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## **TOO LITTLE TOO LATE? HOST-COMMUNITY BENEFITS AND SITING SOLID WASTE FACILITIES**

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### **EXECUTIVE SUMMARY**

Most states have established recycling mandates and goals to divert waste away from landfills. These goals have not, however, once and for all solved our waste problems. Even if U.S. cities and counties attain waste diversion and recycling goals, they will still need to handle millions of tons of waste in disposal facilities, including landfills. Yet not-in-my-backyard (NIMBY) sentiment has slowed, or even prevented the siting of new waste facilities. Use of host-community benefit packages can help overcome local opposition, resulting in siting of landfills to meet future disposal capacity needs.

Top-down siting of facilities simply is not acceptable to local residents. Host-community benefits (HCBs) introduce market-like decision-making processes that allow local citizens to make choices about whether, where, and how a disposal facility is sited. A 1990 survey by Cornell Waste Management Institute of New York residents revealed that 86 percent believed that HCB packages were useful in the siting process. Another survey of 565 New York residents showed the importance of both financial compensation and environmental protection measures in siting negotiations.

HCBs internalize costs by compensating local residents for any real or perceived harms or losses they experience when a landfill is sited. Moreover, negotiations over the size of HCBs help generate answers to legitimate scientific, economic, and local welfare concerns. Finally, HCBs institutionalize citizen choice.

State legislation can help foster use of HCBs. One state, New Jersey, requires that any community hosting a waste disposal site receive at least \$1 per ton of landfilled waste and allows for compensation agreements above that amount. Five other states have legislation to encourage or require compensation and/or enhanced citizen participation in the siting process.

Public and private-sector use of HCBs, while no guarantee that siting of waste disposal facilities will occur, can smooth the process.

Taking the long view reminds us of one more often-overlooked truth about garbage: Ever since governments began facing up to their responsibilities, the story of the garbage problem in the West has been one of steady amelioration, of bad giving way to less bad and eventually to not too bad. To be able to complain about the garbage problems that persist is, by past standards, something of a luxury. [William Rathje, "Rubbish!" *The Atlantic Monthly*, December 1989.]

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## I. INTRODUCTION

In the grand scheme of things, William Rathje reminds us that we are lucky even to have the luxury of worrying about what to do with our garbage. But worry we will for at least two reasons. First, affluence breeds demands for amenities, guaranteeing that solid waste management (SWM) problems will not go away. Second, the pursuit of further prosperity demands efficient solid waste management so that scarce resources are not wasted in the process.

The percentage of municipal solid waste that is landfilled--in public or private facilities--will likely decline with the federal emphasis on a hierarchy of waste management that places landfilling, along with waste-to-energy (combustion), at the bottom of the federal SWM hierarchy. Some states appear to be embracing this hierarchy, no questions asked. Others appear to be slightly modifying the federal hierarchy to emphasize waste-to-energy above landfilling. As a result, SWM practices are being shoe-horned into one-size-fits-all strategies that squelch local initiative and invite inefficiency.

In spite of these hierarchical strategies, landfills are likely to remain an important component of waste management. Thus, siting of these facilities in ways that address and mitigate costs (including potential environmental harms) to local communities adjacent to such facilities is imperative. The use of negotiated agreements with host communities that include a package of monetary, environmental, and other benefits in exchange for a siting agreement shows promise of improving the prospects of successful facility siting.

## II. THE EXTENT OF LANDFILLING AND THE PUBLIC/PRIVATE MIX

Opinions about the number of landfills, landfill capacity, and ownership vary. Popular references on the number of landfills in the 1980s varied from 5,500 to 6,000.<sup>1</sup> On the more official side, the U.S. Environmental Protection Agency reported in 1988 that there were 6,034 landfills in 1986, while the U.S. General Accounting Office placed the total number of operating landfills in October 1988 at 7,682.<sup>2</sup> A number of other survey outcomes for 1990 and 1991 are reported by the National Solid Wastes Management Association (NSWMA). Estimates vary from 5,368 (NSWMA's own survey in 1991) to 7,378 (BioCycle magazine's 1990 survey). The NSWMA report settles on 6,600 as a "reasonable estimate of the number of municipal solid waste landfills in existence during this time frame."<sup>3</sup> The decline in the number of landfills predicted by the U.S. Environmental Protection Agency (EPA) in its 1988 report, to around 3,300 in 1992, does not seem to have occurred.

Trends in the number of landfills tell us little about actual landfill capacity. A 1986 survey for EPA by Westat, Inc. showed that around 8 percent of landfills handled 73.3 percent of municipal waste; 69.1 percent of municipal landfills handled just 4.9 percent of the municipal waste stream. University of Pennsylvania solid waste analyst Iraj Zandi points out that thousands of small landfills..."can be closed without much impact on the total receiving capacity of the whole system."<sup>4</sup>

As with estimates of the number of landfills, estimates of landfill ownership patterns vary widely. The aforementioned EPA report broke ownership down as 13.7 percent private, 0.8 percent state, 57.1 percent local government, 3.3 percent federal, and 25 percent other (see Table 1).

**OWNERSHIP OF U.S. SUBTITLE D MUNICIPAL LANDFILLS (in round numbers)**

Ownership	No. of Landfills	% of Total
Federal, State, Local	4,000	61.2
Other Government	1,600	25
Private	1,000	13.7

At least one industry expert is willing to call 15 to 20 percent private involvement "reasonable."<sup>5</sup> Most of the ownership and operation in terms of numbers of landfills is public. However, as Ed Repa at NSWMA has pointed out, landfill ownership based on volume of waste handled is split much closer to 50-50.<sup>6</sup> Thus, while numbers of private landfills may be small, volumes accepted at these facilities probably are large. Evidence to support this contention can be found using 1990 survey estimates by NSWMA covering 219 landfills. Their survey results reveal that publicly owned landfills appear to handle lower volumes (on an average daily basis) than private landfills.

These survey data give a snapshot of current landfill ownership and capacity. A critical policy issue, however, is how future waste disposal needs will be met. Though solid waste policy in the late 1980s resulted in establishment of recycling mandates and goals in most states (see Table 2), attaining those goals (most often targeting around 25 percent of the waste stream for recycling) will still leave much waste to be handled through disposal facilities, including landfills.

Table 2

**STATEWIDE SOLID WASTE MANAGEMENT GOALS**

State	Source Reduction	Recycling (A)	Composting	Mandated	Deadline
Alabama	25%	Yes			1991
California	50%	Yes			2000
Connecticut	(C) 25%		Yes		1991
Dist. of Columbia		45%		Yes	1994
Florida	30%		Yes		1995
Georgia	25%	Yes			1996

Illinois	25%		Yes	2000	
Indiana	50%		Yes	2000	
Iowa	50%		Yes	2000	
Louisiana	25%		Yes	1992	
Maine	50%		No	1994	
Maryland		20% (D)		Yes	1994
Massachusetts	E	10%	25%	21%	Yes 2000
Michigan	E,F	8–12%	20–30%	8–12%	No 2005
Minnesota		35% (G)		Yes	1993
Mississippi	25%		Yes	1996	
Missouri	40%		Yes	1998	
New Hampshire		40%	Yes	2000	
New Jersey		25% (H)		Yes	1990
New Mexico	50%		Yes	2000	
New York	8–10%	40–42%		No (I)	2000
North Carolina		25%	Yes	1993	
Ohio	25%		Yes	1994	
Pennsylvania	(J)	25%		Yes	1997
Rhode Island		15% (K)		Yes	1993
Vermont	40%		No (I)	2000	
Virginia		25%		Yes	1995
Washington	50%		Yes	1995	

(A)Includes yard waste composting.

(B)May include 10 percent waste transformation.

(C)Goal is no charge in waste generation rate.

(D)15% goal for counties under 100,000; 20% goal for counties over 100,000.

(E)Incineration goal: MA-48%; MI-35%–45%.

(F)Reuse goal: MI-4%–6%.

(G)35% goal in the seven county Twin Cities area; 25% in greater Minnesota.

(H)Does not include leaf composting as part of the goal. In 1990, a solid waste management task force recommended a 60% recycling goal, although this goal is currently not mandated by law.

(I)Goals were developed pursuant to the State Solid Waste Management Plan.

(J)Goal is to reduce the amount of waste generated.

(K)Rhode Island's ultimate goal is to recycle as much as possible.

SOURCE: "The State of Garbage in America," Biocycle, May 1991, p. 30.

Despite this need, public opposition to siting of such facilities continues to stall, or sometimes altogether prevent, siting of new landfills (and other waste disposal infrastructure). This problem particularly has become acute in the increasingly politicized arena of solid waste management decision making. Most siting decisions, whether of publicly or privately owned projects, face some citizen opposition. And all siting decisions—public or private—involve significant public-sector oversight through public hearings in the site-selection and permitting process.

