THE ECONOMIC EVALUATION OF SOLID WASTE MANAGEMENT OPTIONS

EUGENE Z. STAKHIV
Institute for Water Resources
U.S. Army Corps of Engineers
Alexandria, VA 2215-3868 USA

THERESA K. ALLMAN
Department of Economics
George Washington University
Washington D.C. USA

1. Abstract

Issues crucial to the successful implementation of a municipal solid waste (MSW) management program are reviewed. As one of the major responsibilities of local government, management of MSW can require utilization of a substantial portion of community resources, so it is in the interest of the community to undertake careful economic evaluation of all alternative waste solutions. Evaluation should extend beyond the assessment of physical performance and service outputs, to consider the manner by which the services are delivered in terms of economic efficiency. Generally these goals will consist of efficiency, reliability, environmental stability and equity.

Implementing and monitoring a MSW management program requires deliberate planning. Given the primary public works’ objectives of efficiency, reliability, environmental stability, and equity, local officials should follow a series of steps to develop a waste program that meets these goals. An outline of those steps is presented, beginning with a description of the waste statistics that are useful in assessing a community’s waste problem. U.S. statistics are described as an example of the characteristics of MSW. Once a community possesses this information, it must design a system that addresses the identified problems, in a manner that is congruous with federal, state and local regulations, and falls within the financial capability of the region. Individuals and entities that play a significant role in this process are identified and the interplay between these entities in the siting, designing, financing, constructing, operating, and monitoring of a waste management program are discussed.

In 1989 the U.S. Environmental Protection Agency (EPA) suggested that communities pursue an integrated program of source reduction, recycling, incineration and landfill. These options are compared according to the degree of fulfillment of the various elements.
of the public works’ objectives. Source reduction is appealing, because it reduces the resources needed for waste disposal. Both economic theory and practical experience indicate that a significant reduction in MSW can result if residents’ waste service payments are linked to the quantity of waste they dispose. Recycling is another means by which the quantity of waste disposed can be reduced. In order for the product cycle to be complete, the recycled material must be reused and sold as a new product. This involves substantial marketing and possibly legislation. In its developmental stage, this type of program is very costly. Once non disposal options have been exhausted, EPA suggests considering incineration as a method of disposal. Incineration reduces the volume of the waste by about 70 percent, and generates electricity from the heat produced during combustion. Not every community finds it practical to establish an incineration system, because these systems are very capital intensive and demand a large investment. If incineration is not a viable option, then the community must landfill its waste. Before the era of landfill regulation, this was a very inexpensive means of getting rid of MSW. These inexpensive landfills, however, were responsible for polluting groundwater in many municipalities. The new regulations require landfill operators to incorporate the latest technologies that protect groundwater. Unfortunately, the regulations impose costs that significantly raised the price of this disposal option, resulting in a municipal waste disposal “crisis”.

In order to examine the relative economic advantages of various options, an example of the life-cycle cost of four waste disposal options for two hypothetical communities is presented. These two communities are of different sizes to gain some idea of the economies of scale available for waste disposal technology. Disposal alternatives evaluated include a system of landfill only, one of incineration with landfill of ash, another of landfill with recycling, and finally a system of incineration with recycling and landfill of ash. After calculating the present value of the costs of each option, it appears that the least cost method of disposal is landfilling, even with the imposition of stringent regulations, and increased costs associated with those regulations.

2. Introduction

Until recently, the availability of relatively low cost landfill space had given many communities the luxury of largely ignoring the issue of municipal solid waste (MSW) disposal. However, as the portion of community resources devoted to waste disposal grew with the real increase in costs, and space around urban areas became scarce, local officials no longer had that option. The time has come for careful economic evaluation of solid waste management alternatives. Since effective evaluation should extend beyond the assessment of physical performance and service outputs, to consider the manner by which the services are delivered in terms of economic efficiency, performance measures need to be multi-dimensional. Specific elements can be chosen based on the local and national goals that the infrastructure is meant to achieve. Specifically, the National Research Council [33] stated performance needs to be measured by the degree to which the project achieves a hierarchy of goals and objectives. This requires the definition of a set of goals. Usually, for public works projects, these goals include some combination of efficiency,