse, and recycling. No state, however, has enacted a set of laws that sufficiently encourages this practice of waste reduction, or "source reduction," as a viable competitor to the disposal approach to hazardous waste management.

This Note analyzes the inadequacy of current approaches and proposes a model legislative package for managing hazardous waste based on reduction, reuse, and recycling.¹ The proposal is addressed primarily to those state and federal legislators and environmental protection agency staff who have discovered that current disposal-oriented hazardous waste management practices—even those at the forefront of modern day technology—have failed to protect society adequately from the very substantial costs of hazardous waste production. This Note offers an alternative approach and invites debate on what is a more effective solution for coping with the problem of hazardous waste.

1. This Note focuses solely on management of hazardous waste as distinct from nonhazardous solid waste. Although parallels may be drawn between the two, they often present wholly distinct problems and technologies, and are almost universally treated separately for purposes of regulation. For articles discussing recycling of nonhazardous waste, see Zalob, *Current Legislation and Practice of Compulsory Recycling: An International Perspective*, 19 NAT. RESOURCES J. 611 (1979); Halgren, *Recycling and Resource Recovery: State and Municipal Legal Impediments*, 7 COLUM. J. ENVTL. L. 1 (1980); Note, *Conserving Natural Resources: Toward a Comprehensive State Solid Waste Recycling Program Under the Federal Resource Conservation and Recovery Act*, 10 N.Y.U. REV. L. & SOC. CHANGE 469 (1980-81).

For descriptions of the processes of reduction, reuse, and recycling in the context of hazardous waste, see *infra* text accompanying note 47; notes 58-59 and accompanying text.

Hazardous Waste Management

I. CURRENT EFFORTS TO ATTACK THE HAZARDOUS WASTE PROBLEM

The proliferation of abandoned and leaking hazardous waste sites,² the widespread violations at operating landfills,³ and the possibly unavoidable⁴ and irrevocable contamination of ground and drinking water⁵ have led to public concern that cuts across political and social lines. Despite increased attention to the risks of hazardous waste, government responses to date have been at best only partially effective.⁶

A. *Current Emphasis on Waste Production and Disposal*

The federal government has responded to the problem of hazardous waste production and disposal with the Resource Conservation and Recovery Act of 1976 (RCRA)⁷ and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).⁸ Federal and state agencies have used these two statutes almost exclusively to track hazardous waste from cradle (generator) to grave (landfill) and to fund landfill cleanup.⁹ Although RCRA contains provisions encouraging re-

2. As of September 1984, there were 18,900 uncontrolled hazardous waste sites in the Environmental Protection Agency's (EPA's) Emergency and Remedial Response Information System, 538 of which are on the National Priority List. OFFICE OF TECHNOLOGY ASSESSMENT, SUPERFUND STRATEGY 64 (1985) [hereinafter cited as SUPERFUND STRATEGY]. "Still more uncontrolled sites are being discovered, and probably some are being created by current practices and exemptions." OFFICE OF TECHNOLOGY ASSESSMENT, TECHNOLOGIES AND MANAGEMENT STRATEGIES FOR HAZARDOUS WASTE CONTROL 6 (1983) [hereinafter cited as TECHNOLOGIES AND MANAGEMENT STRATEGIES].

3. See *infra* text accompanying note 38.

4. "[L]andfills inhibit releases through containment but will eventually (and usually gradually) leak and may contaminate ground water." TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 14.

5. An unreleased EPA study reports that 29 percent of underground drinking water supplies for 954 cities are contaminated. Scientists believe that dissolving and percolation (leaching) of toxic chemicals from landfills is a contributing factor in each case. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 5 (citing ENGINEERING TIMES, Sept. 1982). In 1982, EPA stated that of 418 uncontrolled hazardous waste sites in the nation requiring priority attention, 347 posed direct threats to drinking water supplies. *Id.* (citing Washington Post, Dec. 21, 1982, at A2, col. 1). OTA considers such threats to the public "substantial." *Id.* at 4.

6. See, e.g., SUPERFUND STRATEGY, *supra* note 2, at 3 (Superfund remedial cleanups tend to be impermanent with some sites deteriorating following cleanup).

7. Pub. L. No. 94-580, 90 Stat. 2795 (codified as amended at 42 U.S.C.A. §§ 6901-6991i (West 1983 & Supp. 1985)). See *infra* note 9.

8. Pub. L. No. 96-510, 94 Stat. 2767 (codified as amended at 42 U.S.C. §§ 9601-9657 (1982)). See *infra* note 9.

9. The RCRA "cradle to grave" system consists of: the identification and listing of hazardous waste; a manifest system (a filing system) used to track waste; management standards and a permit system for treatment, storage, and disposal facilities; and 30-year post-closure (post-operational) requirements. 42 U.S.C.A. §§ 6901-6991i (West 1983 & Supp. 1985).

CERCLA, or "Superfund," provides for emergency response and cleanup in the event of a threatened or actual release from a hazardous waste site. CERCLA imposes strict liability on generators, transporters, and past and present owners or operators of hazardous waste facilities for the cost of remedial action and damage to natural resources, but not for pollution victim compensation. 42 U.S.C. §§ 9601-9657 (1982).

cycling,¹⁰ in practice there has been little or no federal effort to recycle hazardous waste.¹¹

In fact, neither statute contains extensive incentives for generators to produce less waste.¹² For instance, CERCLA funds its Superfund landfill cleanup program through the collection of a tax on the production of petroleum feedstocks and specialized chemicals¹³—substances that only indirectly and to different degrees lead to hazardous waste generation.¹⁴ As a result, many companies that generate hazardous waste do not now pay the Superfund tax.¹⁵ Therefore, the tax does not influence these generators to reduce waste or to use alternatives to land disposal.¹⁶

10. See, e.g., 42 U.S.C. § 6902 (1982) (an objective of Act to promote research and application of resource recovery); §§ 6951–6956 (Commerce Department to develop specifications and markets for recovered material); § 6981 (EPA to research markets and systems for recovering materials); § 6983 (EPA to evaluate methods for solid waste reduction and coordinate information on resource conservation); § 6985 (EPA to conduct studies and make recommendations on incentives, policies, and actions to reduce waste generation or encourage recycling of solid waste).

11. "The Resource Conservation and Recovery Act . . . has failed to promote either resource conservation or recovery." CONFERENCE ON ALTERNATIVE STATE AND LOCAL POLICIES, THE TOXICS CRISIS: WHAT THE STATES SHOULD DO 3 (J. Tryens ed. 1983). "Only about 10 percent [or \$4.4 million] of EPA's current R & D efforts for hazardous waste [were] devoted to alternatives to land disposal" in fiscal year 1983. TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 16, 30. Ten years of such funding would be sufficient to clean up only several major uncontrolled (unregulated and leaking) waste sites. *Id.* at 30. Practically all of the RCRA provisions encouraging the recycling of solid waste, although technically capable of being applied to hazardous waste, have been applied solely to nonhazardous solid waste. See 42 U.S.C. §§ 6903(5), (27) (hazardous waste defined as subset of solid waste). "[T]he emphasis in RCRA is not on reducing waste generation but on management of waste [sic] once they are generated, and EPA has not generally pursued the resource recovery aspects of RCRA." TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 11; accord Telephone interview with Dr. Joel S. Hirschhorn, Senior Associate at the Congressional Office of Technology Assessment (Dec. 18, 1984). Despite EPA claims that waste reduction is its most favored strategy, 41 Fed. Reg. 35,050–51 (1976), it clearly is "not first priority" at EPA. Telephone interview with professional staff member, EPA (Nov. 15, 1984); see also *infra* note 27.

12. The current regulatory structure does not directly encourage safer and more permanent solutions than land disposal, but instead provides indirect disincentives for such alternatives. TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 16. These disincentives include the absence of financial responsibility requirements for corrective action if hazardous waste is released from an operating landfill, *id.*, and the 30-year limitation for post-closure requirements at land disposal sites, 40 C.F.R. §§ 264.117, 265.117 (1985), when 500 years may be realistic as a period of concern about hazardous wastes in landfills. NAT'L MATERIALS ADVISORY BD., MANAGEMENT OF HAZARDOUS INDUSTRIAL WASTES: RESEARCH AND DEVELOPMENT NEEDS 6 (1983) [hereinafter cited as NMAB REPORT]. But see EPA Interim Final Rules Applicable to Hazardous Waste Treatment, Storage, and Disposal Facilities, 47 Fed. Reg. 32,279–80 (1982) (discussing drawbacks to financial responsibility requirements).

Conversely, increasing costs of waste management, due partially to federal hazardous waste regulatory programs, have indirectly provided incentives for waste reduction. "The indirect approach, however, does not appear to produce positive results extensive enough and fast enough to substantially impact national waste management practices." TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 74.

13. 42 U.S.C. § 9631.

14. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 75.

15. Hirschhorn, *Hazardous Waste Source Reduction and a Waste-end Superfund Tax*, in MASSACHUSETTS HAZARDOUS WASTE SOURCE REDUCTION CONFERENCE PROCEEDINGS 36, 38 (R. Clark ed. 1983) [hereinafter cited as 1983 MASSACHUSETTS CONFERENCE] (available from Massachusetts Department of Environmental Management).