Top-down imposition of waste facilities on a local community by public officials frequently externalized many costs associated with landfill siting and operation in past years. Thus, top-down imposition has been rejected; it simply is not acceptable to local residents. In this context, a crucial policy concern is identifying alternative decision-making processes that can defuse and facilitate the siting decision. This paper shows that adoption of market-like conditions allows local citizens to make choices about whether, where, and how a disposal facility is sited.

### III.SITING POLICY: FEDERAL AND STATE SETTINGS

Putting first things first, one must remember that landfilling is a socially valuable activity, notwithstanding negative perceptions of landfills. Two points are relevant. First, solid waste is the residual resulting from consumption of goods and services that people value. While it may be possible to reduce the amount of waste generated per unit of consumption, total elimination of waste, without also eliminating consumption, is not possible. Moreover, the consumption itself—since it results from satisfying human needs and wants—must be seen as a benefit. In short, reduction of consumption is a cost from the perspective of human well-being.

Second, there are essentially four ways of handling the residuals of this consumption: one can recycle waste, burn it, compost it, or landfill it. The appropriate mix of options will vary depending on composition of the waste stream and opportunity costs of using one method over another, but in many locations, landfilling is an efficient alternative for handling much of the waste stream. Simply put, it is often the lowest-cost option. Often, debates ignore the implications of this essential point. If society's resources are not to be wasted, alternatives should be assessed taking into account a comparison of their relative benefits and costs.

At the state level, typically, SWM plans embrace a "one-size-fits-all" hierarchy, with landfilling well down the list of important waste management plan elements. For example, the state of Washington follows a slightly modified version of the EPA's hierarchy (source reduction, then recycling, then combustion and landfilling).<sup>7</sup> The state's dictates about local siting procedures take as given that such a hierarchy makes sense. Fully 33 pages are devoted to reduction/recycling guidelines, while landfilling shares a single page with storage, treatment, and enforcement. The objective in this hierarchy is to decrease the size of landfilling's niche, though, as indicated in a report by the U.S. Congress' Office of Technology Assessment (OTA), "Landfills will always be needed to manage the residues from recycling and incineration, as well as for the noncombustible portion of the waste stream."<sup>8</sup>

The EPA has projected a decline in landfilling and other disposal of around 25 million tons over the 1988–1995 period.<sup>9</sup> But the remaining tonnage still will be substantial (53.1 percent of total municipal waste generation in 1995), and the report warns: "This does not mean, however, that landfill capacity will not be a problem, since landfill capacity may continue to decline more rapidly than discards requiring management by landfilling."<sup>10</sup>

Why landfill capacity should continue to decline more rapidly than generated waste receives little attention, leaving answers to be generated by interested others. Two explanations should be discarded immediately. First, contrary to popular belief, we are not running out of landfill space. Gonzaga University economist Clark Wiseman calculates that at the current rate of land disposal, the next 500 years' worth of generation could be handled in a landfill 100 yards deep and 20 miles on each side, or less than .1 percent of the U.S. continental land area.<sup>11</sup> Compacting could further reduce capacity needs.<sup>12</sup>

While transportation costs to such a centralized facility might prove prohibitive, it is a useful construct in thinking about capacity. Most of us can think of portions of the United States where a landfill of about 256,000 acres would hardly be noticed, especially since only portions of the total area would be excavated at any given time. But even if such a grand hole never is dug, landfill space will not disappear. Instead, increasing population densities and increasing relative scarcity of landfill sites would dictate that landfill space simply will become more expensive.<sup>13</sup>

Second, safety is becoming less of an issue for solid waste landfills. Even though they disagree with how the EPA data on landfill risks have been generated and interpreted by the agency and others, Ken Chilton and Jennifer Chilton, in a report for the Center for the

Study of American Business at Washington University, note that "60 percent of the fills pose less than a 1 in 10 billion risk of harm, which the EPA considers zero risk. According to the EPA model, another 6 percent of all MSW landfills pose essentially no risk."<sup>14</sup> An additional 29 percent of the landfills pose between a 1 in 100,000 and 1 in 1 million risk of harm. Although U.S. Environmental Protection Agency definitions of acceptable risk vary, Chilton and Chilton note that a 1 in 100,000 risk of harm has been used in the past.<sup>15</sup> Thus, fully 95 percent of the landfills analyzed by EPA pose (arguably) acceptable risks.

Further safety evidence can be found in a 1989 U.S. General Accounting Office report on landfill sites that either are the target of state-level clean-up efforts or are on the National Priorities List (NPL) for clean up under the auspices of Superfund. Only 107 of the total 7,682 landfills listed as operating in 1988 are on either list. These clean-up sites comprise about 1.4 percent of all municipal landfills. Only 42, or about 0.5 percent, are on the NPL.<sup>16</sup> Furthermore, these problems actually pertain primarily to older municipal landfills that were built long before current EPA regulations.

### The Siting Problem

If not availability and safety, then what are the problems with solid waste disposal? First, to the extent that garbage collection is "free" or underpriced, more waste will be generated than would otherwise make sense from the perspective of the individual consumer. In this "free goods" context, consumers are not forced to account for the costs of waste disposal in decisions about consumption, "waste conservation," and disposal.

Garbage collection has often been underpriced because cheap collection is politically attractive, or was deemed necessary to prevent potentially unsanitary dumping.<sup>17</sup> The result is that landfills have, until recently, often inherited a politically influenced, inefficiently high level of waste in the first place.<sup>18</sup> When local governments offer flat-rate (including zero-rate) collection fees, waste generators are given the green light to generate more waste. If waste service prices reflected the actual costs of SWM, less of it would be generated in the first place and the per capita (or per household) demand for landfilling (or other disposal facilities) would decrease.<sup>19</sup>

Second, political considerations—for example, providing "cheap" disposal capacity, or selecting sites with less powerful political constituencies—during the landfill-siting process often institutionalize the generation of external costs associated with such siting. In turn, the presence of these external costs without any mitigation has contributed to anti-landfill, NIMBY (not-in-my-backyard) sentiment. This contention stands in contrast to the culprit of "national unwillingness" identified in the OTA report cited above. The report states that:

Indeed, a continued high percentage of all MSW [municipal solid waste] could be landfilled if the nation were willing to site or expand more landfills, pay the costs of transporting MSW to these landfills, pay for pollution controls, and accept some unavoidable risks.<sup>20</sup>

According to OTA, then, landfill capacity will decline because the nation (referring actually to local communities) is unwilling to site and/or expand landfills, cover transportation and pollution control costs, and accept risks.

The OTA language is misleading because local communities (or regions) actually site landfills, not "the nation." Failure to acknowledge this local or regional decision-making context implicitly downplays: 1) the importance of local decision processes in siting facilities; and 2) the prospects for diverse community waste management decisions.

Useful in setting the proper tone for an analysis of landfilling policy is a quote by Clark Wiseman, identifying political considerations during the siting process as the source of the problem:

The solid waste problem is not one of space, ecology, or even cost. The problem is a political one—that of siting new landfills. Anticipating the loss of amenities or property values, potentially affected property owners unite into a group capable of bending government to its will. The special interest nature of the resulting policies is not different in nature from farm subsidies, protective tariffs and unnecessary military installations, all of which confer losses upon citizens at large.<sup>23</sup>

While Wiseman is correct that there is a political component in the landfill-siting process, his is an incomplete portrayal of the politics of landfilling. Long before the siting process produced the sort of NIMBY response observed by Wiseman, the more general SWM process already had been shaped to keep collection fees low and to determine the location of the landfill.

A key source of the NIMBY response is that SWM systems benefit all waste generators, while imposing costs primarily on those individuals proximate to the landfill sites. In other words, all generators benefit from the presence of a landfill to handle their waste, while only (or primarily) those adjacent to such a facility experience the perceived and actual negative consequences of the landfill. If there is no compensation to these individuals, they are, in effect, being asked to shoulder the costs associated with these negative consequences without receiving any counterbalancing benefits. Ignoring this smaller group negatively affected by the siting in the interests of providing a "public" good that benefits, especially, large waste generators may have been politically astute. On the other hand, it likely contributed to current NIMBY sentiments.

Critics often target NIMBYs as individuals that stand in the way of provision of needed facilities. The criticism implicitly assumes that the affected individuals should sacrifice for the good of the community. However, even if one is willing to take as given that the social benefits exceed the social costs at some particular landfill candidate site, there is nonetheless no reason not to compensate the affected individuals for their losses (perceived or real). Such compensation, combined with other protections and benefits, has become increasingly common and important in a negotiating process between communities and prospective landfill-siting agents, facilitating siting of disposal facilities.

