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Resource Recovery Planning and Management

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by
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PREFACE

The American public first became aware of environmental problems in a general way at the end of the 1960s. Perhaps the peak of public interest in the environmental crisis occurred during Earth Week in May 1970 when university campuses across the nation sponsored information and action programs to press for improvements in environmental quality. This growing public and official concern led to the establishment of a federal Environmental Protection Agency in 1971 charged with overseeing all federal efforts to raise the quality of the environment. Prior to this time, individual agencies with fragmented responsibility had been working at federal and local levels to manage and alleviate environmental problems.

Traditionally, the approach taken had been fairly narrow, with primary emphasis on the engineering, sanitation and public health approaches to the management of environmental problems. However, as demonstrated by this broad public concern that developed and matured in the late 1960s and early 1970s, the knowledge of the causes and cures of environmental decline were not fully understood, and effective controls for achieving higher environmental quality could not be developed until this knowledge became available.

The early development of environmental control methodology focused on the physical sciences, including chemistry, biology and engineering. With the creation of the U.S. Environmental Protection Agency (EPA) and development of a broader environmental perspective, more and more attention has been directed toward examining policy issues as well.

One discipline or topic brought into focus during this period of growing public awareness was that of solid waste management. In many ways, solid waste management epitomizes the need for an integrated approach to managing environmental problems. The elements of solid waste management cross many media lines in terms of pollution control and pollution management. Air and water pollution problems resulting from disposal of solid waste are certainly within the traditional fields of classical environmental management. Problems of collection and management of solid waste relate to important urban policy issues such as productivity and efficiency of municipal labor forces.

Residuals remaining from individual consumer, corporate and business economic activity and from air and water pollution control technology have traditionally found their way into the solid waste stream. As environmental controls are strengthened, more and more of these residuals must be managed. Faced with growing quantities of solid wastes from different sources, solid waste decision-makers have shown increased interest in the concept of resource recovery.

A problem of growing concern is the ever-increasing cost associated with solid waste management operations. Costs are increasing more rapidly than the general inflation rate perhaps because solid waste management encompasses most of the higher inflation rate items such as salaries and fuel as well as falling under many new environmental control regulations. For example, until the 1970s, little attention was paid by the public to the thousands of buried "garbage dumps" that covered the countryside. Then, "dumps" were obviously the lowest cost method (in dollars) for disposing of waste, although it did considerable damage to the environment. Unfortunately, this environmental damage would be paid for by future generations. In some cases, the damage could not be corrected at any cost. As a corrective measure, regulations were proposed to require that this waste be disposed of through controlled operations such as in sanitary landfills. These landfills were designed to have minimum impact on the environment, but their costs were 5 to 15 times those of the open dump. Limited site availability and the investment in

equipment required to properly perform the disposal operations resulted in large operations involving massive amounts of garbage. Centralized sites, in turn, resulted in increased hauling distances with vehicles and crews spending larger portions of their time transporting waste rather than picking it up. This, in turn, resulted in more crews, gas, vehicles, etc. All of this increased the cost of solid waste management without increasing service productivity.

In this book, the authors have examined the general solid waste problem; the problem of local decision-makers involved in solid waste management; optimization of solid waste systems; options for resource recovery; case studies involving resource recovery; and how a resource recovery system might be selected. It is hoped that this effort will result in increasing the understanding of solid waste management in general, and resource recovery in particular.

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CHAPTER 1

THE SOLID WASTE PROBLEM

The average American family throws away about a ton and a half of solid waste each year through the normal waste stream. Engineers use the term "solid waste" to distinguish nonliquid refuse from the sewage that flows from toilets and sinks. Local authorities find it difficult to dispose of the ever-increasing amounts of solid waste without causing air, ground and water pollution or wrecking the municipal budget. The American public has adopted a lifestyle of using something once and then casually discarding it, which is an unfortunate waste of our limited natural resources.

Only within the last 10 years have the collection, removal and disposal problems associated with solid waste received the attention that these essential functions deserve. Only within recent years have most municipal officials been willing to admit that solid waste collection and disposal are technical management and policy problems worthy of attention and study. Much progress has been made, but only a few communities are using the administrative and technical approaches that generally have proved to be most satisfactory.

Management methods, equipment and practices should not be uniform across the country because conditions vary, and management procedures should be varied to meet them. Each city's problems should be analyzed in terms of sound management techniques and should receive at least the same consideration usually given other aspects of public works in government.

