



SEMINARIO INTERNACIONAL GESTIÓN INTEGRAL DE RESIDUOS SÓLIDOS Y PELIGROSOS, SIGLO XXI

STATUS OF SOLID WASTE MANAGEMENT IN THE UNITED STATES¹

George M. Savage and Linda L. Eggerth
CalRecovery, Inc.
1850 Gateway Blvd., Suite 1060
Concord, California 94520
USA

Introduction

Solid waste management practices in the United States have changed substantially over the past 20 years. During this time period, management of the wastes has shifted from primarily collection and land disposal methods to a diverse spectrum of methods directed toward recycling and energy recovery.

Solid Waste Management Infrastructure

Factors that govern the methods of managing solid wastes in the United States include the size of the community, availability and cost of disposal alternatives, mandated levels of waste diversion, community sentiment, and available financial resources. The responsibility for waste management is typically at the municipal or county level. In many cases, local authorities (consortiums of municipalities or counties) manage solid wastes for their participants. The authorities are formed because of certain political, financial, and legal benefits with regard to planning and operating solid waste management systems. Environmental requirements for solid waste management systems are imposed at the state level, and at the Federal level by the U.S. Environmental Protection Agency (U.S. EPA).

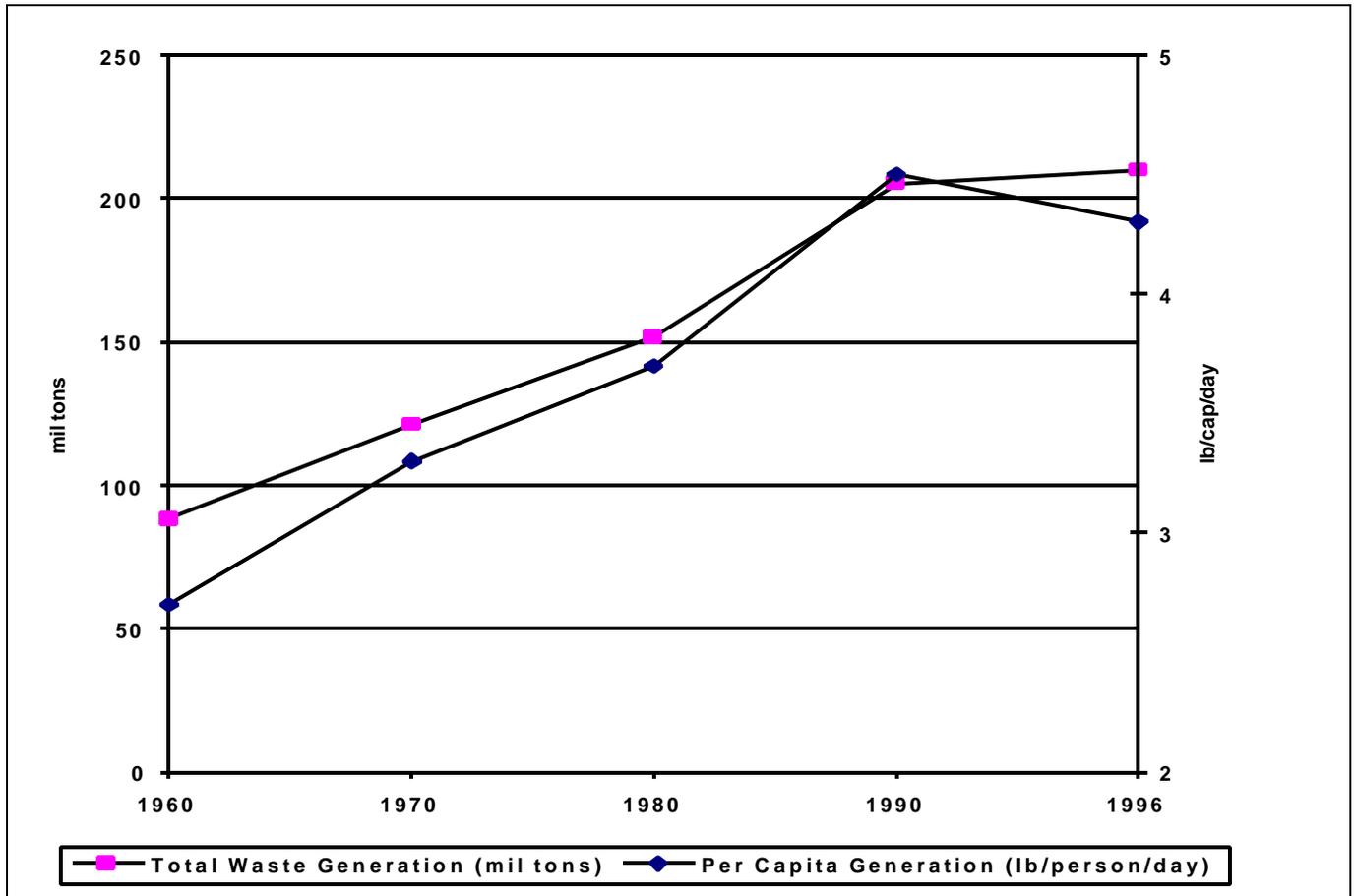
Solid waste management services in the United States are provided by both the public and the private sectors. Recently, there has been a trend toward privatization of solid waste management services. Factors affecting the choice of public or private ownership and operation of solid waste management services include the degree of control desired by the community(ies) and the risk and extent of financial liability.