The OTA analysis cited earlier thus conveys a factual error. Specifically, some communities are siting landfills. Moreover, in some instances, landfilling is occurring in which external costs are being mitigated or internalized. Transportation costs are covered, pollution controls are implemented and even insured, and, once compensated, risks have been accepted by local communities. Finally, many private companies are finding landfilling a profitable activity, suggesting that there is demand, and willingness to pay, for such facilities.

### Host-Benefit Packages

The central question is under what conditions such siting is likely to occur. Increasingly, a key element in this activity is a package of host community benefits. These benefit packages have resulted from two different negotiation processes between the landfill developer (public or private) and the host community.

More frequently, such benefit packages are the last stage in a public planning process. They are used "to narrow the selection among the sites identified through the planning process and/or to cope with localized opposition."<sup>21</sup> Both the private and public sectors have increasingly turned to use of such benefit packages to facilitate the siting process. The process itself, however, remains largely centralized, with public decision makers identifying sites through some form of political planning process.

More recently, benefit packages have been part of a more market-oriented siting process. In this process, a potential developer elicits input from different communities at the outset of a siting effort as a means of identifying a community interested in negotiating a mutually acceptable compensation and benefit package. In effect, the latter process moves "beyond the notion of community responsibility and public interest (with compensation for affected parties) to one of a public-private collaboration in a profitable business venture of providing needed infrastructure services."<sup>22</sup> The emphasis is on choice, participation in the siting process before a site has been identified, and negotiation, rather than on an "after-the-fact" compensation scheme where a site has been pre-selected by public decision makers.

Prior to documenting successes with use of these host community benefits (HCBs) in the siting process, one must examine perceptions integral to the NIMBY phenomenon. Certain misunderstandings about public perceptions deserve careful consideration. In addition, recent sample evidence on perceptions is enlightening on a number of issues concerning the efficacy and perceived fairness of HCBs.

## IV. PERCEPTIONS, PUBLIC POLICY, AND LANDFILLING EVIDENCE

Public risk perceptions are integral to the discussion of landfill siting and compensation. While experts might agree that landfills are safe, some members of the public typically remain skeptical. Policy makers find themselves caught in the middle. Often the whole process just devolves into a debate between self-taught citizen experts (NIMBYs) and hired guns over the democratization of information.<sup>24</sup> Rather than helping to define risks, or reduce uncertainty, the debate does just the opposite.

Policy scientists have been developing new and better methodologies for understanding risk perceptions.<sup>25</sup> However, there remains a critical need for accurate predictions of public perceptions regarding health risk and technical safety issues and their impacts on policy.<sup>26</sup> An example concerns the role of preventative measures, as opposed to compensation, in dealing with environmental choices subject to uncertainty. Some contend that preventative measures are far superior and have greater public acceptance than compensation schemes, while others disagree. <sup>27</sup>

Dallas Burtraw, in an essay published by Resources for the Future, adds another twist to this debate, arguing that monetary compensation for harms that occur over time is insufficient.<sup>28</sup> Since guessing what the future harm will be is difficult, Burtraw argues that community projects paying out over an extended period may be preferred. Such "linked compensation," so dubbed because it links the nature of damages and payments that occur over time, will be preferred because it helps offset harm occurring over an extended period. For example, a new community center provides benefits over time to counter the possibility of any costs from the landfill over time.

While this is nice philosophy, Burtraw fails to notice that "contingency payment" instruments such as bonds, posted as a promise of payment in the event of a bad outcome, can link cash payments to damages over time. This can at worst provide the same amount of satisfaction and, typically, should be expected to provide higher levels of satisfaction for local communities than "linked compensation."

To follow the idea of building a community center, for example, think about whether local communities would prefer the flow of community center benefits to a cash payment at a future date. There is some evidence that people prefer such "contingency payments" over "linked compensation." Surveys examined below add to a growing literature arguing that public perceptions are rational and reasonable. En route, there is some interesting insight for the compensation issues just mentioned.

In a 1990 National Solid Wastes Management Association (NSWMA) survey, 59 percent of the respondents would oppose building new landfills while 38 percent would not.<sup>29</sup> But such a simple, broad treatment begs more than a few questions. Fortunately, two 1990 surveys by the Cornell Waste Management Institute provide more in-depth details.<sup>30</sup> Responses to questions about host-community benefit (HCB) packages posed to public officials, planners, cooperative extension agents, recycling coordinators, and members of citizen groups in New York State revealed the following. Of 58 counties and boroughs, 36 percent have considered HCB packages and 29 percent have some type of HCB package either in operation or in the planning stages. The public was evenly split on whether it would or did respond favorably toward such packages, but a majority of those responding (86 percent) felt that HCB packages were useful in the siting process.

These individuals, arguably closest to the landfill-siting process, made it clear that acceptance depends not so much on what is offered (environmental guarantees, contingency funds, property value protection, employment, and direct payment demands were quite similar across all counties and boroughs), as on how the compensation package is offered. Of paramount importance is early involvement in the process by

individuals so that their needs were included in the decision process from the outset. This suggests that benefit package negotiations after a site has already been selected may be less likely to overcome NIMBY sentiment and public opposition to a particular site than the more market-oriented process in which citizens choose at the outset whether they want to enter into negotiations over possible siting of a landfill in their community.

Another survey of 565 residents living within two miles of a proposed landfill in upstate New York revealed attitudes and perceptions that appeared rational.<sup>30</sup> Table 3 ranks their responses by the percent of the sample that identified the listed types of siting factors as important. The most striking outcome is that environmental concerns predominate, followed by property compensation, disruption controls, and contingency funds.

Table 3

DESIRABILITY OF HOST COMMUNITY BENEFITS

Type of Benefit	% In Favor
Free Water Tests	90
Water Quality Guarantee	90
More Public Reports of Test Results	84
Allow Owners to Hire Their Own Appraisers	83
Speed Limit Enforcement	83
Pay Present Owners Property Value Loss on Sale	79
Landscape to Hide Landfill	76
Restrict Landfill Hours	74
Control Illegal Dumping	70
More Monitoring Wells	63
Establish Special Fund for Problems	62
Restrict Landfill Days	61
Support Roads	58
Extension of Public Water if Problem Develops	57
Restrict Number of Trucks	52
Pay Future Owners Property-Value Loss on Sale	48

Use More Than One Entrance 43

Free Garbage Pickup 42

No Private Trucks 39

Create Small Ponds 39

Provide Public Water Lines Now 39

Support Fire District 36

Support Ambulance 36

Establish Fishery Program 35

All other "Unrelated Compensation" (e.g., low-interest housing loans, local hiring, local scholarships, etc.) 30

SOURCE: Adapted from Table 1, Scherer and Juanillo (1990), p. 1091.

An examination of Table 3 provides some evidence concerning the theoretical compensation debates outlined above. (Residents were not faced with an actual siting proposition—the survey was entirely hypothetical). First, there appears to be no clear predisposition on the part of survey respondents toward either preventative measures or payment promises. Both are important. Second, it appears that a sample of upstate New Yorkers is not enamored of Burtraw's concept of "linked compensation." Such benefits are rejected by a majority of respondents. One could surmise that local residents understand that contingency funds accomplish the same goal as "linked compensation" but in a much more flexible way.

The survey also showed that current residents are much more concerned about getting compensation than they are about whether or not future owners get compensation. This represents a fairly high level of sophistication in economic analysis. Compensation to future owners is unnecessary since the loss (if any) already would be imputed into lower, later property values. Newcomers would pay less for their property (if real property losses were, in fact, to occur).<sup>31</sup>

All in all, these survey responses reveal a sophisticated, reasonable, and straightforward appraisal of landfill-siting risks. From an economic perspective, individual utility is diminished whether risks are scientifically assessed or derived from individuals' subjective perceptions. The losses—in terms of perceived or actual increased risks—are real, in any case, and must be compensated. Given this, the frequent absence of any consideration of compensation for costs associated with landfilling is a serious impediment to the resolution of important SWM problems. Cornell University researchers Clifford Scherer and Napoleon Juanillo draw the important conclusion: "When the community is involved in the process of planning and discussion, only then will the concept of host community benefits have full meaning."

A corollary would seem to be that even if the community is involved, the siting process will be less effective in the absence of HCBs. If HCBs are not a part of the process, it is highly likely that NIMBY sentiment will persist.

Policy analyst Ken Chilton argues that economic incentives offer a way out of the NIMBY syndrome. In another study, Ken and Jennifer Chilton argue that: 1) perception-driven costs are real; 2) risk communication should include participation; and 3) compensation schemes can help facilitate siting.<sup>32</sup> The point is that those enjoying the benefits of the landfill should offset at least some of the costs imposed on neighbors in the surrounding area. Since few jobs are created and the landfill is not necessarily an asset to neighbors, compensation can smooth the way. Compensation, by increasing the costs of landfilling to reflect "welfare losses" to affected residents, also can help send market signals to households, industries, and commercial establishments that will produce appropriate changes in behavior in terms of waste reduction. In fact, just such a movement is occurring.