16. U.S. GEN. ACCOUNTING OFFICE, STATE EXPERIENCES WITH TAXES ON GENERATORS OR

Hazardous Waste Management

RCRA, like CERCLA, does not emphasize waste reduction, but focuses on the management of hazardous wastes once they have been generated. EPA has not only failed to pursue the resource recovery aspects of RCRA,¹⁷ but through regulatory policies, has created disincentives for waste reduction. For example, EPA has kept the costs associated with landfilling low, thereby not reflecting long-term cleanup costs and thus the true costs of disposal.¹⁸ Such undervaluation of land disposal costs provides a direct incentive for land disposal and a corresponding indirect disincentive for the development of alternatives.¹⁹

DISPOSERS OF HAZARDOUS WASTE 2 (1984) [hereinafter cited as GAO REPORT]. In the long run, however, fear of future liability for hazardous waste releases from land disposal sites under CERCLA may influence some generators to develop alternative methods. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 16, 76; Hirschhorn, *Federal Policies and Reduction of Hazardous Wastes*, in POLLUTION TO PROFIT: REDUCING INDUSTRIAL WASTE IN ILLINOIS, PROCEEDINGS OF THE WASTE REDUCTION CONFERENCE 141, 143 (Illinois Department of Energy and Natural Resources ed. 1984) [hereinafter cited as ILLINOIS CONFERENCE].

17. See *supra* note 11.

18. The average cost of disposing hazardous waste under RCRA regulations is about \$90 per ton. The cost to clean up improperly disposed waste, however, is \$2000 per ton, and site cleanup costs may reach 30 million dollars per site. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 6, 20; SUPERFUND STRATEGY, *supra* note 2, at 61 (updating TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra*, estimates). In the case of Love Canal, it would have cost \$2 million (in 1979 dollars) to dispose of the waste under current standards. The cost of remedial action, however, is expected to exceed \$100 million, and legal claims for damages total approximately \$2 billion. TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra*, at 6. As it currently stands, “[h]azardous waste generators . . . would not find in their own account books the social costs of leaky landfills, highway spills, years-delayed health impacts, and so on, and would therefore underestimate the cost to society of the waste they produce.” O’Hare, *Governments and Source Reduction of Hazardous Waste*, 1 HAZARDOUS WASTE 443, 445 (1984).

19. RCRA regulations provide other disincentives for the development of alternatives such as recycling. For example, the regulations classify most materials to be recycled as “hazardous waste,” 40 C.F.R. §§ 261.2–3 (1985), subjecting them to manifest requirements used to track hazardous waste from origin to disposal. See, e.g., *id.* §§ 261.6, 266.21–23; 50 Fed. Reg. 643 (1985). With the enactment of the RCRA amendments, even many small quantity generators who were formerly unregulated now fall under this provision of the regulations. Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, § 221, 98 Stat. 3221, 3248 (codified at 42 U.S.C.A. § 6921 (West Supp. 1985)) [hereinafter cited as HSWA]. Generators who might otherwise have sold recyclable waste are thus deterred, because in the event of an accident after sale, EPA can track the waste back to the generator through the manifest and impose liability under CERCLA at any indefinite future time. As the regulations define material to be recycled as hazardous only up to the point at which the recycling process is complete, 50 Fed. Reg. 633 (1985), many larger firms that can afford it process their recyclables in-house. These larger generators, unlike their smaller counterparts, are thereby able to avoid the risks associated with third parties handling manifested hazardous waste for which the generators may be held liable. Telephone interview with Barry Garelick, Regulatory Analyst at EPA (Dec. 19, 1984); see also Garelick, *When is a Waste Not a Waste*, THE ENVIRONMENTAL FORUM, Sept. 1985, at 26, 31-32 (published by the Environmental Law Institute).

The subjection of resource recovery facilities to strict permit and standard requirements identical to requirements for any treatment facility creates another disincentive to recycling under current law. See, e.g., 40 C.F.R. §§ 261.6, 264.1–199, 265.1–199, 265.370–406, 266.20–70, 270.1–74 (1985); 50 Fed. Reg. 643, 665–67 (1985). Also, some generators may decide not to recycle because of prohibitive costs associated with “delisting” recycling residues—a procedure necessary to dispose more cheaply of the residues as non-hazardous solid wastes. Hirschhorn, *supra* note 16, at 143.

RCRA, however, does provide limited incentives for waste reduction. In particular, as RCRA has become more fully implemented, waste management costs have increased substantially, providing a motivation for waste reduction. TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at

Furthermore, the amendments to RCRA enacted in November 1984,²⁰ which declare a national policy of waste reduction²¹ and give EPA authority to restrict landfilling,²² are insufficient to encourage reduction, reuse, and recycling because they provide no positive incentives for these practices. Although the landfill restrictions, assuming EPA actually implements them, may create new supplies of reusable waste by making available quantities of hazardous waste previously placed in landfills,²³ the amendments fail to encourage the development of markets for the waste.²⁴ More importantly, the amendments provide no inducements for the development or use of optimal waste minimization techniques in lieu of comparably less desirable post-production technologies, such as ocean dumping, incineration, or chemical treatment.²⁵ Unless the new national policy spurs additional legislation on waste reduction, the federal solution will remain aimed almost entirely at containing or removing hazardous waste after production and disposal.

B. *Problems With the Current Approach*

There are serious limitations to the current federal approach to hazardous waste, which relies primarily on waste management and disposal in-

16; Hirschhorn, *supra* note 16, at 142, 143. If the program becomes more stringent, comprehensive, and better enforced, these incentives are likely to increase. *See id.* at 143. Conversely, if enforcement remains inadequate, and the RCRA regulations remain insufficient to protect public health and the environment, as their critics charge, waste generators and managers will continue to pay less than the full cost of hazardous waste generation. *See id.* at 142.

20. *See* HSWA, *supra* note 19, at §§ 1-704.

21. *Id.* at § 101(b). "National Policy—The Congress hereby declares it to be the national policy of the United States that, wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible." *Id.* This is to be accomplished "by encouraging process substitution, materials recovery, properly conducted recycling and reuse, and treatment. . . ." *Id.*

22. *Id.* at § 201(a). Section 201(a)(d)-(a)(g) prohibits land disposal of federally listed hazardous waste unless EPA determines that protection of human health and the environment does not require such a prohibition. These determinations are to be made on a schedule beginning in 1986 and spanning several more years. *Id.* The Act allows EPA extensions for making these decisions. *Id.* at § 201(a)(h); *see* Skinner, *Banning Waste From Land Disposal*, at 3, in papers presented by EPA at the First Public Briefing on the 1984 Amendments to the Resource Conservation and Recovery Act, Video Teleconference (Dec. 11, 1984).

23. *See infra* notes 24, 46.

24. Supplies will be created from the waste that was previously landfilled, but the amendments do not provide for the fate of this supply. Also, EPA has discretion in imposing the landfill ban, *see, e.g.*, HSWA, *supra* note 19, at § 201(a)(d), and there is a distinct possibility that, if implemented at all, it will take years for the amendments to be effective. Telephone interview with Dr. Joel S. Hirschhorn, *supra* note 11.

25. These less desirable technologies have environmental costs. Incineration, for example, contributes to toxic air pollution. Despite these facts, special interest groups in Washington are discussing ways to circumvent the amendments' disposal restrictions, specifically by finding new loopholes in the regulations, and by resorting to other controversial disposal methods such as ocean dumping and exporting of hazardous waste. Telephone interview with Dr. Joel S. Hirschhorn, *supra* note 11; *cf.* UNITED NATIONS ENVIRONMENT PROGRAMME, *THE STATE OF THE ENVIRONMENT 1983: SELECTED TOPICS 9* (1983) (developing countries vulnerable to hazardous waste exports).

stead of waste reduction.²⁶ First, the approach rests on an assumption that safe methods exist to contain hazardous waste on land, and that there are technical solutions once contamination of the environment has occurred.²⁷ Scientific studies suggest that this assumption is unwarranted. In fact, “[t]he weight of scientific evidence indicates that land disposal of hazardous waste will sooner or later jeopardize public health.”²⁸ Even state-of-the-art land disposal facilities will eventually leak and possibly contaminate groundwater during the decades or centuries that some hazardous chemicals remain dangerous.²⁹

Second, the system overlooks future unknown costs for the immediate benefit of disposal. By minimizing present waste management costs, greater costs associated with cleanup are postponed to the future and may be shifted away from the private to the public sector,³⁰ technical cleanup problems are compounded,³¹ and irreparable damage, such as contamination of major groundwater supplies, may arise.³² As generators do not

26. Land disposal is used for 80 percent of federally regulated hazardous waste, or 30 million tons per year. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 5. An even greater percentage of the 255 million to 275 million tons of hazardous waste under federal and state regulation may be disposed on land. *Id.* Much of this waste is treatable or recyclable. *Id.* at 15.

27. EPA apparently has not adopted a consistent position on the validity of this assumption, as evidenced by constantly shifting official statements on the matter. Compare Huisingsh, *The Opportunity, Challenge and Obligation of Making Pollution Prevention Pay in North Carolina*, in 1983 MASSACHUSETTS CONFERENCE, *supra* note 15, at 11 (“Landfilling represents the lowest risk option currently available for dealing with the large quantity of hazardous waste generated each year. . . .”) (quoting Ann Gorsuch, EPA Administrator, July, 1981) with 47 Fed. Reg. 32,285 (1982) (“[A]ny liner will begin to leak eventually.”) and 46 Fed. Reg. 11,128 (1981) (“There is good . . . evidence that the hazardous constituents . . . placed in land disposal facilities very likely will migrate . . . into the broader environment . . . [I]n most cases, even with the application of the best available land disposal technology, it will occur eventually.”). Ironically, throughout the period these statements were made, EPA claimed that waste reduction was its most favored strategy. See *supra* note 11.