Waste Generation and Composition

In 1996, the generation of municipal solid waste (MSW) in the United States was about 210 million tons. This rate of generation (i.e., disposed wastes plus wastes diverted from disposal via recycling or composting) is approximately equivalent to 4.3 pounds of waste per person per day.

¹ For presentation at International Fair and Seminar, Solid and Hazardous Waste Integral Management, XXI Century, Medellín, Colombia, November 1999.

The comparative generation rate for 1960 was 2.7 pounds per person per day. The historical trend of waste generation is illustrated graphically in Figure 1.



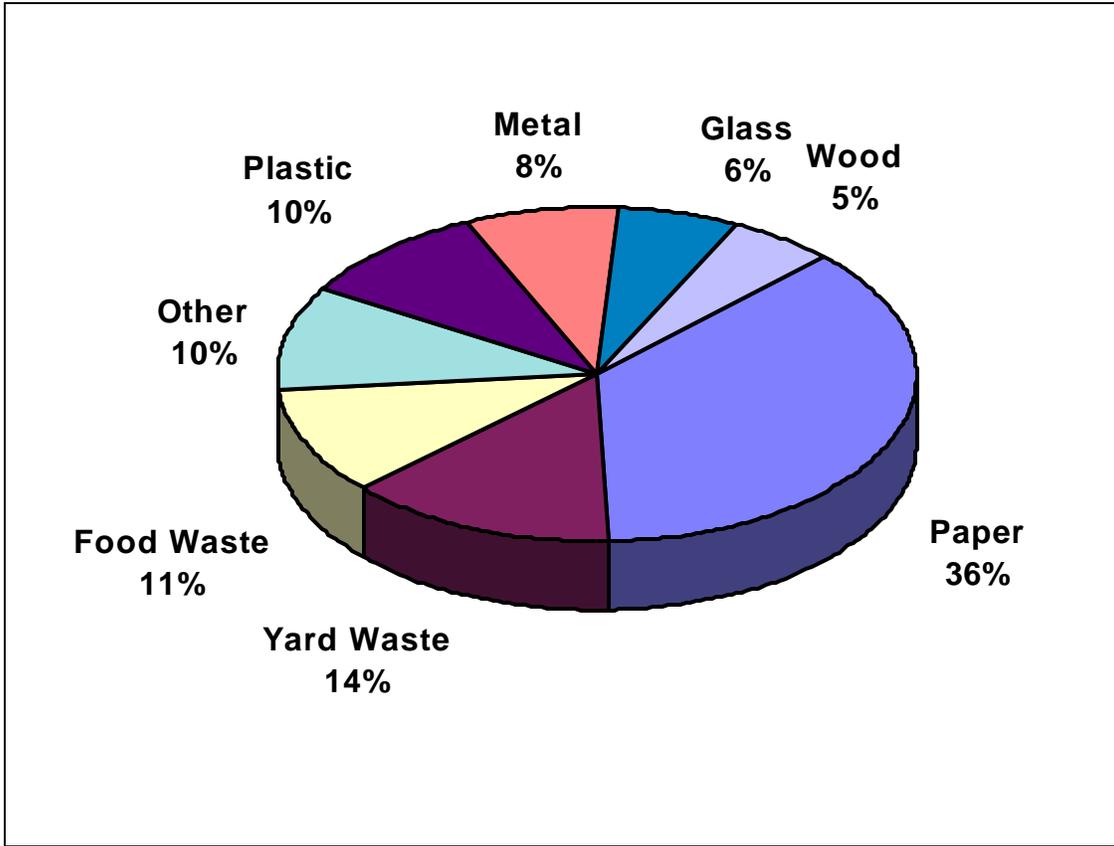
Ref: U.S. EPA

Figure 1. Trends in MSW Generation (1960-1996)

In 1996, approximately 36% of generated waste was paper and paperboard materials. Yard waste composed about 14% of the generated waste stream. The estimated weight percentages of several other major material types in the generated waste stream are given in Figure 2.