#### V.PRIVATE INVOLVEMENT IN LANDFILLING AND HOST COMMUNITY BENEFITS

Prior to a discussion of ongoing HCB approaches, a few things must be set straight. First, returning to the OTA report discussed above, one must identify the correct decision-making context. Short of licensing compliance with federal and state health and safety guidelines, the actual siting of landfills has been primarily a local—or regional—activity. Thus, local communities (rather than "the nation") must be "willing to site or expand more landfills" and local, often rural residents must "accept some unavoidable risks."

HCBs are a proven technique in facility siting other than solid waste. They have been instrumental in siting large-scale electric generation facilities in the United States for decades. At least one study details the efficacy of HCBs in siting nuclear power plants in Japan.<sup>33</sup> Even as Japanese citizens grow less willing to live with the risks associated with nuclear facilities, compensation is proving an important ameliorative.<sup>34</sup>

Turning to an investigation of HCBs and landfilling in the United States, there appears to be some prospect for bucking the EPA forecast of declining landfill capacity. When citizen participation and HCBs are part of the decision-making process, siting is occurring. In their review of five landfill-siting outcomes, the City Club of Portland finds that citizen involvement, perceived procedural fairness, a strong information base, and "the economic benefits of a particular siting, whether perceived or actual and whether in the form of economic development or compensation, can be crucial to the siting's success or failure."<sup>35</sup> Indeed, extending compensation approaches is one of the club's suggestions for improving the landfill-siting process.

Only one example could be found where there is any form of payment without private-sector involvement, though the Solid Waste Association of North America (SWANA) indicates that host fees are also an emerging part of public-sector landfill siting decisions.<sup>36</sup> In one notable example of a publicly owned landfill, Riverview Highlands, in the Detroit area, charges surrounding communities \$2.85 per cubic yard to take their

wastes.<sup>37</sup> The proceeds have gone to build a ski slope/golf course on their landfill. Any profits are rebated to residents through property tax reduction. Residents are happy with taxes at 63¢/\$1000 assessed value where 74¢/\$1000 is the area average. Given its success, the city is looking to expand the landfill.

However, nothing could be found for the Riverview Highlands case about any compensation that might have occurred at the time of the siting decision. Therefore, current tax reductions likely are being enjoyed by many Riverview Highlanders who were not residents at the time of the siting decision. Many residents, then, are being reimbursed for perceived losses already suffered and some residents who faced costs at the time of the landfill siting doubtless no longer are around to receive any reimbursement.

The beginnings of an important recurring theme also are found in the City Club of Portland report. There are no laws governing compensation in Oregon, and the club report notes that HCBs tend to be part of a siting strategy when a private developer is the proponent. Indeed, the club's sternest warning concerns public-provision decisions: "It is inappropriate to restrict the siting debate to engineering questions when the fundamental questions pertain to livability and economics."<sup>38</sup>

In Table 4, host community fees (the most basic compensation portion of HCB arrangements, usually paid on the basis of dollars per ton of waste disposed) for eleven landfills from across the nation are shown.<sup>39</sup> These payments vary substantially, as should be expected. In Mobile, Arizona, with a population of around 100, there is no formal local government infrastructure beyond the mayor. One should expect that siting a landfill in such a place would be cheapest.

#### Location/Operator/Sources:

1. Gilliam County, Oregon; Waste Management, Inc. Sources: Simon (1990); Bailey (1991); Steele, "Negotiation Know-How Crucial to Landfill Deals," Spokane Spokesman Review Chronicle, Jan. 12, 1992.
2. Riverside County, California; Western Waste Industries. Sources: Bailey (1991); Steele (1992).
3. Klickitat County, Washington, Rabanco Company, Ltd. Sources; B. Long, "Company Woos Total Waste," Moscow Pullman Daily News, Jan. 27, 1992; K. Olsen "Adams County Ignoring SWAL," Moscow Pullman Daily News, Mar. 17, 1992; Steele (1992).
4. Adams County, Washington; Waste Management, Inc. Sources: Long (1992); Olsen (1992); Steele (1992).
5. Mobile, Arizona; Waste Management, Inc. Sources: Bailey (1991); Steele (1992).
6. Charles County, Virginia; Chambers Development Company, Inc. Sources: T. Campbell, "Landfill Praised as the Ultimate," Richmond Times Dispatch, May 1, 1990; Simon (1990); Spear (1990); Bailey (1991); Scarlett (1991).

7. Riverview, Michigan; City of Riverview. Sources: Barnes (1991); Chilton (1991).
8. Amelia County, Virginia; Chambers Development Company, Inc. Sources: McGehee (1990).
9. Whitman County, Washington; Waste Management, Inc. Source: Long (1992).
10. Madison, Wisconsin; Creative Resources Ventures, Ltd. Sources: Katz (1990).
11. Muskego, Wisconsin; Creative Resources Ventures, Ltd. Sources: "Landfill Agreement between Emerald Park, Inc. and City of Muskego." Signed by parties to the agreement, April, 1991. Supplied by Todd Watermolen, National Solid Wastes Management Association.

At the other end of the payment distribution would lie more densely populated areas, like Riverside County, California. While still making sense to site landfills in some more densely populated areas, the costs will likely be greater to do so. An additional indicator of how important these costs can be in more densely populated areas is that Riverside County employs a 50-person engineering and administrative staff whose only job is to analyze landfill proposals.<sup>40</sup>

The table covers only host community fees, far from a complete accounting of the total HCB package. In order to give a flavor for just how extensive HCBs can be, the packages for two of the landfills listed in Table 1, (plus another that is not listed due to incomplete host-fee information) are detailed. In addition to the host fees in the table, part of Creative Resource Ventures, Ltd.'s expected 12-year, \$6-million payment at its Madison, Wisconsin site includes:

- \_Guaranteed property values for all homeowners within a specified distance of the site;
- \_A pair of 200-foot wells to supply water to 78 area homes formerly served by individual shallow wells;
- \_1.5 miles of road rebuilding;
- \_A contingency fund growing from a contribution of 50¢/ton of refuse landfilled;
- \_\$20,000/year for the operation of a nearby park;
- \_\$5,500/year to help fund a recycling program; and
- \_\$5,000/year to fund the education and operation of a local citizens' oversight committee.<sup>41</sup>

In addition to incoming waste limitations, waste reduction and recycling, road and traffic agreements, operation restrictions, environmental monitoring, and post-closure agreements, the following items are listed as "direct compensation" for the company's Libby, Wisconsin landfill:

\_Expenses of the local negotiating committee

\_Highway and street reconstruction

\_Roadway maintenance

\_Compensation to county parks

\_Compensation to adjacent property owners (water supply replacement, community water supply guarantees, well testing, property-value guarantees, compensation to area residents).

\_Contingency fund

\_Compensation for local fire-protection services

\_Details of securities offered for payments.<sup>42</sup>

In a different region of the country, the following costs are paid by Chambers Development at its Charles City County site in West Virginia:

\_A \$100,000 fund for surface and groundwater monitoring, maintained at \$100,000 over time by annual contributions.

\_An unspecified contribution to a contingency fund to close, monitor, and maintain the landfill in the event of operator default.

\_A \$2 million (maximum) environmental damage contingency fund to be held for 10 years after approval of final landfill closure. Contributions are at the rate of \$5,131/acre and filled.

\_Free garbage collection and disposal for county residents.

\_Cost-free replacement of shallow drinking water wells at residences within 3,000 feet of the landfill property at the request of any resident.

\_Existing county landfill operating and closure costs will be assumed by Chambers until their new landfill opens.

\_Complete reimbursement for all planning fees, including legal and consulting fees.<sup>43</sup>

As with any bargaining process, there have been failures to reach agreement. In Caswell County, North Carolina, SWM giant Browning-Ferris Industries (BFI) offered to close the county's old landfill, provide free countywide disposal, and a \$1.25–\$2/ton county share of total tipping fees (about \$1 million annually). But BFI required that county officials keep the deal secret while land was optioned. The secrecy clause backfired and county voters rejected the plan.<sup>44</sup> This sent to the firm an extremely important signal about the treatment of local communities that BFI probably will not forget. Indeed, BFI

now states that "community choice" and their early involvement of citizens, even before site selection, is the central pillar of their current siting strategy.<sup>45</sup>

Another SWM giant, Waste Management, Inc. (WMI), offered residents of Lake Calumet, Illinois, \$25 million to expand a landfill but were turned down.<sup>46</sup> Failures are healthy and have to happen. The potential operator then either searches for cheaper places or considers returning with a better offer.

