International Journal of Scientific Engineering and Technology (ISSN : 2277-1581)
Volume No.2, Issue No.12, pp : 1194-1197 1 Dec. 2013

Financial Assessment of Bhanpur Landfil Site

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ABSTRACT

The most common means for disposing of municipal solid waste is burial in a sanitary landfill. However, many landfill are underestimate the total cost of landfill disposal be considering only land and operating costs, ignoring external physical and social costs associated with landfills. This paper pro0oses and approach be estimating (in monetary terms) the external costs arising from the development and operation pf a landfill.

Key Words- Refuse, landfill costs Bhanpur Bhopal

Introduction

Sanitary landfilling is currently the most common means of disposal for municipal solid waste (MSW) in Bhopal. When landfill costs are calculated, however, environmental and social costs are usually ignored (Duabar & Berkman 1987, Gunnerson & Jones 1984). Ignoring such costs may underprice landfills, which in turn may inhibit the development of other waste management options, such as waste reduction, recycling and resource recovery. These options are frequently perceived as being more expensive that landfilling.

Little effort has been made to quantify the costs of the environmental and social impacts of landfills and most published studies focus on only one of the many external costs. It is crucial to attempt to value externalities in real monetary terms, because economic analysis is usually the basis for evaluating activities which bear on the natural environment.

The objective of this paper was to propose an approach to evaluating monetarily the costs pf externalities that are likely to arise from the use of MSW landfills. The true cost of a landfill is defined as the sum of these external costs plus standard landfill costs. The true cost thus represents the full economic cost borne by the host community as a result of a landfill's existence and usage.

External landfill costs are evaluated for the perspective of the public landfill. The valuation techniques cost are ultimately borne (equitably or inequitably) by the landfill users.

The approach presented in this paper could improve the accuracy of landfill cost assessments. Improved cost assessments may encourage improved environmental protection and energy conservation, partly due to the accelerated development of non-landfill waste management alternatives.

External impacts of landfills

Landfills exert two types of external impacts on their surroundings, i.e. physical and social impacts.

Physical impacts

Physical impacts are those resulting directly from the products generated by the landfill. Contamination of groundwaters and surface waters by landfill leachate, migration and atmospheric release of landfill gases and fires are all physical impacts associated with landfills.

Leachate contamination of groundwater and surface water is one of gravest risks associated with landfill operation. Most new landfills are quipped with some type of leachate containment and/or collection system. However, these system provide no guarantee that contamination of water resources will be avoided. As Robinson (1987) states, leachate problems persist despite "plethora of advice and exhortation in recent years" on how to avoid them.

The difficulty in preventing leachate production stems fom the impossibility of completely denying water access into the landfill. All solid waster places in a landfill contains moisture. Several modes of failure exist for caps and final covers, the most common being erosion (Johnson 1986).

Landfill gas, typically 45-55% methane and 40-50% carbon dioxide represents a potential environmental hazard in many ways. Both methane and carbon dioxide may cause damage to vegetation. Landfills make a measurable contribution to atmospheric methane which is a greenhouse gas (Augenstein 1990). Thus, it is argued that any release of methane from a landfill must be viewed as pollution, regardless of whether any terrestrial damage occurs.

Non-methane organic compounds contained in landfill gas are also under scrutiny. Some of these compounds are regarded as toxic and under certain conditions they may present a cancer risk to specific groups of individuals.

Landfill fires are not believed to arise spontaneously but any occur at any time during a landfill's active lifetime where operations are run improperly resulting in the placement of burning loads or from aerobic reactions in buried waste. These both serve to elevate temperature within landfill (Wilson 1981). Fires can also occasionally erupt during gas abstraction (Emberton & Parkwer 1987) or from the sparking of landfill equipment (Knowles 1987). The use of daily cover may limit the undesirable impacts of landfill fires, unpleasant odors and visual affront.

Social impacts

Social impacts are those inflicted upon society by the landfill regardless of whether the landfill produces any physical impacts. Such impacts include increased traffic, visible air pollution, noise, aesthetic degradation and limited land utility.

