ENVIRONMENTAL AND ECONOMIC CONSIDERATIONS OF SOLID WASTE MANAGEMENT IN RURAL AREAS OF OKLAHOMA[1]

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Not only large cities but also small towns in rural areas of Oklahoma must find alternative methods of solid waste disposal by July 1, 1974. New federal and state legislation, as well as local ordinances, will prohibit present methods, including open dump disposal, open dump burning, and roadside dumping. An example of how a rural area may be able to comply with legislation relating to solid waste disposal is presented.

The quantitative aspects of solid waste collection and disposal are no longer the major concerns of this community service. Complaints of odors, insects, and sanitary problems associated with nearby disposal site operations have led to public indignation, outcries, and a package of federal and state legislation affecting solid waste disposal. A good quality environment is now the keynote for local government administrators in considering how solid wastes must be handled. Every method of solid waste disposal pollutes the air, land, and/or water to some extent. The key is to select the method which has the greatest net social and economic benefits, *i.e.*, is least offensive and least costly.

Need for this new emphasis on solid waste management results from one or more of the following factors: (a) concentration of people in relatively small areas; (b) increasing affluence of the people; (c) new technology which, associated with more leisure time, leads to more products, processing and packaging, particularly of ready-to-eat foods and of other consumer items in disposable containers, *e.g.*, throwaway bottles and cans; (d) increased littering of the environment; (e) new concern for a cleaner, more livable environment expressed in laws and regulations relating to public nuisances and to air and water pollution.

Solid wastes, if not properly handled, pose health as well as nuisance problems and are degrading to the environment. Many open dumps are excellent breeding places for rats and insects which are a threat to human walfare.

Even for rural communities, where populations may stabilize or continue to decline in the years ahead, the problem of solid waste management will be one for top priority decisions and one that will be costly to solve. Proper, long-range planning is needed now to project waste requirements and, if necessary, to obtain easements on specific landfill sites 30 to 40 years in advance. The solid waste planning decisions of small towns and rural communities will be guided by the new state laws on water and air pollution and on solid waste management (1, p. 817).

LEGAL GUIDES

The Solid Waste Disposal Act of 1965 was passed by the United States Congress in 1965. Title II of the Act authorized the Department of Health, Education and Welfare: "(1) to initiate and accelerate a national research and development program for new and improved methods of proper and economic solid waste disposal; and (2) to provide technical and financial assistance to state and local governments and interstate agencies in the planning, development and conduct of solid waste disposal programs." The term solid waste disposal, as used in the Act, means the collection, storage, treatment, utilization, processing or final disposal of solid waste.

The Resource Recovery Act of 1970 amended or deleted most of the provisions of the 1965 Act. Key amendments of the Act provide for training grants in occupations involving the design, operation, and maintenance of solid waste disposal systems,

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and extend the general provisions of the earlier Act to not only disposal of solid wastes, but also resource recovery. As defined in the 1970 Act, resource recovery is a solid waste management system providing for collection, separation, recycling, and recovery of solid wastes, as well as disposal of nonrecoverable waste residues.

The Oklahoma Solid Waste Management Act of 1970 creates a Solid Waste Management Advisory Committee, grants certain authority to municipal and county solid waste management systems to enter into agreements, and empowers the State Health Department to adopt and enforce rules and regulations relating to solid waste management (2, p. 1).

Section 2 of the Act specifies the purpose as follows: "to regulate the collection and disposal of solid wastes in a manner that will (a) protect the public health and welfare; (b) prevent water pollution or air pollution; (c) prevent the spread of disease and the creation of nuisances; (d) conserve natural resources; and (e) enhance the beauty and quality of the environment." (2, p. 1)

A solid waste management system includes the entire process of storage, collection, transportation, processing, and disposal of solid wastes by any person engaging in such process as a business, or by any municipality, authority, trust, county or any combination of the above [Sec 3 (6)] (2, p. 2).

County commissioners are authorized to levy and collect fees and charges, and to require licenses as related to solid waste management. Section 12 specifies what is illegal dumping of solid wastes, and section 14 authorizes penalties such as a jail term or fines up to $200 per day for each violation (2, pp. 4-6).

The State Board of Health adopted certain rules and regulations on June 13, 1971, relating to the collection and disposal of solid wastes and setting standards for the operation of sanitary landfills. The time table for operation of a collection system and disposal system (or site) serving a given population grouping is as follows: over 10,000 people — July 1, 1971; 5,000-10,000 people — July 1, 1972; 3,000 - 5,000 people — July 1, 1973; less than 3,000 people — July 1, 1974 (2, pp. 7-8).