The upshot of this presentation of HCBs is that local communities have something to sell that SWM firms (or, potentially, local governments) want to buy. Predictably, a market response is generating a set of payments in keeping with local communities' perceptions of their opportunity costs. While some earlier reports of profitability seem too high in light of current experience, the result is proving profitable to private SWM firms.<sup>47</sup>

Statements by participants in landfill-siting processes reveal how straightforward and businesslike HCBs have become. Fred Darden, Charles City County administrator, points out the obvious enticement for financially strapped communities,<sup>48</sup> "We're going from a poor county to one that's at least comfortable. There's money in garbage." Dean Judd, Commissioner of Adams County Washington, lays to rest the notion that development is much of a motive, "The economic benefits to Adams County are minimal. If we are going to take it, we darn well better be reimbursed."<sup>49</sup> Christopher White, president of Mid-American Waste Systems, stresses the historical setting of HCBs, "It's something the utility companies and the railroads have done for years."<sup>50</sup> Robert Wasserstrom, BFI vice president, speaks to the future of HCBs, "We see host fees coming into play from now on onto the future. It's a business proposition. We're not unhappy to do it."<sup>51</sup>

### State Legislation

There remain potential problems, especially if there is any market power on the part of landfill-site sellers and buyers. As a result, state governments have made moves to counter any such power. Wisconsin imposes a type of final-offer arbitration. In the context of siting privately operated landfills, municipal and county governments have been legally required to set up local negotiating committees that must include a set number of private citizens in addition to elected officials. If no contract is struck between the local community and the operator, outside mediation (possibly by state agencies) is implemented. The result has been the signing of some agreement in nearly all cases. Importantly, environmental and technical matters are not subject to negotiation and are handled separately at the state level.<sup>52</sup> In addition, there is no requirement of binding final-offer arbitration when the landfilling task is assumed by strictly public suppliers.

Questions naturally arise as to whether or not any compensation requirements exist in state legislation concerning landfilling. The state of New Jersey requires that any community hosting a waste disposal site receive at least \$1 per ton of landfilled waste and allows for compensation agreements above that amount. Five other states—Massachusetts, Minnesota, Maine, Wisconsin, and Tennessee—also have legislation to encourage or require some form of compensation see Table 5).

Table 5

STATE LAWS REGARDING SITING OF SOLID WASTE FACILITIES

	Mass.	Minn.	Maine	Wisc.	N.J.	Tenn.			
State Plan	+	+	+	+	+	+			
Local Plan	-	-	-	-	+	+			
Site Location Criteria	+		+	+	+	+	+		
Negot./Siting Agreement			-	-	+	+	+	-	
Compensation	+	+	+	+	+	+			
Local Dec. Preserved/Enhanced				+	-	-	-	-	+
State Preemption of Local Authority				-	+	+	+	+	-
Socioeconomic Impacts Considered				-	-	+	+	-	-
Siting Board	-	-	+	+	-	-			
Enhanced Public Participation				-	-	+	+	+	+

SOURCE: The Public's Capital, Winter 1991, p. 5., and the Reason Foundation.

VI.POLITICAL ECONOMY OF LANDFILLING

Whether or not landfill siting generates net social costs depends on the property rights system. Both the definition and enforcement of property rights are essential to avoiding social costs. If the causes of landfill costs are identifiable, and redress through the courts is available for any external costs imposed, including environmental damages, then there is no externality problem and private markets should serve well. A competitive SWM siting process should perform efficiently and, arguably, fairly, provided compensation to adversely affected parties occurs.

Policy analyst Ken Chilton argues that the externalities associated with SWM are more manageable and tractable than for other types of externalities (for example, such as agricultural pollution, where the pollution cannot be attributed to an identifiable source).<sup>53</sup> Solid waste policy analyst Lynn Scarlett argues that property rights are typically assigned for solid waste landfills—with both public and private ownership—facilitating solutions.<sup>54</sup> Above all, the fact that mutually agreed to siting is occurring strongly supports the claim that landfilling operations can internalize the costs of their activity.

The existence of a successful landfill-siting process that is agreeable to all parties suggests externalities need not pose an intractable problem. The detail of landfill

contracts covered in the previous section illustrates that sufficient property-rights structures exist for reaching compensation agreements. From this perspective, the SWM growth industry facilitated by host-community benefit packages can be viewed as socially efficient—as a means of internalizing previously external costs and compensating those adversely affected by a siting.

But things will be quite different for SWM, and landfilling in particular, in the absence of HCBs, and in the absence of clearly defined landfill costs and ownership responsibilities. Elected officials have an incentive to concentrate benefits and disperse costs for their services. This incentive historically has applied directly to SWM at both the collection-pricing and landfilling stages. For the former, large-scale generators and households have benefited from flat-rate (including zero-rate) collection fees. Therein lies one political constraint on more efficient public-sector pricing policy.

At the landfilling stage, the political process has imposed externalities. Political actions that have provided benefits to politically potent groups, while dispersing the costs of such a decision over the general public, are the political counterpart to market externalities. By the same logic that holds at the collection stage, shifting costs onto residents near the landfill without compensation lowers the cost of SWM for some constituencies—for example, large waste generators.

The details of the cost-shifting process in landfill siting are straightforward. Landfill siting imposes two types of costs. The first are costs that typically are amenable to insurance or bond schemes. If an insurance market exists, a policy against any landfill catastrophe can be carried. If not, then a bond can be posted, generating a contingency fund for use in the event of catastrophe. Thus, for example, if groundwater is contaminated, an accumulated contingency fund can pay for anything from short-run inconveniences to large-scale restoration. Again, the landfill contracts struck between private operators and local communities in the previous section abound with such safeguards.

While these kinds of costs can be covered through insurance and bond schemes, they have not always been covered in the past. Local governments often set landfill tipping fees based on capital and operating costs, but exclude, for example, post-closure costs or contingencies for clean-up of problems associated with landfills. Small-scale private operators, likewise, often failed to carry such insurance, nor were they required to post bonds in the site-permitting process. This practice essentially shifted costs of clean-up away from large-scale landfill users and onto the general taxpayer.

Federal subtitle D landfill regulations under the Resource Conservation and Recovery Act) and state legislation now requires landfill operators—public or private—to set up bonds or other funds to ensure that post-closure costs or other site-remediation costs will be covered, but these requirements emerged largely in the 1980s. Both public and private landfill operators are now required to cover these contingent costs, thereby reducing or eliminating one source of previously unpriced landfill costs.

Perception Costs

However, another type of cost is borne even if no catastrophe occurs and regardless of whether insurance or bonds are used. Quality of life may decline due to fear of a landfill catastrophe. In addition, even if no landfill catastrophe occurs, outside perceptions of quality of life may be diminished, adversely affecting product values, property values representing the imputed value of products over time, and local tax bases that depend upon assessed property values.<sup>55</sup>

These costs are distinct in that they result from perceptions. They occur: 1) as a direct result of the policy move; 2) whether or not any catastrophe actually occurs; and 3) quite independently of whether perceptions are correct or not.

Some "perception costs" might be insurable. For example, a contingency fund may cover declines in property values due to outside perceptions of product quality. However, uninsurable costs remain as a result of landfill siting. If those suffering them are to be at least indifferent between living near the landfill or not, direct compensation is required at the time of the siting decision.

The distinction between insurable and uninsurable costs is best handled by example. Suppose a neighbor installs a state-of-the-art, 5,000-gallon gasoline storage tank in their backyard. A fire-insurance expert evaluates the container, declares it perfectly safe, and certifies that it poses no additional threat to you, so that your insurance premium should remain unaffected. There is no risk increase according to the experts, but you still perceive yourself as living on a gasoline bomb, lowering your current level of satisfaction. To the extent that potential buyers of your home feel the same way, the value of your property also will fall.<sup>56</sup>

In some landfill cases, these costs have been compensated. For example, residents adjacent to the Oaks Sanitary Landfill in Montgomery, Maryland had their property taxes reduced by 25 percent to reflect the perceived loss in value associated with the landfill's proximity.<sup>57</sup> In this instance, the tax reduction was not based on any market data, but instead "accommodated [were] residents—who insisted that their properties' value had fallen."<sup>58</sup> It was a form of compensation for the kinds of uninsurable risks described above. Systematic use of HCBs is a more direct means of covering these "costs."

But when landfilling has no compensation component, as has been the case in many siting activities to date, benefits are concentrated in the hands of some at the expense of other, usually less-organized constituencies. Given that the measurement of perception costs is somewhat involved, labeling them as irrational exaggeration is easy, and public-sector advantage can be had by ignoring them.<sup>59</sup> As a result, a current payment is avoided, and SWM looks cheaper to important constituency groups than it really is.