28. Huisingsh, *supra* note 27, at 11 (citing *Hearings Before the Subcomm. on Fisheries and Wildlife Conservation and the Environment and the Subcomm. on Oceanography and the Comm. on Merchant Marine and Fisheries on Hazardous Waste Disposal—H.R. 1700*, 98th Cong., 1st Sess. 13 (1983) (statement of William Sanjour, Chief of Hazardous Waste Implementation Branch, EPA); *Resource Conservation and Recovery Act Reauthorization: Hearings Before the Subcomm. on Commerce, Transportation, and Tourism of the House Comm. on Energy and Commerce*, 97th Cong., 2d Sess. 60, 62, 69, 72 (1983) (statement of P.M. Montague, Project Administrator of the Hazardous Waste Research Program, School of Engineering/Applied Sciences, Princeton University)).

29. *Id.*

30. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 5, 12, 16. It is unclear what these future costs will be or when they will be incurred. Indeed, due to the chemical stability of some hazardous waste, with some substances remaining toxic for centuries, the risks could easily be transferred to future generations. See NMAB REPORT, *supra* note 12, at 7; SUPERFUND STRATEGY, *supra* note 2, at 3. Because neither CERCLA nor RCRA provides compensation to pollution victims in most circumstances, see Note, *The Inapplicability of Traditional Tort Analysis to Environmental Risks: The Example of Toxic Waste Pollution Victim Compensation*, 35 STAN. L. REV. 575, 596-600 (1983), and common law may not provide relief, *id.* at 575, the victims will most likely bear these costs. But see 42 U.S.C. § 9611(j) (1982) (providing compensation from CERCLA’s Post-closure Liability Fund for “injury or loss” resulting from release of hazardous substances from facilities meeting RCRA closure requirements).

31. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 58.

32. *Id.*

bear the true costs of waste management,³³ the cost of products whose manufacture generates hazardous waste is artificially low, reducing the pressure that market forces would otherwise exert toward less costly substitutes.³⁴

Third, there are practical and political limits to disposal as evidenced by the difficulties experienced in siting treatment facilities and landfills. Communities are almost universally opposed to placing any hazardous waste facility in their own neighborhoods.³⁵ The Office of Technology Assessment attributes this opposition to health and safety concerns, fear of economic losses, and the perception that industry and government cannot prevent adverse consequences.³⁶ Past experience suggests that these fears are justified.³⁷

Fourth, EPA's failure to remedy widespread lack of compliance with RCRA and the exceedingly high costs of CERCLA remedial action bring into question the viability of current regulatory programs. For instance, the General Accounting Office has estimated that in some states, 78% of hazardous waste facilities were out of compliance with RCRA landfill regulations in 1983.³⁸ Correspondingly, the Office of Technology Assessment has estimated that to clean up approximately 10,000 of the presently known uncontrolled hazardous waste sites will cost the nation several hundred billion dollars, as compared with the \$1.6 billion that was collected under CERCLA for this purpose through 1985.³⁹

Finally, in some instances treatment and disposal costs to industry are higher than the costs associated with alternative methods.⁴⁰ Many times a

33. See *supra* note 30.

34. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 58. The authors state two reasons for fully internalizing waste management costs:

First, on the basis of equity, it is proper that those persons most responsible for waste generation should pay for proper management, including those choosing to consume products or use services requiring the generation of hazardous waste. Second, if the management alternatives most protective of the public good are to be promoted, then it is reasonable to penalize those alternatives providing lower levels of protection.

Id.

35. *Id.* at 254.

36. *Id.*; NMAB REPORT, *supra* note 12, at 24.

37. See *supra* notes 2-6.

38. U.S. GEN. ACCOUNTING OFFICE, INTERIM REPORT ON INSPECTION, ENFORCEMENT, AND PERMITTING ACTIVITIES AT HAZARDOUS WASTE FACILITIES 2 (1983) (survey of four states).

39. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 6; SUPERFUND STRATEGY, *supra* note 2, at 3 (updating TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* cost figures). Furthermore, in the five years since CERCLA's passage, little progress has been made toward permanent cleanup of known hazardous waste sites, and cleanup at some sites has in fact caused conditions to deteriorate. SUPERFUND STRATEGY, *supra* note 2, at 3, 6, 9.

40. When comparing the cost of alternatives, it is important to factor in lack of "environmental equivalence." Under the concept of "environmental equivalence," costs must be estimated over the entire period that a substance remains hazardous under each management alternative. This cost estimation has not been made for perpetual storage. See Overcash, *Implication and Procedures for Waste Elimination of Hazardous Wastes*, in MAKING POLLUTION PREVENTION PAY-ECOLOGY WITH

change of manufacturing process or of raw materials eliminates the production of waste materials and provides additional valuable products from what was formerly pollution. Thus, in the long-run, waste prevention may cost less than treatment and disposal.⁴¹ By minimizing waste through reduction, reuse, or recycling,⁴² profit may result from lower material costs;⁴³ lower energy costs due to more efficient technology;⁴⁴ lower waste processing costs;⁴⁵ and avoidance of disposal, cleanup, and liability costs.⁴⁶

II. THE REDUCTION APPROACH

A. *The Benefits of Reduction, Reuse, and Recycling*

The reduction, reuse, and recycling approach is the best long-term solution to the problem of hazardous waste and is a companion to limited disposal. Source reduction is based on two premises: first, that reducing production and disposal of hazardous waste will reduce unwanted risk; and second, that because of limited natural resources, it is unwise for a society to dispose of everything it produces. Source reduction is an alternative to end-of-pipe treatment of hazardous waste and to perpetual storage in or on land. It can be accomplished by both (1) modification of industrial processes within a plant resulting in decreased generation of hazardous waste; and (2) recycling and reuse processes that may occur on or off the site of the particular generating plant.⁴⁷

For some companies, reduction, reuse, and recycling will be economically efficient in the short run.⁴⁸ And as a long-run strategy, source reduc-

ECONOMY AS POLICY 68, 70 (D. Huisingsh & V. Bailey eds. 1982) [hereinafter cited as D. Huisingsh & V. Bailey]; see also TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 14 (costs on basis of comparable levels of control cannot be compared).

41. See *infra* notes 48-49. See generally M. ROYSTON, POLLUTION PREVENTION PAYS (1979) (examining cost savings from industrial waste prevention).

42. It has been estimated that greater use of alternatives to land disposal "could increase industry's near-term costs significantly, perhaps by as much as 50 to 100 percent." TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 6; cf. *id.* at 14 (land disposal is still low-cost option under *current regulations* for most hazardous waste) (emphasis added); Hirschhorn, *supra* note 16, at 142 (land disposal is lowest cost, most widely used waste management option). "But years or decades from now, cleaning up a site from which there are hazardous releases, and compensating victims, might cost 10 to 100 times the additional costs incurred today to prevent releases of hazardous materials." TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 6. Viewing the costs of land disposal in this way employs the concept of environmental equivalence. See *supra* note 40.

43. Easson, *Process Design to Minimize Pollution Case Studies*, in D. Huisingsh & V. Bailey, *supra* note 40, at 96.

44. *Id.*

45. *Id.*

46. Written comments from Dr. Joel S. Hirschhorn to author (Mar. 2, 1985); see also Dorn, *Waste Exchanges: An Informational Tool for Linking Waste Generators with Users*, in D. Huisingsh & V. Bailey, *supra* note 40, at 87 (citing 1976 Arthur D. Little, Inc. study finding that 6 million metric tons per year of materials discarded could be reused or recycled, with value estimated at about \$300 million).

47. See Overcash, *supra* note 40, at 68.

48. "An increasing number of case studies indicate that changes-in-production-process can reduce

tion of hazardous waste accommodates industrial growth⁴⁹ with the lowest external costs⁵⁰ and encourages technological growth.⁵¹ Thus, the current legal challenge is to eliminate dependence on land disposal by enacting laws that encourage the implementation of already existing and perhaps cost-saving waste elimination technology,⁵² while simultaneously encouraging the development of new industrial processes for waste reduction.⁵³

B. *Setting Goals and Overcoming Obstacles to Source Reduction Legislation*

Source reduction legislation should serve twin objectives. First, the legislation should be based upon those policies that lead to the most effective reduction, reuse, and recycling strategies. Second, the legislation should be

pollution levels at the same time that they raise firm profits." Runge, *Positive Incentives for Pollution Control in North Carolina: A Policy Analysis*, in D. Huisingsh & V. Bailey, *supra* note 40, at 127. "Indeed, many firms have found purposive source reduction not only cheap but profitable as valuable materials can be recovered from some waste streams at surprisingly low cost." O'Hare, *supra* note 18, at 443 (footnote omitted). For example, in France, of 100 industrial processes studied that avoided waste production completely, 70 percent were cheaper both to build and run than their end-of-pipe alternative. Royston, *Pollution Prevention—Philosophy, Technology and Economics*, in ILLINOIS CONFERENCE, *supra* note 16, at 39. Often, there are few financial obstacles to taking advantage of opportunities for hazardous waste reduction. See NAT'L RESEARCH COUNCIL, A DIGEST OF THE REPORT ON REDUCING HAZARDOUS WASTE GENERATION: AN EVALUATION AND A CALL FOR ACTION 6 (1985) [hereinafter cited as NRC DIGEST]. "In some cases, waste reduction initiatives may pay for themselves. . . ." *Id.* at 7. For discussion of the reasons that industry has not yet implemented waste minimization on a large scale, despite its potential benefits, see *infra* notes 54–73 and accompanying text.