Refuse collection becomes more pronounced on roads closer to the site. Affected roads may also become noisier and degrade more quickly once the traffic increases.

The construction and operation of landfills generates two types of air pollution not discussed previously: (1) exhaust from both equipment at the landfill and vehicles delivering waste and (2) fugitive dust from the site, resulting from both equipment operation and wind erosion of cover material. Dust particularly respirable quartz, has been identified as a hazard at landfill suites (Mozzon et al, 1987)

Noise at landfills can be noticeable in nearby residential areas, the excessive noise can have many undesirable effects on those exposed to it, the noise is simply regarded as an annoyance.

Increased traffic, localized air and noise pollution and land clearing all contribute to a reduction in aesthetic quality for properties near a landfill. In addition, the littering of roads leading to the landfill is a serious social concern in many communities.

In general, a landfill's presence affects the present and future uses of both the landfill site and surrounding land. After closure, a landfill may continue to settle for several years and will require continued aftercare. Settlement may prevent the construction of any substantial structures on the site for many years.

Emberton & Parker (1987) site problems associated with building on landfills, including the migration and odor of landfill gas and the chemically aggressive nature of the waste on which a structure would be built. For these reasons, landfills are often restored into parkland or other "passive" public facilities after closure. While these facilities are generally viewed as assets by a community, the landfill's existence pre-empts. At least temporarily, the community's full range of development for the land.

It is also likely that a landfill will impact upon the use of surrounding land. An example of this component of the land utility impact is provided by the well publicized Love Canal incident in Niagara Falls, New York. Hazardous waste which had been buried in the canal leached into nearby soil, forcing residents whose homes were built near the canal to relocate. After the soil contamination occurred, the abandoned properties in Love Canal had no value. The impact would have been lessened (but nonetheless real) if the contamination somehow has rendered the land useful for e.g. agriculture, but not for human habitation.

Social impacts

The social impacts cost has three components. They are:(1) the cumulative decrease of surrounding property values; (2) the cost associated with land utility effects, also known as an "opportunity cost": and (3) a "hastening cost".

Surrounding property depreciation

It may be assumed that the impact of a landfill on surrounding property values reflects the local effects of altered traffic patterns, air pollution, visual unattractiveness and noise pollution. Thus, if property values prior to the landfill's existence are well known the cumulative dollar value of most landfill social impacts (i.e. traffic, air noise, aesthetics) may be found by measuring the decreases in property value.

The scenario presented to the respondents was necessarily simplified; a rigorous analysis of the many factors contributing to a property's worth would be prohibitively time consuming and is beyond the scope of the study undertaken, Therefore, in the survey such considerations as predominant wind direction and relative locations of other amenities and disamenities besides the landfill were ignored. Furthermore, as the EPA (1975) suggest, due to the uniqueness of each property and the dynamic nature of property values, the results of a similar study, using real date cannot be applied confidently to areas other than those from which the date were obtained.

This survey, however, provides a general methodology by which these costs can be approximated. Furthermore, the trends reflected argue strongly that property values are affected by their proximity to a new landfill. Specifically:

- Properties closer to a landfill lose more value than properties further away from it.
- The amount of property depreciation decreases with distance from the landfill.
- At a given distance from a landfill up to 2 miles (3.2 km), more valuable properties lose a greater percentage of their worth than do valuable ones.
- Landfills can depress the e value of properties up to 3 miles (4.8 km) away.

These observations suggest that a landfill is likely to inflict the greatest cumulative property depreciation in high density urban areas, where property value are high and distances between adjacent properties are small.

Our results differ from several previous studies which have focused on rates of property appreciation (Gamble et al. 1982. Anon.1983. Pettit & Johnson 1987. Price 1988) Most of these studies suggest that properties developed near a landfill have comparable rates of appreciation to those for similar properties far from the landfill. However, Price found that in some cases properties near landfills appreciate more slowly and in these instances more expensive homes are impacted to a grater than less expensive ones.

Our study differs from the above studies in two respects. First, it focuses on actual property values not rates of appreciation. Second, it assumes that a landfill is to be situated near as established neighbourhood and the loss in property value is then directly felt by the owners at the time the landfill is sited. Our scenario no doubt causes greater community reaction and loss of property values, and it is less realistic than allowing development to occur around a landfill. Our results may therefore be considered the "worst case" in the loss of property values.