The law does not require residents living on isolated farms in a rural area to undertake an organized solid waste management program. However, because more people are building homes and living along county, state and U.S. highways outside recognized city boundaries, some governmental unit eventually will need to undertake the establishment of a disposal system. Obviously, a better solution would be for all residents of a county to work together now to establish a county-wide solid waste management system. Regulation 2.7 states than no permit will be issued for a sanitary landfill site where there is open burning or uncontrolled dumping, or where water may be polluted.

STAGES IN SOLID WASTE MANAGEMENT

Storage. The first stage is storage, by the home owner, tenant, local business firm, factory or plant, for a specified time interval, usually 3 or 4 days. Selection of method of final disposal and method of transport to the disposal site will have some effect on the type of container used for initial storage. Most rural communities have made great strides in adopting containers that improve the sanitary aspects and improve the handling efficiencies. For example, ordinances recently adopted by some local governments prohibit the use of 55 gallon drums as storage containers by homes and businesses.

Collection. The second stage in solid waste management is collection. This is by far the most expensive step and one that may account for as much as 80% of the total cost of the solid waste management program. Costs of acquisition and maintenance of trucks and other equipment, as well as wages of collection personnel have increased by 100% or more in the last 15 years and probably will continue to increase at a rapid rate.

Alternatives that should be analyzed for cost effectiveness in collecting solid wastes are: (a) transfer of material from storage containers located at curbs or in alleys; (b) manual transport of the full containers from back doors to truck for dumping and return of the empty containers; (c) emptying of full containers into carrying tubs for transfer to truck; (d) exchange of full residential containers for empty ones; (e) strategic location of an adequate supply of

large portable containers into which home storage containers can be emptied, with less frequent emptying of the larger containers; (f) use of disposable refuse bags for curb, alley, or back door collections.

Many factors affect the method or combination of methods used, *e.g.,* physical shape and size of the county or other governmental unit being considered, density of the population, frequency of pickup, and how much work the residents are willing to do. Are residents in towns willing to take their garbage to the curb or alley, and are residents in a rural area willing to take their solid wastes to a central collecting point along a highway?

Collection costs vary greatly from one community to another, depending on the above and other factors, including wage rates and union work rules. Collection costs per ton of refuse ranged from $9.15 to $24.96 per ton in five cities surveyed recently. Labor represents 60% to 80% of these collection costs.

Disposal. The third stage of a solid waste management system is disposal. Since the primary problem is solid waste management in small towns and rural areas, *i.e.,* low-density communities, the sanitary landfill approach appears to be the most economically feasible and technically adaptable. Incineration, composting, pyrolysis (a low-oxygen, high-temperature burning method) and salvaging and recycling are other methods. Proper site selection is the key to an "esthetically-oriented" landfill. To keep the cost of hauling within reason, the site should be located as near as possible to the source of solid waste generation. If the landfill site is to serve two or more communities, then waste production volume, as well as future population and industrial growth, must be projected to determine where the least-cost site will be located in the next 10 or 20 years.

Disposal costs are not the only factor in site selection. Good access, all weather roads to the site are essential. Characteristics of the soil, the potential for ground and water pollution, and eventual use to be made of the acreage in the completed landfill are all key factors to consider. If properly operated and closed, landfills can later be used for recreational, residential, business and industrial sites, with little or no settling problems encountered. Obviously, for multistory apartments, office buildings, or industrial plants, footings should be extended below the landfill.

Solid waste disposal costs using a sanitary landfill are generally less than with other methods. Operating cost estimates vary from $0.50 to about $4.00 per ton. A recent survey showed that the average cost of operating 360 landfills was about $1.05 per ton, including amortization of landfill equipment and land cost (3, p. 29).

HOW IT COULD WORK IN SEQUOYAH COUNTY

According to the April 1, 1970 census, the population of Sequoyah County was 23,370, an increase of 4,369 or almost 30% over the 1960 census figure. Another favorable growth trend for the county is indicated by a net increase of births over deaths of 2,125 during the 1960-1970 decade. About 79% of the county population was classified as rural, and only Sallisaw, the county seat, with a population of 4,888, meets the census definition of an urban community.

Seven other incorporated towns are in Sequoyah County; they range from Marble City with 299 persons to Vian with 1,131. Several rural communities such as Short, Brushy, Box, Redland, and McKey also need to be considered in developing a county-wide solid waste mangement system. Similarly, the needs of the people living outside any recognized community boundary must be included in the planning process.