49. For example, waste reduction efforts have saved 3M Company more than \$150 million through reduced costs for pollution control construction and operations, and from sales of products that otherwise would have been discontinued because they were environmentally unacceptable. Susag, *U.S. Industry: Success in Waste Reduction—The 3M Experience*, in ILLINOIS CONFERENCE, *supra* note 16, at 82. The value of recycled byproducts, including disposal avoidance costs, at Dow Corning's Midland, Michigan plant exceeded \$8 million in 1981. Meyer, "In Every Dark Cloud . . .," in D. Huisingsh & V. Bailey, *supra* note 40, at 23. See generally M. CAMPBELL & W. GLENN, PROFIT FROM POLLUTION PREVENTION: A GUIDE TO INDUSTRIAL WASTE REDUCTION & RECYCLING (1982) (project of Pollution Probe Foundation) (documenting hundreds of instances in which firms have profited from pollution prevention).

50. See *supra* note 42.

51. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 10 (changes in processes motivated by waste management concerns may help introduce innovative technologies); Caldart & Ryan, *Looking for Long-Term Answers: Managing Hazardous Waste Through Production Process Change*, in MASSACHUSETTS HAZARDOUS WASTE SOURCE REDUCTION CONFERENCE PROCEEDINGS 182, 188 (R. Clark ed. 1984) [hereinafter cited as 1984 MASSACHUSETTS CONFERENCE] (available from Massachusetts Department of Environmental Management) (regulations going beyond current technology result in innovative products and processes); cf. Royston, *supra* note 41, at 79 (interpreting 1976 MIT study finding that "environmental pressure" is one of most important forces behind industrial innovation and thus technological and economic benefits).

52. See *supra* notes 48–49; Hirschhorn, *supra* note 15, at 36 (one-quarter to one-third of hazardous waste could be eliminated within next five years through any of approaches that now can be used for source reduction); GOVERNOR'S OFFICE OF APPROPRIATE TECHNOLOGY, ALTERNATIVES TO THE LAND DISPOSAL OF HAZARDOUS WASTES: AN ASSESSMENT FOR CALIFORNIA 183 (1981) (75% of waste could be recycled, treated or destroyed).

53. See *infra* note 82.

designed to overcome several obstacles responsible for the limited use of source reduction to date.

1. *Ambiguous Regulatory Programs and Priorities*

The crisis-⁵⁴ and disposal-oriented approaches of both existing hazardous waste laws and industry's response to these laws have been barriers to source reduction.⁵⁵ Coupled with confusing, constantly changing, and often unenforced regulations,⁵⁶ these obstacles have frustrated long-term planning for waste reduction and have reinforced dependence on disposal.⁵⁷

One aim of source reduction legislation must therefore be to design incentives, including the facilitation of markets, that clearly encourage industry's use of source reduction over less preferable waste management techniques. Furthermore, the legislation should give priority to waste reduction over reuse and recycling.⁵⁸ Only reduction directly eliminates the production of hazardous waste and is therefore the most effective of the three in minimizing risks to health and the environment.⁵⁹

54. The laws are crisis-oriented to the extent that they emphasize cleanup in lieu of systematic reduction of waste production. Industry's response has been crisis-oriented with regard to source reduction itself: In general, firms respond to new hazardous waste issues and regulations by implementing isolated source reduction measures, when a systematic approach is required for a comprehensive waste reduction strategy. NAT'L RESEARCH COUNCIL, REDUCING HAZARDOUS WASTE GENERATION: AN EVALUATION AND A CALL FOR ACTION 23 (1985) [hereinafter cited as NRC REPORT].

55. Finkel, *Economic and Regulatory Incentives for Hazardous Waste Reduction in Massachusetts*, in 1983 MASSACHUSETTS CONFERENCE, *supra* note 15, at 48; *see also* TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 17 (until private sector perceives regulatory structure as not containing bias in favor of land disposal, investment in new technologies will be limited); *cf.* NRC REPORT, *supra* note 54, at 21 (discrepancy between true cost and current cost of land disposal must be addressed to promote waste reduction).

56. Finkel, *supra* note 55, at 48; NRC DIGEST, *supra* note 48, at 10 ("[T]he current trend toward stronger implementation of [RCRA] must continue if reduction efforts are to be maximized.").

57. Finkel, *supra* note 55, at 48; *see* NRC DIGEST, *supra* note 48, at 9 ("Industrial firms are less likely to make definite plans for waste reduction in the face of uncertainty."). The unpredictability of the RCRA regulatory program delays commitments to undertake waste reduction practices and hinders implementation of reduction programs already begun. NRC REPORT, *supra* note 54, at 32.

58. *See* Caldart & Ryan, *supra* note 51, at 187 (reduction preferable to reuse and recycling); WORLD HEALTH ORG., MANAGEMENT OF HAZARDOUS WASTE: POLICY GUIDELINES AND CODE OF PRACTICE 3 (M. Suess & J. Huisman eds. 1983) (same). *But see* Patterson, *Strategies for Industrial Waste Elimination*, in ILLINOIS CONFERENCE, *supra* note 16, at 93-94 (recycling and reuse may offer greatest waste reduction opportunity). In turn, reuse is preferable to recycling in that prior to reintroduction into manufacturing processes, recycling, unlike reuse, requires processing of the waste that thereby creates a residue.

59. *See* NRC REPORT, *supra* note 54, at 13. Both reuse and recycling, if not undertaken cautiously, can lead to risks from, e.g., occupational exposure or improper storage of recyclable materials. *Id.*; *see also* Caldart & Ryan, *supra* note 51, at 187; 48 Fed. Reg. 14,505-07 (1983) (citing examples of accidents involving recyclables).

2. Feasibility Questions

Although further research is needed to demonstrate technical and economic feasibility,⁶⁰ current predictions indicate that existing technologies for source reduction can eliminate between thirty and eighty percent of hazardous waste entering landfills.⁶¹ Not only does source reduction appear to be technically feasible, but past accomplishments bolster the conclusion that reduction presently is economically viable as well. For example, several larger waste generators are beginning to introduce waste minimization processes. The 3M Company, for instance, has saved over \$150 million through its use of such techniques worldwide.⁶² Similarly, smaller generators are now saving money by selling wastes through exchanges rather than paying fees for disposal.⁶³

Larger firms, however, are generally better equipped than their smaller counterparts to research and implement optimal waste reduction technologies.⁶⁴ Thus, for waste reduction strategies to be implemented on a large scale, a source reduction program must address capital and research-and-development needs of smaller firms.

3. Information Deficiencies

The most significant barrier to the use of source reduction could be lack of knowledge.⁶⁵ More and better information must be readily available if industry and policy makers are to evaluate accurately the potential benefits of source reduction.⁶⁶ Information can also serve a critical role in demonstrating to industry and the public that source reduction is feasible.⁶⁷ A source reduction program, therefore, should maximize industry access to both information and technical assistance within the constraints of shielding industrial trade secrets.⁶⁸

60. NRC DIGEST, *supra* note 48, at 7; *see also* Hirschhorn, *Long Term Benefits of Waste Reduction*, in 1984 MASSACHUSETTS CONFERENCE, *supra* note 51, at 2. Hirschhorn states that while there clearly are many R & D opportunities, attention should focus on information transfer, technical assistance, and capital assistance for implementing currently available technologies. *Id.*

61. TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 12; written comments from Dr. Joel S. Hirschhorn to author (Mar. 2, 1985); *see also supra* note 52.

62. *See supra* note 49; *see also supra* notes 42, 48 (discussing financial costs of waste prevention).

63. *See infra* notes 104-06 and accompanying text.

64. Runge, *supra* note 48, at 128.

65. *See* Hirschhorn, *supra* note 15, at 36. Six books have been written about source reduction as compared to hundreds on techniques such as land burial or incineration. Sarokin, *Source Reduction of Hazardous and Toxic Wastes: Obstacles and Incentives*, in 1983 MASSACHUSETTS CONFERENCE, *supra* note 15, at 63.

66. *See* Dorn, *supra* note 46, at 92. According to the National Research Council, lack of data, as well as the "absence of an extensive peer-reviewed literature on waste reduction," constrained its study of the institutional factors affecting waste generation. *See* NRC DIGEST, *supra* note 48, at 2.

67. Brower, *Waste Reduction—Concept to Reality*, in D. Huisingsh & V. Bailey, *supra* note 40, at 110 (industry requires positive proof of profitability).

68. *See infra* note 70; *infra* text accompanying notes 107-09.

