Example 7.3
The Superfund*

The federal government made no attempt to reduce industrial pollution at its source until the early 1970s, with the passage of the Clean Air Act (1970) and the Water Pollution Control Act (1972), and the establishment of the Environmental Protection Agency (EPA-1970). Before then, individual states were responsible for controlling industrial pollution within their boundaries, and the states' policies were largely ineffectual. The result was that industries were essentially able to dispose of their industrial wastes into the air, water, and ground with impunity.

The potential dangers of allowing industries to dump hazardous wastes into the water and ground were driven home to the American public in 1980 in an incident known as 'The Love Canal'. The Love Canal, located in Niagara Falls, NY, was used as a toxic waste disposal site by the Hooker Chemical and Plastics Corporation. By 1942, the company had disposed of 22,000 tons of toxic waste in the surrounding area. After a noticeably high incidence of birth defects, retardation, cancers and other health hazards in the region, President Carter declared a state of emergency in the area in May of 1980, and the EPA relocated and reimbursed 800 families for their homes. Soon thereafter, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which established a trust fund known as the Superfund.[1] The purpose of the Superfund was to finance a new program by the EPA to identify and clean up hazardous waste sites across the U.S. Over time the EPA program itself became identified as the Superfund.

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[1] *Superfund Program Implementation Manual FY 06/07*, 26 April 2006, Environmental Protection Agency, www.epa.gov/superfund/action/process/spim06/pdfs/ch1_2.pdf

THE SUPERFUND

The Superfund was financed by three new sets of taxes earmarked to the Fund:

- Taxes on crude oil and certain chemicals or substances that are usually found to be the contaminants at Superfund sites
- Taxes on petroleum products imported into the U.S.
- An environmental tax on the larger corporations.

Congress authorized a Trust Fund of $1.6 billion in 1980, and in 1986, when the Superfund authority was renewed, Congress increased the amount to $8.5 billion.[2] In addition, a primary goal of the EPA is to assign financial liability to persons or businesses that are responsible for the toxic wastes at sites scheduled for clean-up. The Trust Fund is used only when the companies responsible for the toxic waste have gone out of business, lack the proper funding, or cannot be identified.

The authority for the Superfund expired once again in 1994 and all attempts to reauthorize it through Congressional Bills have since failed. Consequently, the Superfund program authority is extended annually through the Act of Appropriations, and financed out of general tax revenues. The original earmarked taxes have all been repealed. Also, the EPA has become less aggressive over time in asking those responsible for the toxic wastes to pay for the clean-up.

EVALUATING HAZARDOUS WASTE SITES

The EPA soon came to realize that the Love Canal was just the tip of an enormous iceberg – there turned out to be tens of thousands of potentially hazardous waste sites throughout the U.S. Since 1980, 45,900 waste sites have been identified and evaluated by the EPA, and there are undoubtedly more to come. Only a small percentage of these sites, however, have been categorized as hazardous enough to be placed on the EPA's National Priorities List (NPL) – the list of sites that are scheduled to be cleaned up.

The evaluation process by which a hazardous waste site is placed on the NPL is quite rigorous. First, preliminary assessments are made of each site to determine whether the site poses an immediate threat to public health. If the site is considered to be an immediate threat, the clean-up process is begun immediately – whether or not it is on the NPL. Second, the region in which the site is located must determine which program should address the site (options include the Superfund, the Brownfields, state remediation, or one of several other programs). Third, sites are awarded NPL status and

[2] Thomas Tietenberg, *Environmental and Natural Resource Economics, 3rd edition*, New York, NY: HarperCollins, 1992, pp. 1–678

prioritized according to the Hazard Ranking System. Finally, a multi-year work plan is developed and five-year reviews are conducted at each contaminated site.[3]

The Hazard Ranking System (HRS) is a numerically based screening system that evaluates five categories of concerns at each site. The purpose of the HRS is to analyze:

- Waste risks (whether chemical, oil, biological or radiological releases)
- Their method of environmental exposure (whether ground or surface water, soil, or air)
- The effects on the human population or environment.

Each category is given a raw score from 1 to 5, which is then multiplied by its weight factor. The totals for all five categories are then summed to obtain an overall score, with a maximum value of 100. A site that scores below 28.5 is generally not considered for placement on the NPL.[4]

The five categories and their weights are as follows[5]:

Factor	Weight
A. Risks to human population exposed: population size, proximity to contaminants, likelihood of exposure	5
B. Stability: mobility of contaminant, site structure and effectiveness of any institutional or physical controls	5
C. Contaminant characteristics: concentration, toxicity and volume	3
D. Threat to a significant environment: endangered species or their critical habitats, sensitive environmental areas	3
E. Program management considerations: innovative technologies, cost delays, high profile projects, environmental justice, state involvement, brownfields/economic redevelopment	4

Notice that the HRS regards the potential risk to the exposed human population and the stability of the contaminant as the most important deciding factors for a site's placement on the NPL, and the potential risk to the environment and endangered species and the

[3] Chairman Raymond Loehr, comp, *Superfund Subcommittee of the National Advisory Council for Environmental Policy and Technology: Final Report*, 12 April 2004, National Advisory Council for Environmental Policy and Technology, www.epa.gov/oswer/docs/naceptdocs/NACEPTsuperfund-Final-Report.pdf

[4] *Superfund Subcommittee of the National Advisory Council for Environment Policy and Technology: Final Report*, p. 111, available at www.epa.gov/oswer/docs/naceptdocs/NACEPTsuperfund-Final-Report.pdf.

[5] *Ibid.*, pp. 237, 238

characteristics of the contaminant as the least important, with management considerations in the middle.

Application of the HRS to the 45,900 sites identified 1,689 for inclusion on the NPL and scheduled for clean-up.