Sallisaw already has a city-wide solid waste collection system, and, based on its population, must begin using a sanitary landfill or other approved disposal system by July 1, 1973. Sallisaw is willing to cooperate with the other towns and communities in developing a county-wide system, probably with one common sanitary landfill site. A couple of other communities have a private weekly collection system, but have no landfill site that would meet State Health Department regulations.

Sallisaw has two rear-loading packer-type collection trucks. Two more of this type packer trucks plus one front-end loading packer truck (25 cu. yd. capacity) for use in the rural areas likely would be need-

ed to initiate a good collection system. The additional vehicles would cost approximately $85,000. A crawler-type tractor at the landfill site would cost $30,000 or more. Approximately 40 large collection containers (4 cu. yd. capacity) strategically located at businesses in the smaller communities and in the rural areas would be needed in conjunction with the front-end loading packer truck. The storage containers would cost about $12,000. These items plus other needed equipment, material, and facilities, *e.g.,* pick-up truck, operator's shack with sanitation facilities at the landfill site, and fencing for landfill site, represent an investment of at least $135,000.

The county population is projected to increase to 35,000 persons by 1980. If the solid wastes were disposed by filling in 20-foot-deep trenches (cells), approximately 50 acres of land would provide for the landfill site needs for the ten year period, 1971-1981. This estimate includes 10 acres for a turn-around area, access roads, and a buffer zone between trenches and fencing.

If the county is foresighted, it will plan to purchase or lease 100 acres or more to take care of projected needs for at least 20 years. This would provide for increased population and the increased wastes that will be generated per capita per day by 1980 and by 1990. Such a site should be centrally located in the county near Sallisaw, just off one of the paved highways. If the land must be purchased, 100 acres represents a $20,000 or higher investment.

Annual labor and operation and maintenance costs for operation of the landfill probably would approach $75,000, a cost which is estimated to include amortization of the equipment and land costs over a 10-year period at an interest rate of 5%.

How can these costs be financed? The 1971 assessed valuation of property in Sequoyah County is $12.1 million, including $5.2 million in public utility assessments. A 3-mill, county-wide levy would raise $36,300 per year at the current assessed valuation. Obviously, an increase in industrial and residential building would increase this base. Residents in the rural areas could cost-share on 30 of the 4 cubic yard storage containers on a 50-50 basis, or pay approximately $4,500 of the acquisition costs. Assuming a 5-to-7-year life for the containers and cost-sharing by ten residences on each container, the cost would represent a small investment per residence in the rural area.

Residents of the incorporated towns where door-to-door pick-up service is provided could be charged $2.00 per residence per month. Assuming there are three persons per household and 9,000 persons living in the towns, $6,000 (3,000 residences x $2.00) per month or $72,000 per year could be raised to pay for the collection costs and part of the amortization costs of the landfill site and equipment. Businesses would pay a higher monthly charge based on frequency of collection, size and number of large collection containers used, etc. No estimate is made here of the amount of money that could be thus obtained because the needs of the various businesses in the towns in Sequoyah County have not been determined.

Some municipalities in Oklahoma have recently voted an additional one cent to the city sales tax to cover the costs of landfill site acquisition and landfill equipment operation. If all towns in the county would vote such a levy, or if State legislation were passed to allow county governments to initiate a county-wide sales tax, an alternative revenue source would be available to help finance the landfill operation.

Certainly we still have the human behavior factor or the people problem. A strong educational program on the social and economic benefits of a package concept solid waste management system is needed. All residents of the area should be encouraged to use the system for disposal of their wastes. The people also need to be assured of the fairness or objectivity of the financing method selected to pay for operation of the system.

FURTHER CONSIDERATIONS

The greatest void in solid waste management is the lack of information on permeability, leaching, and other soil characteristics. Adjacent soil is affected by the solid waste in the sanitary landfill. The percolation of water through old batteries, pesticide containers, and other junked items containing chemicals has the potential to cause pollution problems for both underground water and downstream surface waters. Still, a properly managed sanitary landfill is the best method of solid waste disposal for most rural communities.

Research is needed to determine land requirements and minimum facilities performance for rural communities with varying economic bases. We plan to develop an information system which will allow projection of long term needs of the community for sanitary landfill sites. Growth indicators, such as potential for industrial development, population and income projections, etc., are among the data needs if local governments are to develop adequate long range plans for solid waste management.

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