4. *Industry Opposition*

As discussed above, industry opposition to source reduction is due in part to unawareness that reduction is feasible for many wastes.⁶⁹ It also results from fears that autonomy and trade secrets could be jeopardized by programs that delve into the specifics of production processes.⁷⁰ Furthermore, industry opposition may emanate from risk-aversion⁷¹—that is, both executives and workers resist the prospect of increased near-term costs and uncertain economic benefits,⁷² as well as change in their routinized behavior.⁷³ Because the success of a source reduction program may depend upon industry support, legislation must address these concerns, such as by providing incentives for voluntary waste reduction efforts and by minimizing direct regulation.

III. THE REDUCTION PROPOSAL

Currently, only six states have enacted significant legislation on hazardous waste source reduction,⁷⁴ with no state using all the legal incentives available. The model law advocated in this Note attempts to synthesize the particular strengths of each state's legislation and to address the hazardous waste problem through a comprehensive legislative approach. The proposal employs both regulatory and non-regulatory mechanisms and encompasses four critical areas: planning, research, institutional assistance, and statutory and regulatory adjustments.

A. *Planning*

Planning includes developing a guiding government policy on source reduction and a scheme for policy implementation. Planning is necessary to address the complexity of the hazardous waste problem and to accommodate regional differences and varying state resources⁷⁵ for coping with

69. See Finkel, *supra* note 55, at 46; *supra* notes 60–68 and accompanying text; *infra* note 111.

70. Waste reduction gives a competitive advantage if waste management costs are a significant fraction of production costs. NRC REPORT, *supra* note 54, at 25. Many firms are thus reluctant to release information on reduction technologies. *Id.* The confidentiality problem varies between industries, but particularly inhibits adoption of waste reduction by small businesses, which are without the resources to explore such opportunities individually. *Id.* at 25–26. This problem may be best dealt with by the creation of centralized government programs for R & D and information dissemination. See also *infra* text accompanying notes 107–08.

71. “Reduction in generation of hazardous waste may be impeded because of a tendency in industry to select proven production technologies rather than alternatives that may generate less waste.” NRC DIGEST, *supra* note 48, at 4; see also Finkel, *supra* note 55, at 47 (smaller firms particularly risk-averse).

72. NRC REPORT, *supra* note 54, at 23–24.

73. *Id.*; Finkel, *supra* note 55, at 47.

74. These states are California, Illinois, Minnesota, New York, North Carolina, and Washington. For discussion of particular portions of these laws, see *infra* notes 76–127 and accompanying text.

75. For example, some states have no disposal sites within their borders or are dominated by

hazardous waste. Planning also assures that waste reduction becomes a long-run strategy.

Legislation for waste minimization planning should include provisions that encourage source reduction by declaring it a high priority⁷⁶ and that mandate government promotion of waste minimization technology.⁷⁷ The legislation should specify that industry implement hazardous waste management techniques in order of descending priority, with waste reduction highest (followed by reuse and recycling), and land disposal lowest.⁷⁸

To assure implementation of these delineated priorities, the legislation should provide that the non-regulatory agency responsible for implementing the source reduction program⁷⁹ prepare a hazardous waste plan⁸⁰ for the region based on alternatives to land disposal. In setting forth source reduction goals and recommendations on strategies to achieve these goals, the plan can serve as a cohesive policy guide for government, and as a demonstration to industry and the public of a new emphasis on waste reduction.⁸¹

B. Research

Research on source reduction is necessary because source reduction is a relatively new approach to hazardous waste management, with marketing

different industries.

76. See, e.g., WASH. REV. CODE ANN §§ 70.105.150, .105.160 (Supp. 1986) ("Management and regulation of hazardous waste disposal should encourage practices which result in the least amount of waste being produced."); MINN. STAT. ANN §§ 115A.02, .075 (West Supp. 1986) (goal of Waste Management Act and first priority to reduce amount of waste generated); N.C. GEN. STAT. § 143B-216.10(c) (Supp. 1985) (declares prevention, recycling, detoxification, and reduction as waste management techniques that best protect human health and environment).

77. California law should be used as a model because it directly charges its implementing agency to promote recycling, recovery, reduction, and exchange of hazardous waste. See CAL. HEALTH & SAFETY CODE § 25170(h), (j) (West Supp. 1986); see also, e.g., ILL. ANN. STAT. ch. 111½ § 1020 (Smith-Hurd Supp. 1985) (one purpose of title is to encourage recycling and reuse).

78. Washington law provides a particularly good model, listing reduction, recycling, treatment, incineration, solidification, and landfilling in descending order of priority. See WASH. REV. CODE ANN § 70.105.150 (Supp. 1986). The only apparent problem with this section is that the definitions given for the terms "landfill" and "treatment" are somewhat ambiguous. Telephone interview with Gerald W. Boese, Project Manager for the Hazardous Waste Section of the Washington Department of Ecology (Aug. 13, 1984); see also MINN. STAT. ANN. § 115A.075 (West Supp. 1986) (first priority given to eliminating generation; disposal should be last resort).

79. See *infra* text accompanying notes 99-101; *supra* text accompanying notes 73-74.

80. Minnesota's legislation is the best model, because it mandates that the state's Waste Management Board adopt a plan placing highest priority on alternatives to land disposal, including process modification, recycling, reuse, and recovery. See MINN. STAT. ANN. § 115A.11 (West Supp. 1986). The revised draft plan predicts a 31% reduction in the state's hazardous waste generation by the year 2000. MINN. WASTE MANAGEMENT BD., REVISED DRAFT HAZARDOUS WASTE MANAGEMENT PLAN 83 (Feb. 1984); see also N.Y. PUB. AUTH. LAW § 1285-g(3) (McKinney 1982) (recycling program to include planning).

81. Another source reduction planning strategy worth considering in comprehensive legislation is coordination between states. See N.C. GEN. STAT. § 143B-216.13.(9) (1983) (Waste Management Board to promote discussion with other states concerning regional hazardous waste management agreements).

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and technological waste reduction techniques still being developed.⁸² Because the high financial costs to generators of disposal have only recently—and even now, only partially—been imposed,⁸³ generators mistakenly continue to believe that land disposal will remain the cheapest management alternative. This misconception has stifled private incentives to research source reduction, making government intervention necessary to ensure that such research actually occurs.⁸⁴

Legislation mandating research on source reduction can vest research authority in a government agency⁸⁵ or provide for agency-administered grants to universities and industry.⁸⁶ Research efforts should be aimed initially at generating the information necessary to implement currently available waste reduction technologies, and then—to assure that waste reduction continues—at developing new techniques.⁸⁷ Legislation for a research program⁸⁸ should therefore provide for an initial assessment of the

82. See TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 9 (data needed on alternative industrial processes for waste reduction); Clark, *Source Reduction Policy Issues*, in 1984 MASSACHUSETTS CONFERENCE, *supra* note 51, at 7 (research and development of new methods of source reduction is necessary component for future waste reduction efforts).

83. These high costs are due primarily to RCRA regulations and CERCLA liability on the federal level, and to comparable state statutes. But as pointed out earlier, *supra* note 18 and accompanying text, the true costs of disposal have not yet been incurred.

84. See ROYSTON, *supra* note 41, at 138 (financial assistance needed for research designed to produce clean technologies); cf. Palmer, *Chemical Recycling: Making it Pay*, in D. Huisingsh & V. Bailey, *supra* note 40, at 82 (expertise needed because workers in one industry do not know how chemicals can be used in another).

85. See, e.g., CAL. HEALTH & SAFETY CODE § 25170(e) (West Supp. 1986) (Department of Health Services to coordinate research on hazardous waste recycling and recovery); N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(ii) (McKinney 1982) (recycling program to include research into feasibility and market potential of recovered industrial materials); WASH. REV. CODE ANN. § 70.105.160 (Supp. 1986) (Department of Ecology to study methods to achieve waste reduction).

86. See, e.g., *infra* note 125 (discussing Minnesota's program for research grants to industry). However, "[a]lthough R & D may occur within the private sector, it will do little to advance waste reduction efforts on a larger scale unless information is freely exchanged." Clark, *supra* note 82, at 7. Because many firms are reluctant to release information, *supra* note 70, concentrating at least a portion of research monies within universities appears desirable. On the other hand, while agencies and industries tend to work toward quick results on source reduction research, university contractors may be constrained by such factors as the academic year and the need to publish. Telephone interview with Terry Pierson, Staff member of North Carolina Board of Science and Technology (Mar. 5, 1985). Thus a balanced approach to research, involving both universities and industry, is needed. *Id.*

87. See NRC REPORT, *supra* note 54, at 36-37 (current need to encourage adoption of existing source reduction methods, but as more reduction occurs, new techniques will need development).