MEASURING SUCCESS

The EPA has changed the way that it evaluates the success of the Superfund over time. The first measure was the number of sites cleaned up and thus deleted from the NPL. The Superfund has not been very successful by this measure. Since 1980, only 347 sites have been deleted form the NPL, leaving 1,342 still to be cleaned up (as of 29 November 2010). Perhaps because of the low number of deletions, the EPA subsequently changed its measure of success to the number of sites at which construction of the clean-up equipment has been completed. A completed construction site is defined as one in which physical construction is complete regardless of whether the final clean-up goals or other requirements have been met.[6] This measure shows a much higher success rate. From 1980 to 2010 there have been 1,100 completed construction sites, which is approximately 86% of the current sites on the NPL.[7]

The number of completed construction sites is not a very good measure of success, however, for two reasons. One is that there is still much work to the done following the completion of construction. It takes an average of twelve years to clean up a site after the construction phase has been completed. Another is that it does not provide an assessment of the reduction in health risks or the containment of toxins that pose risks to the environment, a primary goal of the Superfund. For this reason, in 2002 the Superfund began to evaluate success based on two indicators developed by the Resource Conservation and Recovery Act (RCRA) program. The first indicator is the percentage of sites that have human exposure to toxic waste under control, which was 80% in 2002. The second indicator is the percentage of sites with contaminated ground water under control, which was 60% in 2002.[8]

The Superfund has some notable achievements to its credit, including the clean-up of the Columbia Space Shuttle disaster over Texas on 1 February, 2003 and the World Trade Center following the attack of 11 September 2001. Nonetheless, the EPA is clearly a long way from ridding the U.S. of hazardous waste sites, no matter what measure of

[6] Katherine Probst and Diane Sherman, *Success for Superfund: A New Approach for Keeping Score*, Washington, D.C.: Resources for the Future, April 2004.
[7] www.epa.gov/superfund/sites/npl/index.htm. Go to the Sites link.
[8] Katherine Probst and Diane Sherman, *Success for Superfund: A New Approach for Keeping Score*, Washington, D.C.: Resources for the Future, April 2004, p. 3.

success is used. Much additional time, effort, and money will be required. Several projected costs studies on the Superfund have been conducted since its inception in 1980. Two of the more recent studies are a report to Congress by the EPA in 1998, and a study by Resources for the Future (RFF) commissioned by Congress and published in 2001. When the EPA gave its report to Congress in 1998, the Superfund had already allocated $19.2 billion to the program. It estimated that $13.7 billion would be needed for the completion of the NPL.[9]

The RFF study was more limited in scope. It estimated the costs of the program only from the years 2000 to 2009 and it did not assume that the clean-up of NPL sites would be finished by 2009. The study included the costs of cleaning up current and future NPL sites through the year 2009, the cost of emergency response and removal actions, administrative costs (including undertaking the five-year reviews) and implementing long-term response actions.[10] It developed three estimates for three different scenarios: a base case, a low case, and a high case. The base case estimated costs of $15.2 billion; the low case estimated costs of $13.9 billion; and the high case estimated costs of $16.4 billion.[11] These estimates are much higher than the EPA estimates, given the limited time frame of the RFF study.

IS THE SUPERFUND COST-EFFECTIVE?

An important question surrounding the Superfund is whether it is cost effective. In 1999, Hamilton and Viscusi conducted a study using a hedonic pricing estimation of the housing market as part of a cost–benefit analysis of the Superfund.[12] In particular, Hamilton and Viscusi estimated the number of cancer cases averted by cleaning up Superfund sites. They concluded that the Superfund is inefficient in terms of cost per cancer case avoided.

The main reason for their result is that the standard set by CERCLA – to remove all contaminants from a site – is undoubtedly too high. The idea was to prevent harm to any individual who might enter the site. But a more reasonable standard would be expressed in terms of the reduction in the risk of developing cancer within the population residing near the site. Under the latter goal, partial clean-up or containment might be sufficient to achieve a substantial reduction in the risk to the population, and do so at a

[9] *Progress Toward Implementing Superfund Fiscal Year 1998: Report to Congress*, Chapter 6: 'Resource Estimates', Office of Emergency and Remedial Response U.S. Environmental Protection Agency, www.epa.gov/superfund/accomp/sarc/1998/98executivesum.pdf
[10] *Ibid.*
[11] Katherine Probst and David M. Konisky, *Superfund's Future: What Will It Cost?: a Report to Congress*, Washington D.C., Resources for the Future, 2001, Executive Summary, www.rff.org/rff/Documents/RFF-Bk-superfund-cost-exec-sum.pdf
[12] Chapter 20 of the textbook has a discussion of hedonic price estimation.

cost low enough to pass a cost–benefit test. In contrast, requiring the complete removal of the contaminants forces the Superfund to reduce exposure to cancer at very high costs.[13]

A related issue is that the overall cost-effectiveness of the program needs to be evaluated. In 2006, 45% of the program's funds were allocated to only 14 sites.[14] As many studies suggest, there may be significant room for improvement in the allocation of funds and the efficiency of the cleanup conducted. While there is room for improvement, it may prove difficult because the Superfund's operations extend across the entire country. Yet, according to the RFF report, progress can be made through improved standardization of data published on the Superfund and a change in the way success is measured and implemented.

[13] James Hamilton and W. Kip Viscusi, 'How Costly is "Clean"? An Analysis of the Benefits and Costs of Superfund Site Remediations,' *Journal of Policy Analysis and Management* 1999, Vol. 18, No. 1, pp. 2–27
[14] *Superfund National Accomplishments Summary FY2006* as of December 2006, www.epa.gov/superfund/accomp/numbers06.htm