Land opportunity cost

An opportunity cost is the value of goods or services foregone by the production of some other goods or services with the same resources (Atkinson 1982). Thus, any reduction in property value caused by a landfill's presence is an opportunity cost. The land utility effects discussed above may be represented by opportunity costs.

The landfill opportunity cost has two components: (1) that of the landfill site itself; and (2) that of any surrounding area whose future use is somehow affected by the presence of the landfill. Typically, a government must either purchase or condemn (and then purchase) the land on which it build's a landfill. Once the government owns the property, no property taxes are collected on it for its entire duration under public ownership. Thus, the first component of the landfill's opportunity cost is the sum of the annual property tax revenues that the government will fail to collect for the land as long as it is publicly owned. Considering the typical reuse options available for landfill sites, this period could be 50 years or more.

Evaluating the site opportunity cost in this way provides only its lower bound. This approach assumes that, were the property not used for landfill, it would remain undeveloped. However, if the property were developed its value would increase, increasing the tax revenue that the government would receive.

This approach therefore also neglects the potential secondary revenue which might be generated by any such structures. An example of secondary revenue is the sales tax that would result from patronage of stores built on the land parcel in question.

The cost of surrounding areas may be evaluated similarly to the site opportunity cost, as the property tax lost due to property depreciation caused by the landfill's presence. If a property worth $200.000 a priori is devalued to $100.000 by a nearby landfill, the landfill causes the state and local governments to lose property tax revenue on $100.000 worth of property. This cost will persist as long as property values are adversely affected by the landfill's presence.

Hastening cost

In addition to property depreciation and land opportunity costs, a landfill imparts a hastening cost on its owner, because each ton of waste deposited in the landfill hastens the moment at which a new landfill must be opened. Landfill space like gold or salt is a commodity with limited availability. The hastening cost is defined as the interest that could be earned on the initial investment required for a replacement facility over the period by which disposal of the current ton of waste hastens the investment. While the hastening cost concept is useful the cost itself is usually negligible.

Allocation of social costs

The proper allocation of social costs is not obvious. Some costs associated with landfills are borne by the governmental body owning the landfill and thus are borne (it is hoped equitably) by all citizens within that community. These costs must be paid by the citizens in the from of taxes or fees. The reduction of taxable land values results in a cost to the community because it must increase other sources of revenue to compensate for those lost taxes.

On the other hand, the loss of property values is borne directly by the property owners affected and is not shared equally by all of the citizens of that community. Likewise, opportunity costs must be borne by the property owners, although tax revenues will of course also be reduced if a lower level of development occurs. It may be reasonable to redirect property value losses and opportunity costs too the entire community because everyone uses the landfill.

Conclusion

Although landfilling is a well established waste disposal method many municipalities (and other landfill owners) significantly underestimate their landfill costs. This is primarily a result of failure to place reasonable costs on the physical and social impact associated with landfills.

Physical impacts result from the natural generation of products particularly leachate and landfill gas, which have the potential to cause environment damage. Social impacts area consequence of the landfill's existence. The important social impacts are adjacent property depreciation (which reflects the adverse effects of noise pollution, air pollution, visual unattractiveness and increased traffic to and from the landfill and land opportunity costs. The opportunity cost has two components, On elevating to the landfill site and the other surrounding propeprties.

Losses in property values typically are borne unfairly by residents living close to near landfills. In fact, public opposition to the sitting of new landfills is due largely to anticipated losses in property values. Given the typical strength of such opposition and the equal utility that a municipal landfill provides for all users, regardless of proximity to the landfill, it seems reasonable that the community consider compensating property owners living near a proposed landfill site.

Although it is difficult to assess a landfill true cost accurately an effort must be made to do so. This paper offers one approach for making such assessments demonstrate that its application can yield reasonable results. For us in a practical evaluation of waste management options, the true cost of a landfill should be compared to those of other waste treatment options. True costs for each alternative waste management option should be determine using an a analogous approach.

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