NIMBY sentiment usually results when those near landfill sites either bear the insurance premium for insurable-risk costs or bear uninsurable perception costs. (The exception is when professional environmental intervenors initiate a NIMBY reaction). By running roughshod over local perceptions in the effort to provide cheap SWM to some residents, local decision makers simply are imposing an external cost on other residents. Yet ignoring perception costs will make it worthwhile for NIMBY sentiment to find other

avenues into the decision process that raise siting costs and reduce chances of successfully accomplishing a socially valuable goal—the siting of needed disposal facilities. Ultimately, then, even if collection is efficiently priced, the results of ignoring particular constituencies in siting decisions will reduce the chances for successful landfill siting, and, over time, make additional landfills that are sited more expensive than they otherwise would be.

Occasionally, some perception cost elements do make it into the debate. For example, property values before and after landfill siting at other locations are surveyed. The finding is that they do not change much. A study done during an ash landfill-siting process in Spokane concludes:

In summary, it was found that property values generally are not impacted by the presence of a properly operated and managed landfill. Where fixed and measurable impacts do not exist and variable/perception impacts are controlled, the other variables of property selection control a purchaser's decision. These variables include supply and demand of homesites, accessibility to services and employment, school systems, and other amenities such as trees, view, and the like. Characteristics of housing sites and their location relative to the above considerations appear to be more significant than a landfill in explaining sale price differences.<sup>60</sup>

These conclusions were based on interviews with local officials and casual looks at sale values for ten landfills (nine in Washington and one in Oregon), bolstered by a supporting literature review. Another literature review reached similar conclusions for the relationship between property values and landfills, generally.<sup>61</sup> And a 1982 study at Penn State University found that "there was no 'conclusive' evidence that these landfill sites had made any adverse impact on the rate of community development in surrounding areas."<sup>62</sup> The same researchers concluded that other variables, including property characteristics, appeared much more important in explaining land prices than proximity to a landfill.<sup>63</sup> In at least one other case, siting of a solid waste facility resulted in price increases after the Solid Waste Authority in Pinellas County, Florida, built roads and other infrastructure to accompany a disposal facility in this instance, the facility was a waste-to-energy plant.<sup>64</sup>

But these empirical discussions of property values, while instructive, are misleading for two reasons. First, the proper gauge of a change in welfare is not the sale value of homes. A perceived diminution of housing value results in a decrease in demand, so that the value to owners declines for all owners, not just those selling their homes. Further, if the supply of housing decreases, the sale price may not change at all, even though everybody affected values their homes less. This is no different if the case is siting public housing facilities in influential neighborhoods in Yonkers, siting an ash dump in Spokane County, or siting a landfill in Riverside, California. In each case, the individual perception of economic harm is what matters. These risk changes, occurring whether the fears of individuals at potential landfill sites actually are realized or not, have an adverse effect on well-being, or economic values.

Second, the before and after periods in housing price analysis always are subjectively chosen. Properly, "before" is when the market incorporates the knowledge that a landfill is coming. This has nothing to do with when a landfill is built, and everything to do with when individual homeowners believe that its construction is inevitable. Centering the episode analysis at the appearance of the landfill is destined to reveal nothing about the losses of individuals who already have left the area. This type of analysis is akin to looking at the Dow Jones average, finding that its level is the same on two different dates, and arguing that stock market participation is a safe bet. A lot of unhappy losers disappear from the market over time.

There is an additional difference between the distributional consequences in the stock market and the distributional consequences of landfill siting. In the latter case, the losers were known beforehand, yet the impacts often have been purposefully ignored. Policy makers have been reluctant to compensate people for the real losses they incur because compensation would increase total landfill costs, potentially arousing public opposition, particularly from large-scale waste generators.

This political equation has begun to change over the past decade, with politically organized local citizens increasingly expressing concern about potential environmental harms or risks. This increased concern, however, has not typically replaced concern about disposal costs—local constituents appear to want both low costs and no environmental risks or "undesirable" land uses. This combination has led politicians often to continue to avoid compensation schemes that would boost costs and, instead, to attempt to site regional landfills outside their immediate district, or to avoid siting facilities altogether.

In contrast to this approach, many private operators are now making extensive use of compensation mechanisms to cover perception costs. This is a dramatic improvement over earlier siting decisions that did not compensate directly affected parties. Absent compensation costs, such decisions impose externalities, compound incentives to overproduce waste, reduce incentives to develop alternative SWM techniques, and waste scarce resources by prolonging the siting process. Use of HCBs makes for more efficient and fair landfilling decisions.

This point cannot be sidetracked by arguments over the proper treatment of risk perceptions in public policy decisions. Whether perceptions of the public are sincere or strategic, well-informed or ignorant, amenable to alteration through risk communication or not, misses the crucial point. Even if misperceptions and strategic behavior can be reduced, perception costs will not be driven to zero. If there is ignorance or misrepresentation (and not all agree that there is), education and information can change the magnitude of perception costs, but these costs are not eliminated. The issue of the efficacy and fairness of compensation remains.

There are several arguments against incorporating perception costs in the SWM policy process. Some will argue that perception costs actually represent distortions in individual decision-making processes. Individuals exaggerate the effects of extremely low probability outcomes and, in some cases, even misrepresent the costs purposefully. Compensating them would simply reward bad, if not immoral, decision making.

The first part of this argument means, in effect, that educational efforts could make everyone more knowledgeable and "better" at risky decision making. But educational efforts in the risk field have proven difficult and often ineffectual. In a recent example, economists Jin Tan Liu and Kerry Smith present the case of nuclear power education in Taiwan.<sup>65</sup> A national debate on nuclear power did not narrow the gap between the public risk perceptions and nuclear expert opinion of the risks involved. An earlier study of risk communication concerning radon exposure "could not establish that providing information caused perceived and measured risks to converge or that mitigating actions were efficient."<sup>66</sup> This mirrored the outcomes of a study of a number of major federal information programs.<sup>67</sup>

The second part of the argument is that the line between sincere perception costs and "extortion" is a thin one. How do we distinguish true perception costs from inflated, strategic claims? Actually, there is little difficulty in doing this. Economists, psychologists, and sociologists have made great strides in closing this gap. In addition, the history of bargaining and negotiation has shown that arbitrators can fine-tune these assessments. The current successful siting of landfills through mutually agreed to benefit packages gives testimony to this ability.

In addition, a recent novel exercise in eliciting sincere cost estimates invokes a variation on the test of competition.<sup>68</sup> Browning-Ferris Industries (BFI) offered a combined landfill-recycling center to the lowest bidder among approximately 1,400 towns and cities in the state of New York.<sup>69</sup> While promising to protect property values and groundwater supplies, as well as providing local road and sewer infrastructure, BFI provided a booklet titled, "An Invitation to Benefit Your Community," which highlighted revenue, employment, and other siting pluses for local communities. In the two years since the program was launched, some 80 communities requested information from BFI. Of those, a dozen or so made serious inquiries; three planned referenda for local citizens to vote whether they want the community to be considered as a potential host for a landfill, and in one community, voters approved the concept to proceed with negotiations over siting a facility.

The BFI program formalizes the market-oriented approach in which host-benefit negotiations begin at the outset, before a site has even been identified. Indeed, the negotiation process over benefits is part of the process to locate an acceptable site.

A final argument against compensation is that it costs too much, even though the siting itself is beneficial on net. Consequently, for the social good, some people must lose in the process. But adherence to this logic would institutionalize one fundamental reason why we have an SWM problem in the first place and must be rejected outright. In part, a waste problem exists, because though consumers consume products that have waste as a by-product, disposal costs are not included in the price of the products. Although they are the source of waste, consumers do not always pay directly for disposal through waste service user fees. Instead, these costs have often been borne by society at large, and by local residents in the particular case of uncompensated landfill costs.

As long as waste disposal prices lie below the actual costs that disposal imposes, the source of the waste problem remains untouched. Thus, if perception costs associated with landfilling are not compensated, then those people who suffer them are, in effect, subsidizing all waste generators. Moreover, there is no incentive for decreasing waste generation (by not considering perception costs as well as all other costs associated with siting and operating a disposal facility), the signal to all of us is to continue to "pile it on." As waste generators, we need to pay the full costs associated with handling and disposing of waste, rather than forcing a small number of residents to bear those costs in our place.

In the final evaluation, cost-shifting fosters the belief that landfilling is cheaper than it actually is. Cost-shifting has been facilitated because perception costs can be brushed aside as unmeasurable "psychic" costs, or simply the irrational fears of the uninformed. But people near the proposed sites feel deeply affected by such a siting and perceive that there is an increased risk to themselves, their communities, their quality of life, and their livelihood, if it is nearby. Since these individuals must contend with the perception costs at the proposed site, they are usually unmoved by the bulk of technical engineering evaluations. Basically, the engineering estimates do not address their issue of primary concern.