88. North Carolina, through its "Pollution Prevention Pays" program, may be the leading state in waste reduction research. In July 1983, the state allocated \$600,000 over two years to the North Carolina Board of Science and Technology for research and technical assistance to industry. Huisingsh, *The Experience and Promise of a Statewide Pollution Prevention Program*, in ILLINOIS CONFERENCE, *supra* note 16, at 121; Div. of Environmental Management, N.C. Dep't of Natural Resources and Community Dev., Informational Pamphlet (discussing Pollution Prevention Pays Program); telephone interview with Terry Pierson, Staff Member of North Carolina Board of Science and Technology (Aug. 7, 1984). The state is also studying the feasibility of creating a research center devoted to pollution prevention. HAZARDOUS WASTE STUDY COMM'N OF 1983, POLLUTION PREVENTION—REPORT TO THE LEGISLATIVE RESEARCH COMMISSION (report accepted by Commission on May 17, 1984). One major strength of North Carolina's program is the ties built between industry, government, and universities within a non-regulatory framework. See N.C. Bd. of Science and Tech-

types and amounts of waste streams generated by industries within the jurisdiction,⁸⁹ estimates of future waste streams,⁹⁰ and an analysis of the best methods for each industry to reduce these streams given current technology.⁹¹ Each waste should also be studied generically, to determine the degree and type of difficulties encountered reducing or reusing particular wastes.⁹²

Non-regulatory, voluntary waste minimization projects will win approval by a risk-averse industry only if research efforts produce comprehensive feasibility studies and economic analyses.⁹³ A thorough research program should therefore contain technological and market research⁹⁴ on reduction, reuse, and recycling techniques, as well as pilot projects⁹⁵ to demonstrate the feasibility of new techniques.⁹⁶

C. Institutional Assistance

The third critical area within a comprehensive legislative approach—institutional assistance for source reduction—includes the creation and empowerment of governmental agencies and other institutions charged with promoting waste minimization. Institutional assistance is in-

nology, Informational Pamphlet (discussing Pollution Prevention Research and Education Program). See generally Huisigh, *supra* note 27, at 9 (discussing North Carolina program).

89. See N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(iii), (iv) (McKinney 1982) (collection of data on industrial material and methods); N.C. GEN. STAT. § 143B-216.13.(1) (1983) (Waste Management Board to evaluate volume, distribution, location, and characteristics of waste generated); see also Caldart & Ryan, *supra* note 51, at 182 (policies should be grounded on examination of problem on industry-by-industry basis).

90. See, e.g., ILL. ANN. STAT. ch. 111½ § 1020.1 (Smith-Hurd Supp. 1985) (monitoring of existing and expected rates of hazardous waste production); MINN. STAT. ANN. § 115A.11 (West Supp. 1986) (plan to contain reduction targets and estimate of waste generation through year 2000).

91. Washington legislation comes closest to this objective, requiring a "study to determine the best management practices for categories of waste" considering available technology, including methods to achieve waste reduction. WASH. REV. CODE ANN. § 70.105.160 (Supp. 1986); see also MINN. STAT. ANN. § 115A.08 Subd. 4(c) (West Supp. 1986) (requiring evaluation of all feasible and prudent alternatives to disposal and their potential to reduce disposal); N.C. GEN. STAT. § 143B-216.13.(2) (1983) (Waste Management Board to recommend how to maximize resource recovery).

92. New York's requirement of rating recyclables according to "the degree of difficulty and the kind of difficulty encountered" in recycling is innovative and should be used as a model, because it goes beyond the usual requirement of simply listing recyclables. N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(viii) (McKinney 1982); see, e.g., CAL. HEALTH & SAFETY CODE §§ 25175(a), 25176 (West 1984 & Supp. 1986) (lists shall be prepared and presented annually to legislature).

93. Brower, *supra* note 67, at 110.

94. See, e.g., CAL. HEALTH & SAFETY CODE § 25170(g) (West 1984) (study of market potential and feasibility of resource recovery); N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(ii) (McKinney 1982) (same).

95. See, e.g., CAL. HEALTH & SAFETY CODE § 25170(l) (West 1984) (providing for pilot projects).

96. The research program can be funded, at least in part, by a tax on generation or disposal. For example, Washington partially funds its waste management study through a combination of such tax proceeds, WASH. REV. CODE ANN. § 70.105A.060(1) (Supp. 1986), and hazardous waste fines and penalties, *id.* § 70.105.180; see also ILL. ANN. STAT. ch. 111½ § 1022.2(e) (Smith-Hurd Supp. 1985) (12.5% of land disposal fees used to research alternatives).

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dispensable because markets alone have failed adequately to encourage reduction and discourage disposal. Institutional assistance also facilitates necessary central coordination of source reduction. For example, the expertise required to choose the most effective waste minimization strategies for a particular plant may be too costly for each generator to develop individually,⁹⁷ and may be obtained more efficiently by a government body. This is particularly true for the multiple and diverse small quantity generators, who need technical assistance on waste reduction that only a central institution can provide.⁹⁸

A comprehensive source reduction program includes both regulatory functions, such as enforcing disposal restrictions,⁹⁹ and non-regulatory functions, such as providing information to industry.¹⁰⁰ To retain maximum industry support for source reduction, the legislation should provide that these functions be separated. Authority for the program thus should be divided between a regulatory body, such as a state Environmental Protection Agency, and a non-regulatory body, such as a government corporation.¹⁰¹ In addition, an Advisory Council representing diverse interests should report to the responsible agencies and the legislature on, for example, suggested changes in the waste reduction program.¹⁰²

97. Runge, *supra* note 48, at 115, 128.

98. *Id.*

99. *See infra* text accompanying notes 115-17.

100. *See* N.C. Bd. of Science and Technology, Informational Pamphlet, *supra* note 88, at 1-2 (regulatory and non-regulatory functions needed); Hickman, *Industrial Waste Prevention: An Assessment and Demonstration in the Region of Waterloo, Ontario*, in 1984 MASSACHUSETTS CONFERENCE, *supra* note 51, at 27 (cooperative approach and adequate regulatory framework needed). Overcash, *supra* note 40, at 69, asserts that the government role should be restricted to evaluating the environmental ramifications of different approaches and to ensuring that maximum use is made of waste elimination. This, however, is not an argument against regulatory controls as a complement to a strong non-regulatory incentive structure, as regulatory controls can result in increased waste reduction. "[A] strong regulatory program is essential since it raises the costs of managing residuals and provides an incentive for generators of waste to find ways to minimize these costs." N.C. Bd. of Science and Technology, Informational Pamphlet, *supra* note 88, at 1; *see also* NRC DIGEST, *supra* note 48, at 3 (waste reduction most likely fostered by non-regulatory methods such as information dissemination programs and economic incentives, but regulatory standards will be strong impetus in undertaking waste reduction efforts).

101. This structure has been effective in New York, as evidenced by support for the program by both trade associations and environmentalists. Telephone interview with Pickett Simpson, Hazardous Waste Program Manager for the New York Environmental Facilities Corporation (Aug. 14, 1984). Likewise, Minnesota's Waste Management Board, with responsibility for the state's source reduction program, is separate from the agency having regulatory authority over hazardous wastes. Decker, *Waste Reduction Programs in Minnesota*, in 1984 MASSACHUSETTS CONFERENCE, *supra* note 51, at 30. This is not the case in California, where the Department of Health Services exercises regulatory and non-regulatory functions. This structure assumes, most likely falsely, that industry will vigorously undertake voluntary waste reduction projects with the help of the same government body by which it is regulated. Thus, California's approach would not seem to encourage voluntary adoption of source reduction to the same extent as when regulatory and non-regulatory functions are separated.

102. The Council should include members with different interests and concerns over hazardous waste, such as representatives from business, industry, universities, environmental groups, and the general public. *See* ILL. ANN. STAT. ch. 111½ § 1005.1 (Smith-Hurd Supp. 1985) (creates Hazardous Waste Advisory Council with broad membership and duties). The Council can suggest administrative

In order to facilitate the creation of markets for reusable waste,¹⁰³ the legislation also should grant the non-regulatory body responsibility for a "passive" waste exchange,¹⁰⁴ which would operate as a clearinghouse to match up generators who have waste to sell with purchasers who can use the waste as raw material.¹⁰⁵ The government can also operate an "active" exchange, which, unlike the "passive" model, would take physical possession of the waste.¹⁰⁶ To gain industry support for the waste exchange, as well as for any other aspect of the source reduction program where the confidentiality of sensitive production or waste minimization processes could be at stake,¹⁰⁷ legislation should provide strong protec-

and legislative changes as well as methods to promote reduction technologies. *Id.* Apparently, Illinois' Council is responsible for the recent introduction of legislation. Telephone interview with John Schmitt, Illinois Department of Natural Resources (July 16, 1984); *see also* 1983 N.C. Sess. Laws 926 (creates Hazardous Waste Study Commission).

103. The failure to provide markets for reusable waste is a distinctive shortcoming of the 1984 RCRA amendments. *See supra* text accompanying notes 24, 58. These markets have not developed on their own partially because the unpredictability of the RCRA regulatory system has discouraged both the practice of recycling and the development of recycling facilities. *See* NRC REPORT, *supra* note 54, at 41; *supra* text accompanying note 56.

104. Presently, there are exchanges in at least 20 states and 12 foreign countries. Laughlin, *Don't Waste It, Exchange It*, CHEMTECH, Feb. 1984, at 93, 94. Many are government-run, because broad industry participation often requires the exchange to operate across a wide region, with hazardous materials that have an unknown or unrecognized value. Telephone interview with John W. Rafferty, Director of Minnesota Technical Assistance Program (Mar. 5, 1985); NRC REPORT, *supra* note 54, at 40; *see, e.g.*, CAL. HEALTH & SAFETY CODE § 25170(k) (West 1984) (establishing "information clearinghouse"); N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(vii) (McKinney 1982); N.C. GEN. STAT. § 143B-216.13.(4) (1983); WASH. REV. CODE ANN. § 70.105.100 (Supp. 1986); *cf.* Laughlin, *supra* (citing Canadian study recommending separating exchange from government, *but particularly from regulatory agencies*, to protect industry participants from government "interest" and commercial competition).