2 RESOURCE RECOVERY

THE NATURE OF THE PROBLEM

Solid waste is the result of human activity. Garbage results from processing and marketing, storing and preparing food [1]. Other kinds of solid waste result from the normal processes of living. Residents of cities and towns continuously produce large quantities of waste materials which they cannot ordinarily dispose of safely, effectively or economically by themselves. Such materials cannot be accumulated on individual properties without creating a menace to public health or fire hazards, utilizing valuable space needed for other purposes, and generally detracting from community appearance. Refuse removal is so important that municipal governments must make suitable arrangements for collection and disposal of solid waste.

Whether formally organized collection of solid waste is necessary depends on the community population and its density. Very small municipalities may need little organized collection service, particularly where houses are far apart and businesses are neither large nor numerous. As communities grow and people begin to live in closer proximity, however, it becomes increasingly important to have organized solid waste collection and disposal, because it is more difficult for householders to get rid of their own rubbish and ashes, and the nuisances caused by such individual disposals become more evident.

There are many important issues associated with solid waste management. These range from the strictly local problem of finding an adequate disposal site to the national problem of the diminishing stocks of nonrenewable resources. Most of these issues have not captured directly the attention of the public, but they are the concern of many individuals in various levels of government, industrial groups or organizations that might be affected by the resolution of any particular issue.

Most individuals are not cognizant of solid waste management problems. Once waste is collected from a household, it disappears as far as that household is concerned. In most communities, there is no mechanism to inform a household of a current or impending shortage of disposal capacity; therefore, there is no mechanism to encourage a household to alter its pattern of waste generation.

The concentration of people into population centers has created the requirement for more local government involvement in solid waste collection and disposal. In rural areas, many residents grow most of their own food. This practice significantly reduces the amount of garbage generated, because most garbage results from packing materials. Most of the packing materials, except tin or aluminum cans, can be burned. Where the population density is low, the air can absorb the pollution with minimal problems. Food waste is usually fed to farm animals. Lawn clippings are spread on the fields. The small amount of waste remaining is often burned in areas eroded by rain, which helps reclaim the area. Therefore, in many rural areas, especially on farms, little waste exists for disposal through the normal waste stream. As people migrate to urban areas, generation patterns change. The population no longer grows its own food, but must depend on local markets. Burning must halt because the air cannot assimilate the pollution; lawn clippings can no longer be spread on adjoining land because it contains someone else's lawn or business.

This change comes about so gradually that it is hardly noticed until the problem is already serious. Central Florida (the greater Orlando area) provides an excellent example of this situation. Twenty years ago, the area, except for the central city of Orlando, was sparsely populated; and the city itself had a population of less than 60,000 people. In 1980 the population will generate enough garbage to build a wall of compacted garbage 10 feet high and 5 feet wide reaching across the state from Daytona Beach to the Gulf of Mexico.

Many problems associated with solid waste are economic in nature. From the standpoint of economics, solid waste management can be viewed as a public or private good [2]. A public good in its pure form is a good available to anyone and is equally available to all because: (1) joint consumption of public goods is possible, so that consumption by any consumer in no way diminishes the amount of public goods that can be consumed by other individuals; and (2) the cost of excluding any individual from enjoying a pure public good without excluding other individuals is infinite. A private good is one in which a

4 RESOURCE RECOVERY

consumer can be excluded from the benefits of the service and one which can be traded in a competitive market.

Solid waste services actually fall into both categories. Disposal and the problems associated with disposal fall into the category of a public good since the benefits of controls applied to air, water and ground pollution, contamination, and litter associated with solid waste disposal are not excludable. Joint consumption is possible because the cost of excluding any one individual from enjoying the benefits of proper disposal is infinite. However, provision of the actual solid waste collection services falls more closely into the category of a private good in which a consumer can be excluded from the benefits of the service and which can be traded in a competitive market. Therefore, solid waste management has aspects of both a public and a private good from an economic point of view. No matter what the economic characteristics, solid waste management is a public responsibility.

Resource recovery as it relates to disposal is closely related to the concept of public good. As such, the benefits of developing a resource recovery system are nonexcludable. Therefore, a public manager might be justified in supporting a portion of the resource recovery system on a nonprofit basis out of public funds. This idea is contrary to much of the rhetoric surrounding resource recovery insisting that resource recovery be a totally self-supporting activity.

THE LOCAL GOVERNMENTAL DILEMMA

The issue of mandatory garbage collection and disposal is one of the major dilemmas for government officials who are responsible for cities and/or counties which are large or expanding population centers. Residential solid waste collection is one of the few services provided by or controlled by the local government that directly affects almost every citizen on a regular basis. Police and fire services are available but are not routinely provided directly to most citizens. Because of the health and esthetics problem that results when the service is not provided, solid waste collection and disposal can become a volatile political issue.