The deference paid to engineering evaluations, coupled with the failure to acknowledge perception costs, fosters a belief that these cost-shifting impacts simply do not occur. According to this approach, an extremely low probability sequence of events must occur in order to produce any adverse impact. Those with this perspective see public perceptions as irrational. But, if true, then public officials should have a response to the kind of comment often heard at hearings surrounding the public siting process: If the proposed facility is so safe, then why not site it closer to population centers. Siting officials usually have an inadequate response to this query, thereby justifying: 1) local residents' fears that external landfilling costs are real; and 2) that they are being forced to bear them for political reasons.

Perception costs might be portrayed as distortions of reality, or as the inability of lay people correctly to assess the problem, but individuals will react according to their perceptions. Ignoring these losses is as problematic as denying compensation to bottom-land owners in a public taking of their property for the reservoir of a newly constructed dam. The costs are real regardless of whether public perception is viewed as correct or rational by policy makers, scientists, and technical experts.

Perception costs are only one element on the cost side of the social SWM equation. The full costs of consumption include waste treatment, storage, transportation, disposal, and the perception costs that accompany all of these processes. But care must be exercised that the costs associated with perceived increases in risk do not become an obsession. Even though landfill costs will be experienced unevenly by some members of the population, the design of landfill facilities is intended to diminish risks faced by the general population. These benefits must also enter the equation for a full accounting of the benefits and costs of siting landfill facilities.

All waste-handling options involve some costs and risks. But if landfilling can be accomplished safely and at lower cost than other options, this frees up funds and avoids risks that might be associated with other SWM techniques. And, one must not overlook the benefits from consumption of products that result in some waste generation. Total waste avoidance could be achieved by dramatically reducing consumption, but that would pose a significant "cost" in terms of perceived reduction in quality of life for many individuals.

## VII. CONCLUSIONS

Landfill siting problems occur because real costs faced by individuals in the proximity of proposed sites have been ignored in siting processes. Ignoring perception costs invites dissatisfaction with policies by elements of the recipient populations. The result is that landfill siting will be opposed with whatever means remain for individuals bearing these costs. In cases where NIMBYs successfully stop landfill siting, there will be fewer landfills. In cases where opponents are unsuccessful, landfills will nonetheless be more expensive as a result of a lengthy and contentious siting process.

Ignoring local concerns undermines confidence in the siting process. People end up distrusting the process as much as they distrust each other. All information, including very real environmental concerns, is then discounted. In such an adversarial setting, informed debate is no longer possible, and the outcome is decided not by the net value of the activity, but by the levels of political potency of the contenders.

Further, this decision-making process wastes resources. In consuming society's resources in arguments over landfill siting, there is far too much heat and smoke, and not enough of the light that is really needed.

In resolving the lessons learned in this paper, suggestions for the reform of governmental activity in landfilling become apparent. The first lesson is that individual risk perceptions are altered when landfills are sited. Individuals, firms, and policy makers often take actions that increase the probability of adverse consequences for some individuals. This may occur even though the action is intended to decrease the level of possible adverse consequences for society at large. Raising the probability of an adverse consequence reduces the welfare level of the recipient population whether or not any adverse effect actually occurs. Unless perception costs are compensated, such actions introduce an external cost on those impacted by the decision.

The second lesson is that use of HCBs internalizes costs while the opposite is true in the absence of such payments. Without HCBs solid waste generation appears cheaper than it really is. In addition, negotiations over the size of HCBs help generate answers to legitimate scientific, economic, and local welfare concerns.

The final lesson is that people will respond to perception costs. If external costs persist, NIMBY responses should be predicted and, the larger the costs, the more intense the NIMBY response will be. Lacking any other formal avenues for redress, costly

adversarial approaches are all that remain for those forced to bear externalities as a result of decision-making processes that do not promote compensation.

Thus, landfill-siting decisions make the world more risky for some individuals. Negotiated compensation enhances efficiency, perceived fairness, and the chances for successful landfill siting. As described earlier, use of these packages takes two forms: 1) as a tool to mitigate opposition at the end of an otherwise centralized decision process in which a site is designated before any public input is sought and addressed; and 2) at the outset of a siting process as a means of identifying communities interested in siting a facility in exchange for mutually acceptable compensation and benefits.

HCBs help to reduce externalities associated with landfill siting, institutionalize citizen choice and negotiation at the outset of the process, and smooth the siting process in the long run. Absent HCBs, landfill-siting activities largely ignore compensation and the result is increased NIMBYism as people react to costs imposed on them.

The preceding lessons have important implications for efforts to change the SWM decision-making process. Calls to localize SWM policy are a move in the right direction. Chilton recites the litany:

Local and state solutions to waste problems are preferable to federal responses for two basic reasons. First of all, local and state governments, because of their proximity to the people most affected by their legislation, are more likely to reverse ill-considered courses of action. There are fewer instances where Congress has admitted making a mistake and fundamentally has revised major legislation. Second, solid waste management needs vary significantly depending on local conditions. Costs for landfills, recycling, composting, and incineration depend on demographics, industrial base, resource availability, and so on.<sup>70</sup>

The views in this paper are sympathetic to Chilton's on the technical merits of cost determination and local variation. Localized SWM decisions put the focus back where it belongs on particular residents adjacent to landfill sites. In order to start down the path to sound SWM, the one-size-fits-all federal and state hierarchical SWM model must be relinquished in favor of flexible approaches that include extensive use of HCBs.

But the most important elements of localized SWM decisions are the introduction of accountability and competition. Local governments are more easily monitored by constituents than state and federal governments. And competition among local governments to address constituents' concerns tends to drive local governments toward more-efficient and fair outcomes.

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## ENDNOTES

1. See, for example, J. Cook, "Not in Anybody's Backyard," *Forbes*, Nov. 28, 1988; and B. Brenner, "Where They Take All This Garbage Seriously: Landfill U.," *Business Week*, Mar. 5, 1990, p. 49.

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4. Iraj Zandi, "Major Issues Facing Solid Waste Management in the 1990's," paper prepared for the Congressional Clearinghouse in Recycling and Solid Waste Solutions, U.S. Congress, July 31, 1991, p. 16.

5. Telephone conversation with Ed Repa of NSWMA, June 1992.

6. *Ibid.*

7. See Washington State Department of Ecology, *Guidelines for the Development of Local Solid Waste Management Plans*, Publ. # 90-11, March 15, 1990; and Washington State Department of Ecology, *Washington State Solid Waste Management Plan*, Publ. # 91-1, January 1991.

8. U.S. Congress, "Facing America's Trash," Office of Technology Assessment (Washington, D.C.: October 1989), p. 38.

9. U.S. Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States: 1990* (Update Washington, D.C.: EPA, June 1990), Table 38, p. 74.

10. *Ibid.*, p. 75.

11. Clark Wiseman, "Dumping: Less Wasteful Than Recycling," Wall Street Journal, July 18, 1991, editorial page.

12. See Zandi, "Major Issues Facing Solid Waste Management."

13. Transportation costs do not rule out consideration of less grand holes. An interesting example concerns closed military bases. The Strategic Air Command's Fairchild Air Force Base near Spokane, Washington, covers 537,772 acres, about 500,000 of which are leased. The balance of around 38,000 acres is federally owned. If other military bases that are being withdrawn from service are of the same scale, a potential peacetime dividend could be had by transforming them into regional solid waste landfills. Road systems and perimeter fencing already are in place. In addition, local residents may already be favorably disposed toward such projects. For example, along with the noise and congestion of the air base, residents near Fairchild are in proximity to the largest commercial airport in the area and a brand new county solid waste incinerator. Further, two state prison facilities currently are under construction nearby.

14. Jennifer Chilton and Kenneth Chilton, *Municipal Landfill Risks: How Real Are They?* (St. Louis, Missouri: Center for Study of American Business, April 1991), p. 8.

15. *Ibid.*, p. 10.

16. U.S. General Accounting Office, *Nonhazardous Waste: State Management of Municipal Landfills and Landfill Expansions*.

17. See, for example, Martin Melosi, *Garbage in the Cities* (College Station, Texas: 1981).

18. See, for example, "Survey of Solid Waste Charges," (City of Worcester, Mass., February 1990).

19. Kenneth Chilton notes that Seattle residents pay \$10.70/month for a 19-gallon mini-can (or \$31.75/month for three full-sized 32-gallon cans). Curbside recycling is free. Landfill tonnage has dropped 22 percent. Chilton, "Who Should Take Out the Trash?," (1991). Perkasie, Pennsylvania, charges \$1.50 per 40 pound bag and provides free mandatory recycling. Flow to its landfill has fallen 50 percent.

20. Office of Technology Assessment, *Facing America's Trash*, p. 38.

21. "Overcoming NIMBY: New Approaches to Resolving Siting Disputes," *The Public's Capital*, Winter 1991, p. 4.