105. The success of waste exchanges vary, and the U.S. exchanges are far less successful than many European exchanges. Patterson, *Strategies for Industrial Waste Elimination*, in ILLINOIS CONFERENCE, *supra* note 16, at 92. For example, New York's exchanges saved \$550,000 in disposal costs in 1982-83 by finding uses for over 2700 tons of waste. Telephone interview with Diane M. Hinchcliff, Executive Assistant for the New York State Environmental Facilities Corporation (Aug. 14, 1984). However, North Carolina's exchange is "floundering." Telephone interview with Terry Pierson, *supra* note 88. In addition to financial and marketing problems, the failure may be due to waste generators' fear of future liability. *Id.* Although the text of the statute is ambiguous, CERCLA appears to impose continued liability on a generator in certain circumstances, for instance when the waste is treated by the receiving user, notwithstanding that the generator has sold the waste through an exchange. *See* 42 U.S.C. § 9607(a)(3) (1982) (imposing liability on those who arrange for "treatment or disposal" of hazardous substances); *supra* note 19. *See generally* G. DUNN & N. GINNIS, LIABILITY ASSOCIATED WITH WASTE EXCHANGES (1984) (report to North Carolina Governor's Waste Management Board on liability of exchanges and of participating generators). Federal law should thus be amended to provide that in the event of a sale through an exchange to a bona fide purchaser, the liability for the waste is transferred to the purchaser and the original generator's liability ceases.

106. New York's successful exchanges, *see supra* note 105, provide a good model for government involvement in waste exchanges. The state, unlike most others, both aggressively runs its own active exchange and contributes funds to a regional passive exchange that operates across several states. *See generally* N.Y. STATE ENVIRONMENTAL FACILITIES CORP., INDUSTRIAL MATERIALS RECYCLING ACT PROGRAM SECOND ANNUAL REPORT 2, 3-7 (1983) (describing New York's exchanges). The administrative decision to participate in a regional exchange, rather than to create a wholly new exchange, should depend on a state's size and waste generation patterns.

107. Examples are technical assistance and information exchange programs. *See, e.g.*, WASH.

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tions¹⁰⁸ for industry trade secrets.¹⁰⁹ This may be accomplished through nondisclosure agreements and procedures, and by penalties against program staff for improperly and intentionally disclosing confidential information.

However, complete information on wastes, waste economics, and source reduction technology "is not present in most firms."¹¹⁰ Because of firms' reluctance to transfer information about advantageous waste reduction processes among themselves, it is essential that institutional assistance for source reduction include legislation authorizing technical assistance to industry for waste minimization.¹¹¹ To encourage voluntary industry adoption of state-of-the-art technologies, this program should be non-regulatory and incorporate research efforts and university expertise.¹¹² Elements of a technical assistance program include workshops for specific industries and waste streams; the development of management plans for industrial waste streams; and on-site consultation.¹¹³

REV. CODE ANN. § 70.105.170 (Supp. 1986) (confidentiality preserved).

108. New York legislation provides the strongest protections, including penalties against its staff for improperly disclosing trade secrets. N.Y. PUB. AUTH. LAW § 1285-g(5) (McKinney 1982). The law requires that confidential information, which can be used only for the purposes of the Act, not be disseminated without the express consent of the generator who furnished it, and exempts such information from disclosure under the state freedom of information act. *Id.*; see also *supra* note 70.

109. A comprehensive legislative package should also provide information on source reduction that is available to the general public. For good models, see CAL. HEALTH & SAFETY CODE § 25171 (West 1984) (public report to contain assessment of source reduction technologies); N.Y. PUB. AUTH. LAW § 1285-g(3)(b)(v), (ix) (McKinney 1982) (providing information to public and recycling handbook available to all industries).

110. Clark, *supra* note 82, at 7.

111. Technical assistance offers "real promise" of overcoming information gaps, *id.*, and is a cornerstone to a waste reduction effort. See, e.g., ROYSTON, *supra* note 41, at 115. Although there is currently a "vast body" of scientific and engineering data on source reduction, there are too few information transfer programs "nationwide," and "no federal program in this area." Hirschhorn, *supra* note 16, at 144. This assistance is particularly needed for smaller companies. *Id.* "[D]issemination of information on waste reduction is vital to further waste reduction efforts by industry." NRC DIGEST, *supra* note 48, at 5.

112. North Carolina's well-funded program, see Huisingsh, *supra* note 27, at 29, provides an operational model. The state's technical assistance (TA) program is integrated with research efforts and university expertise. See *supra* note 88. A TA program can pay at least in part for itself. For instance, Massachusetts' four phased technology transfer program is funded through charges to participants, but may be hindered by unspecific enabling legislation. MASS. GEN. LAWS ANN. ch. 21D § 3 (West 1981); telephone interview with Dr. Redmond Clark, Assistant Director of the Massachusetts Bureau of Solid Waste Disposal (Aug. 13, 1984); see also G. HUNT, W. SLOAN & R. WALTERS, APPROACH TO TECHNICAL ASSISTANCE FOR INDUSTRIAL AND HAZARDOUS WASTE GENERATORS (1983) (proposing Maryland TA program with costs shared between state and participating industries). Minnesota, however, which correctly emphasizes assistance to small businesses, provides the most comprehensive model for legislation, including outreach, information dissemination, and coordination with other programs. See MINN. STAT. ANN. § 115A.152 (West Supp. 1986).

113. Decker, *supra* note 101, at 33, 34. The program can also provide a source reduction library, *id.*, and encourage transfer of information between generators. Clark, *supra* note 82, at 7. It can be complemented by awards to industry for outstanding achievement in waste reduction. See N.C. GEN. STAT. § 143B-216.13(8) (1983) ("Governor's Award of Excellence").

D. *Statutory and Regulatory Adjustments*

Statutory and regulatory adjustments¹¹⁴ constitute the fourth area within a comprehensive legislative approach. Such adjustments can compensate for the failure of markets sufficiently to encourage source reduction and can correct statutory and regulatory frameworks that provide few incentives for reduction and inadequate penalties for disposal. Such adjustments also are necessary to reflect a new policy emphasis on waste minimization.

For instance, although Congress gave EPA the authority to ban federally listed hazardous waste from land disposal in the recent RCRA amendments,¹¹⁵ comparable restrictions on the state level are still justified. The states often designate many substances as hazardous that the federal government does not.¹¹⁶ There are thus many potentially dangerous materials—from the states' view—excluded from the congressional ban. To encourage reduction in waste generation to the lowest feasible levels, it is appropriate to place the burden of overcoming a presumption in favor of reduction on industry—the only party in a position actually to reduce generation and minimize disposal. Legislation therefore should provide that all state-listed hazardous waste is banned from land disposal unless industry demonstrates to the responsible regulatory agency that, considering technological and economic feasibility, specific waste cannot be reasonably reduced, reused, recycled, incinerated, or treated, and must be landfilled.¹¹⁷

114. Statutory and regulatory "adjustments" can be contrasted with the creation of wholly new institutional programs, such as research and technical assistance programs.

115. See *supra* note 22; text accompanying notes 20–25.

116. See *supra* note 26 (significant disparity between wastes federally regulated and total amount regulated). State land disposal regulations are also justified because the federal ban will probably not be implemented for many years. See *supra* note 24; *infra* note 117. In fact, the federal legislation appears to be modeled on state law, as evidenced by the amendments' mandate for early EPA review of a series of wastes identical to the wastes banned from land disposal in California. Compare CAL. HEALTH & SAFETY CODE § 25175 (West Supp. 1986) and CAL. ADMIN. CODE tit. 22, R. 82 (1984) with HSWA, *supra* note 19, at § 201(a)(d) (same wastes targeted).

117. Illinois' legislation restricting liquid hazardous waste disposal takes this form, and is also distinctive for its detailed provisions for appeals, enforcement, variances, judicial review, and penalties. See ILL. ANN. STAT. ch. 111½ §§ 1022.6, 1035–1045 (Smith-Hurd Supp. 1985). Whether the provisions are workable cannot be determined until 1987, when the legislation takes effect, but in form this legislation serves as a comprehensive model.

Other approaches exist. For example, California has a two-prong system. It bans categories of wastes from disposal upon an administrative finding that recycling treatment capacity is available. CAL. ADMIN. CODE tit. 22, R. 82 (1984). Second, generators must justify why they have disposed of recyclable waste not subject to the ban. See CAL. HEALTH & SAFETY CODE, § 25175 (West Supp. 1986). One major weakness in the application of California's law is that penalties for noncompliance, although provided for by statute, *id.*, have never been promulgated in the applicable regulations, or enforced. CAL. ADMIN. CODE tit. 22, R. 82 (1984); interview with Chris Wilhelm, California Department of Health Services (July 18, 1984). Another method of encouraging recycling is to restrict disposal facility development unless there are no feasible alternatives. See MINN. STAT. ANN. § 115A.24 (West Supp. 1986).