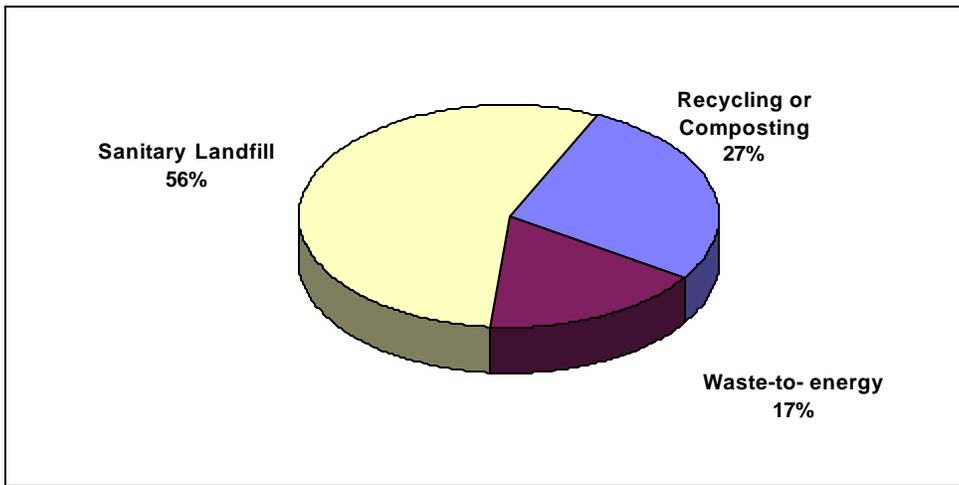
Methods of Waste Management

The primary methods of managing solid waste in the United States are landfills, recycling or composting, and waste-to-energy (WTE). Source reduction of wastes is also practiced, and has recently gained attention. On average, about 27% of the solid waste in the United States is recovered and recycled or composted, 17% is burned in combustion facilities, and the remaining 55% is disposed in sanitary landfills, as illustrated in Figure 3. Reliable data on the extent of source reduction achieved in the United States has yet to be reported.



Ref: U.S. EPA

Figure 2. Composition of MSW Generated in the United States (1996)



Ref: U.S. EPA

Figure 3. Methods of Managing Solid Waste in the United States (1996)

The estimated number of solid waste management systems and facilities in the United States is presented in Table 1. Many communities utilize a combination of these systems to manage their wastes effectively.