22. *Ibid.*

23. Wiseman, "Dumping: Less Wasteful Than Recycling," Wall Street Journal, July 18, 1991, p. 40. See also, Wiseman, "Impediments to Economically Efficient Solid Waste Management," *RFF Resources*, Fall 1991, pp. 9–11.

24.L. Blumberg, and R. Gottlieb, "Citizens Take on the `Experts'," *The Nation*, May 28, 1990, pp. 742–744

25. See Smith and W. Desvousges, "An Empirical Analysis of the Economic Value of Risk Changes," *Journal of Political Economy* (95, 1987), pp. 89–114; R. Gregory and T. McDaniels, "Valuing Environmental Losses: What Promise Does the Right Measure Hold?" *Policy Sciences*, 1991; R. Rosenman, R. Fort, and W. Budd, "Perceptions, Fear, and Economic Loss: An Application of Prospect Theory to Environmental Decision Making," *Policy Sciences* (21 1988), pp. 327–350; and A.M. Freeman, "Valuing Individuals' Changes in Risk: A General Treatment," Discussion Paper QE89-09, Resources for the Future (Washington, D.C., January 1989).

26. The literature points out that there also is room for improvement in the understanding of the human and social influences on risk. See, for example, D. Kahneman and A. Tversky, "On the Psychology of Prediction," *Psychology Review* (80 1973); Slovic, et al., "Decision Processes, Rationality, and Adjustment to Natural Hazards," in G. White (ed.), *Natural Hazards: Local, National, Global* (New York: Oxford Univ. Press, 1974); Slovic, (et al.), J. Carroll and J. Payne (eds.), *Cognition and Social Behavior* (Potomac, MD: Lawrence Erlbaum, 1976); H. Einhorn and R. Hogarth, "Behavioral Decision Theory: Processes of Judgment and Choice," *Annual Review of Psychology* (32 1981); and M. Bjorkman, "Time and Risk in the Cognitive Space," in L. Sjöberg ed.), *Risk and Society* (London: Allen and Unwin, 1987).

27. On the superiority of preventative measures, see A. Fish and S. Romano, "A systematic Approach to Siting Waste Management Facilities," in *Proceedings of the Third Annual Madison Conference on applied Research and Practice on Municipal and Industrial Waste* (Madison, Wisc., 1980); and Smith, et al., "Economic Impacts of Hazardous Waste Facilities," *Hazardous Waste and Hazardous Materials* 3 (1986), p. 195–204. Those disagreeing include H. Kunreuther, et al., in "A Compensation Mechanism for Siting Noxious Facilities: Theory and Experimental Design," *Journal of Environmental Economics and Management* 14 (1987), pp. 1–13.

28. D. Burtraw, "Compensating Losers When Cost-Effective Environmental Policies Are Adopted," *RFF Resources*, Summer 1991, pp. 1–5.

29. National Solid Wastes Management Association, *Public Attitudes Toward Garbage Disposal* (Washington, D.C.: NSWMA, May 1990).

30. Cornell Waste Management Institute, "Survey Summary, 1990," (Ithaca, N.Y., 1990).

31. On the issue of landfill impacts on property values, see C.L. Pettit and Charles Johnson, "The Impact on Property Values of Solid Waste Facilities," *Technical Bulletin* 86-1 (NSWMA, January 31, 1986).

32. Kenneth Chilton, "Talking Trash: Municipal Solid Waste Management," and "Who Should Take Out the Trash?"

- 33.W. Budd, et al., "Risk Externalities, Compensation, and Nuclear Siting in Japan," *The Environmental Professional* 12 (1990), pp. 208–213.
- 34.D. Swinbanks, "Yen Melts Down Opposition," *Nature* (345 1990), p. 285.
- 35.City Club of Portland, "Report on Siting Locally Undesirable Regional Facilities," *City Club of Portland Bulletin* (70 1990), pp. 167–192.
- 36.Conversation with Charlotte Frola, November 1992, Solid Waste Association of North America, Silver Springs, Maryland.
- 37.John Barnes, "Learning to Love the Dump Next Door," *Wall Street Journal*, June 25, 1991, p. A18.
- 38.City Club of Portland, "Report on Siting Locally Undesirable Regional Facilities," p. 185.
- 39.A detail sheet on local-negotiated settlements for seven landfills in Wisconsin, supplied by Todd Watermolen at the National Solid Wastes Management Association, showed host fees to communities on three of them to be in the 45–50¢/ton neighborhood.
- 40.J. Bailey, "Economics of Trash," *Wall Street Journal*, December 12, 1991, pp. A1, A9.
- 41.M. Katz, "YIMBYism Is Coming, But..." *Waste Age*, January 1990, pp. 40–41.
- 42.Davis and Kuelthau, "Final Offer of Madison Landfills, Inc. Libby Landfill," Case No. 45-91-04, submitted to the Waste Facility Siting Board of the State of Wisconsin, August 1991.
- 43.Spear, "Prioritizing Municipal Waste: A Case Study of Charles City County, Virginia," paper presented at the ASTSWMO National Solid Waste Forum, Milwaukee, WI, 1990.
- 44.J. Bailey, "Economics of Trash."
- 45.Conversation with Philip Angel, BFI, December, 1992.
- 46."Buried Alive," *Newsweek*, November 26, 1989.
- 47.Bailey, "Economics of Trash," reports gross profit rates from 40–60% on a few private landfills. See also K. Steele, "Negotiation Know-How Crucial to Landfill Deals," *Spokane Spokesman-Review/Chronicle*, January 12, 1992, pp. B1, B2, concerning earning statements for a WMI landfill in Mobile, Arizona.
- 48.Katz, "YIMBYism Is Coming."
- 49.K. Olsen, "Adams County Ignoring SWAC," *Moscow Pullman Daily News*, March 17, 1992, p. 1A.

50.R. Simon, "Yes, In My Backyard," *Forbes*, September 3, 1990, p. 72.

51.Ibid.

52.Clark Wiseman, "Dumping Less Wasteful Than Recycling," *The Margin Spring* (1992: 40–1); see p. 41.

53.Kenneth Chilton, "Who Should Take Out the Trash?," p. 22.

54.Lynn Scarlett, "Integrated Waste Management: Rethinking Solid Waste Problems and Policy Options," *Reason Foundation Policy Insight*, No. 128, Los Angeles, Calif., May 1991.

55.A recent example is 1989s cherry crop in Washington state. Perceptions of the Alar controversy led to some withdrawal of foreign markets, primarily in South Korea. The Alar controversy involved the state's apple crop, and the only complicity for cherry growers was one of geographic proximity. Nonetheless, the impacts upon cherry growers was quite real.

56.The argument here is not that perception-driven costs should replace contingent costs in the overall evaluation of facility siting. Instead, both types of costs are important and require accounting. This has been the point of some confusion in other work and needs stating.

57.C.L. Pettit and Charles Johnson, "The Impact on Property Values of Solid Waste Facilities," *Technical Bulletin* (86-1, NSWMA, January 31, 1986, p. 1).

58.Ibid., p. 2.

59.See Rosenman, et al., "Perceptions, Fear, and Economic Loss."

60.Spokane Regional Solid Waste Project, "Effects of Landfill Development on Property Values," *Engineering Services Department*, Spokane, Washington, November 1989.

61.C. Cartee, "A Review of Sanitary Landfill Impacts on Property Values," *Real Estate Appraiser & Analyst* (55 Spring 1989).

62.Pennsylvania State University, Institute for Research on Land and Water Resources, *effects of Solid Waste Disposal Sites on Community Development and Residential Property Values*, 1982.

63.Ibid.

64.Pettit and Johnson, "The Impact on Property Values of Solid Waste Facilities," p. 3.

65.J. Liu and V.K. Smith, "Risk Communication and Attitude Change: Taiwan's Experience," *RFF Resources*, Winter 1991.

66.V.K. Smith and F. Johnson, "How Do Risk Perceptions Respond to Information? The Case of Radon," *Review of Economics and Statistics* (70 February 1988).

67.R. Adler and R. Pittle, "Cajolery or Command: Are Education Campaigns an Adequate Substitute for Regulation?" *Yale Journal of Regulation* (1, 1984).

68.An academic predecessor to this is offered by H.P. Kunreuther, et al., "A Compensation Mechanism for Siting Noxious Facilities: Theory and Experimental Design," *Journal of Environmental Economics and Management* (14, 1987).

69.B. Paul, "Browning-Ferris Wants New York Towns to Vie for, Not Fight, Proposed Landfill," *Wall Street Journal*, July 20, 1990.

70.Kenneth Chilton, "Do We Need a Federal Garbage Man?" *Reason Foundation Policy Insight*, No. 137, Los Angeles, Calif., March 1992.