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A tax on disposal—a waste-end tax—should be used in tandem with disposal restrictions, and can be designed to tax generators, or owners and operators of hazardous waste disposal facilities, or both.¹¹⁸ By internalizing the true cost of land disposal within hazardous waste industries, such a tax may be critical in encouraging the use and development of feasible reduction techniques and in discouraging disposal.¹¹⁹ But to have that effect, the tax must be high enough to have an impact on those taxed,¹²⁰ employ a variable rate according to the toxicity of the material discarded, and if the tax is generator-based, exempt material to be reused or recycled.¹²¹ The proceeds may be used to fund cleanup efforts¹²² as well as the overall reduction and recycling program.¹²³

Neither disposal restrictions nor waste-end taxes, however, address industry's initial costs and investment uncertainties in undertaking waste reduction. A comprehensive, positive economic incentive program for

California's system does not encourage source reduction to as great an extent as does Illinois': California requires only a post hoc rationalization from industry after disposal of recyclable waste, while Illinois actually prevents such disposal. Illinois' structure is also preferable to that of the new federal restrictions promulgated in the RCRA amendments. See *supra* note 22. First, the criteria used to determine whether a waste should be banned from disposal under federal law—protection of human health and the environment—although an important goal, does little to affirmatively promote waste minimization. Moreover, using this criteria may be a false assurance to the public, because given current technology, any landfill will leak. See *supra* note 27. Furthermore, the amendments place the discretion to make the decisions on EPA—an agency that is overburdened, known for delay, and subject to enormous political pressure. At best, such a system invites many years of uncertainty over the permissibility of land disposal.

118. See, e.g., CAL. HEALTH & SAFETY CODE §§ 25174.-25174.9, 25300-25395 (West 1984 & Supp. 1986); CAL. ADMIN. CODE tit. 22, R. 79 (1984) (taxes generators and disposal facilities); ILL. ANN. STAT. ch. 111½ § 1022.2 (Smith-Hurd Supp. 1985) (taxes disposal facilities); MINN. STAT. ANN. § 115B.22 (West Supp. 1986) (taxes generators); N.Y. ENVTL. CONSERV. LAW § 27-0923 (McKinney Supp. 1986) (taxes in-state generators and disposal facilities used for out-of-state wastes).

119. See Finkel, *supra* note 55, at 44, 48; TECHNOLOGIES AND MANAGEMENT STRATEGIES, *supra* note 2, at 75-78.

120. Although a tax on waste might be instituted on the federal level, special interests may lobby to make it so low as to have no effect. Should this be the case, escalation of public concern over the growing Superfund problem, resulting in public pressure on industry, may actually serve the same purpose as the tax in reducing disposal. Telephone interview with Dr. Joel S. Hirschhorn, *supra* note 11.

121. See, e.g., Stewart, *Economics, Environment, and the Limits of Legal Control*, 9 HARV. ENVTL. L. REV. 1, 16 (1985) (proposing idea of quantitative risk index for toxics as basis for control strategies with regulatory and economic incentive components).

The states that have implemented a waste-end tax have not yet determined whether it has resulted in more desirable waste management practices. GAO REPORT, *supra* note 16, at 15. However, some of these states have experienced misstatements or nonreporting of wastes by generators or disposal facilities, misuse of exemptions, and a failure to generate anticipated revenues. *Id.* at 8-15.

122. See, e.g., CAL. HEALTH & SAFETY CODE §§ 25174.1-25174.9, 25300-25395 (West 1984 & Supp. 1986); CAL. ADMIN. CODE tit. 22, R. 79 (1984) (taxes generators and disposal facilities to fund cleanup, inspection, and other program costs). One irony of a waste-end tax is that "[t]he more successful the tax is in achieving its objective of encouraging more desirable waste management practices . . . the less successful the tax will be in raising needed revenue [for landfill cleanup]." GAO REPORT, *supra* note 16, at v.

123. See, e.g., ILL. ANN. STAT. ch. 111½ § 1022.2(e) (Smith-Hurd Supp. 1985) (12.5% of receipts used for source reduction); *supra* note 96.

waste reduction¹²⁴ is therefore needed to finance or encourage the development of resource recovery facilities, equipment, and studies. Governments can use bonds, grants,¹²⁵ loans,¹²⁶ and tax incentives¹²⁷ to encourage industry to explore the economic and technical feasibility of source reduction. The role of positive incentives is particularly pronounced where firms are small. Positive inducements provide funding for initial capital costs and technical expertise, which may be already available to larger firms. This financing may be crucial in promoting firm decisions to make waste minimization process changes that will yield overall profits.¹²⁸

E. Implementation

The four components of this legislative approach to source reduction—planning, research, institutional assistance, and statutory and regulatory adjustments—work as an integrated whole. While each describes a conceptually discrete set of programs, each of the four depends on the other three for successful implementation. For example, an institution's effectiveness in rendering technical assistance to industry depends upon an active research program to develop applicable technologies. The scope of the research program in turn relies upon the particular source reduction

124. While a waste-end tax may act as a disincentive to landfilling, positive economic incentives can reward those businesses that engage in source reduction. G. BULANOWSKI, G. LAZARUS, L. MORANDI & J. STEELER, *A SURVEY AND ANALYSIS OF STATE POLICY OPTIONS TO ENCOURAGE ALTERNATIVES TO LAND DISPOSAL OF HAZARDOUS WASTE* 20 (1981) (available from National Conference of State Legislatures); see also Runge, *supra* note 48, at 127 (both positive and negative economic incentives needed). *Contra* telephone interview with Bill Sloane, Secretary of Maryland Hazardous Waste Siting Board (Aug. 8, 1984) (capital investment in reducing wastes should not be subsidized; only waste minimization results should be rewarded).

125. Minnesota law provides grants to generators totaling \$150,000 for source reduction feasibility studies. MINN. STAT. ANN. § 115A.154 (West Supp. 1986). The legislation provides a good model because it requires that the results of the studies be made available to all generators through the state's technical assistance program, thereby helping to disseminate much needed information. This type of grant would appeal most to smaller firms, where confidentiality may be a lesser consideration. See *supra* note 111; see also MINN. STAT. ANN. § 115A.156 (grants for, e.g., metal and solvent recycling facilities); *supra* note 86 (research by both universities and industry needed).

126. Most of the current legislation authorizes the responsible agency to finance loans for construction or modification of recovery and generating facilities through the sale of tax exempt bonds. See, e.g., CAL. HEALTH & SAFETY CODE §§ 44500-44563 (West 1979) (tax exempt revenue bonds); ILL. ANN. STAT. ch. 127 §§ 721-736 (Smith-Hurd Supp. 1985) (bond proceeds may be used for process modification to reduce hazardous waste); MINN. STAT. ANN. § 115A.162 (West Supp. 1986) (loans for up to 75% of hazardous waste processing facility capital costs, exclusive of land costs); N.Y. PUB. AUTH. LAW § 1290 (McKinney 1982 & Supp. 1986) (bonds to finance 40-year unlimited loans); N.C. GEN. STAT. § 159C-6 to -7 (1982) (loans for reduction, recovery, and recycling facilities).

127. For instance, Minnesota has a sales tax exemption for equipment used to process hazardous waste at resource recovery facilities. MINN. STAT. ANN. § 297A.25 Subd. 1(aa) (West Supp. 1986). A comprehensive tax incentive scheme could also include credits for equipment used to reduce or recycle waste. See, e.g., 1984 Minn. Laws ch. 644 §§ 52, 53 (repealed 1985). The Minnesota credits apparently were repealed for purposes of a state tax reduction and simplification plan. Telephone interview with David Cera, Senior Planner for the Minnesota Waste Management Board (Mar. 5, 1986).

128. Runge, *supra* note 48, at 128.

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plan developed within a broader hazardous waste management scheme, and upon an institution to carry out the program. The magnitude of the research effort can also be contingent upon funds obtained through statutory adjustments creating a tax on waste. Ultimately, however, the success of the entire reduction program relies upon a planning decision that reduction is to be a high priority.

CONCLUSION

Federal laws have failed to identify methods of alleviating the source of the hazardous waste problem—that is, needlessly high levels of production and disposal—and instead have focused on finding legal solutions after toxic pollution has already been created. Even with the enactment of the recent RCRA amendments, the fatal flaw of federal laws continues to be their failure to provide adequate incentives for waste elimination in a world ill-equipped to cope with toxic substances safely. Reducing the threat of hazardous waste is clearly a national priority. Source reduction legislation, as proposed in this Note,¹²⁹ is by far the most promising means available to achieve this end.

129. The legislative proposal for reduction, reuse, and recycling advocated in this Note could be used selectively to fill gaps in current federal law, or where appropriate, could be enacted in its entirety as a state package. Ideally, the program should be enacted and initially funded at the federal level, with responsibility for implementation and a portion of funding delegated to the states upon a showing of sufficient state capability. This would ensure a national focus for source reduction, while allowing states the flexibility to design programs suited to their regional needs.

Even under current federal law, RCRA could be interpreted to give EPA the authority to research source reduction. *See supra* note 10. To achieve a comprehensive federal program for waste reduction, however, the other elements of the proposed approach—programs for planning, institutional assistance, and statutory and regulatory adjustments—must be enacted. EPA and Congress should consider this proposal in response to the RCRA amendments' call for an agency study on the desirability of "taking other additional [federal] actions" to reduce hazardous waste. *See HSWA, supra* note 19, at § 224(e).