Table 1. Estimated Number of Solid Waste Management Systems in the United States (1996-1997)

Source-separated curbside collection systems	9,000
Materials recovery facilities	300
Yard waste composting systems	3,000
Waste-to-energy facilities	110
Sanitary landfills	2,500

Adapted from U.S. EPA data

Source Reduction (Waste Prevention)

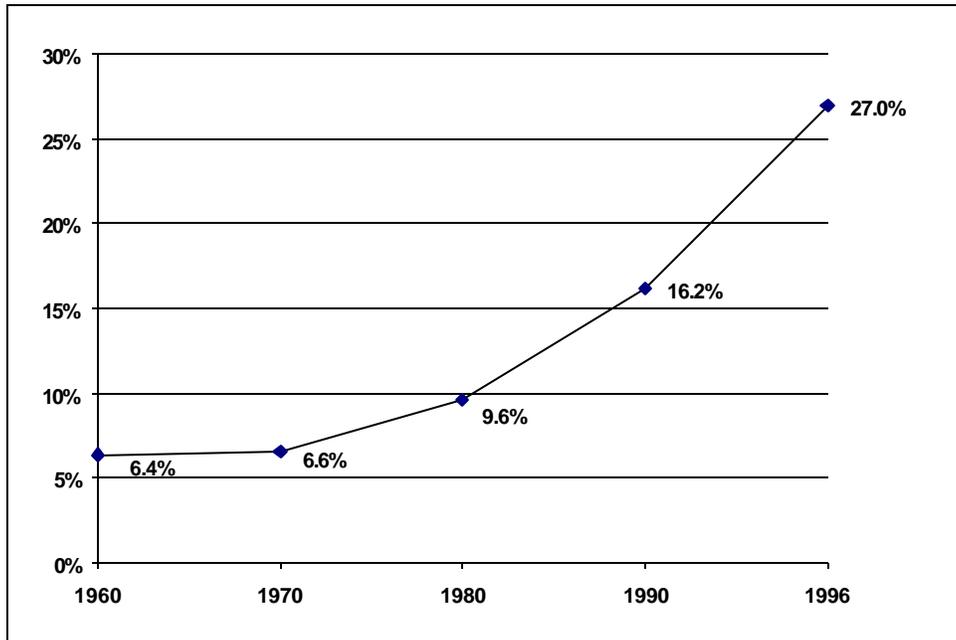
Practices such as recycling of grass clippings on lawns, backyard composting, two-sided copying of paper, and transport packaging reduction by industry have been instituted to decrease the amount of solid waste requiring collection, treatment, and disposal.

Recycling and Composting

Recycling, including composting, diverted 57 million tons of material away from landfills and WTE facilities in 1996, an increase of 67% in waste diversion since 1990. The nationwide recycling rate was approximately 27% in 1996, versus about 10% in 1980, as shown among the historical data presented in Figure 4.

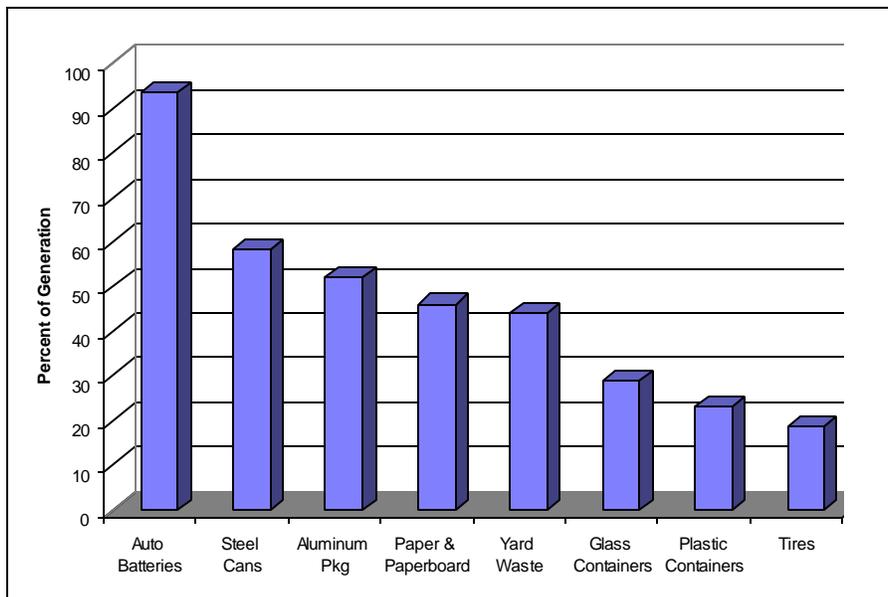
Certain states in the United States have established high waste diversion (recycling) goals. For example, in the state of California, the goal for each California city by the year 2001 is 50% of the generation in 1990. Many communities in California are reporting waste diversion levels in the range of 30% to 40%, based on the quantities of wastes generated in 1990.

Among the programs in the United States, materials that typically are recycled include paper and paperboard (about 42% of generation) and yard trimmings (about 41%). These materials and others are recycled through curbside collection programs, dropoff centers, buyback programs, and container deposit systems. Recovery rates for paper and paperboard, yard waste, and some other material types are compared in Figure 5.



Ref: U.S. EPA

Figure 4. Estimated Recycling Rates in the United States (1960-1996)



Ref: U.S. EPA

Figure 5. Estimated Recovery Rates of Selected Material Types (1996)

The quantities of materials recycled have increased substantially over the past 15 to 20 years. For example, an estimated 33 million tons of wastepaper and paperboard were recycled in 1995, as compared to only 12 million tons in 1980, as shown in Table 2. Thus, markets for secondary materials have expanded greatly over the years for some types of materials. The ceiling of the market demand for secondary materials is not well defined, although recently secondary materials markets have been depressed due to an imbalance of supply and demand.

Table 2. Estimated Rate of Generation and of Recycling of Some Material Types in the United States (1980 and 1995)

Material Type	Year	Generated (millions of tons/year)	Recycled
Paper and paperboard	1995	82	33
	1980	55	12
Glass	1995	13	3
	1980	15	1
Metals	1995	16	6
	1980	16	1

Ref. U.S. EPA data

Waste-to-Energy

In 1996, about 110 waste-to-energy facilities operated in the United States. The installed capacity was about 100,000 tons of MSW per day. Currently, few WTE projects are planned and constructed in the United States. The emphasis of treatment has shifted to recycling and composting.

Landfills

The number of landfills in the United States has steadily decreased over the past 10 years, from about 8,000 in 1988 to about 2,500 currently. The reduction in the number of landfills occurred primarily in response to strict performance requirements placed on existing and new landfills, commencing in 1991 when new U.S. EPA landfill regulations went into effect. Despite the decrease in the number of landfills during the last decade, landfill capacity has remained relatively constant. New landfills are generally much larger than those constructed in the past – a result of strict landfill regulations (including long-term environmental monitoring and requirements for financial assurance), of the difficulty of siting landfills, and of economies of scale. Approximately 220 landfills recover energy from landfill gas (LFG). About 75% of these landfills use LFG to generate electricity onsite, and the remaining 25% export LFG for offsite use.

Conclusions

Solid waste management in the United States has shifted over the past 20 years from collection and disposal to collection, treatment, and disposal. Recycling and composting divert substantial quantities of wastes from disposal.

Consolidation of landfill capacity has occurred over the past 10 years and is likely to continue to be the trend for the foreseeable future in response to environmental regulations, local opposition to sites, and cost competitiveness.

Increases of current recycling rates likely will require expansion of market capacity to absorb the larger quantities of waste-derived materials. In many regions of the United States, the more lucrative material types are already being recovered. Thus, in those cases, additional diversion must come about by recovery and marketing of less marketable types of materials.