

## CHAPTER C - EMPLOYMENT IMPLICATIONS OF ALTERNATIVE SYSTEMS FOR

### SOLID WASTE MANAGEMENT

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#### Introduction

The possible impact of pollution control programs on employment has been an issue of particular concern during the past few years as the country has suffered from high unemployment rates. While it is alleged that pollution control programs have added to this problem, such programs, in fact, can affect employment in both a positive and a negative fashion. In this report the positive aspects of possible, environmentally sound, solid waste management will be examined.

Focusing on the San Francisco Bay Area, many of the positive and negative aspects of landfilling (the present system of solid waste management) are discussed in other chapters of this report. The basic solid waste management problem in the Bay Area is that we are burying most of our wastes in landfills instead of conserving and recovering materials and energy from these wastes. While landfilling of solid waste has been the easiest and cheapest method for waste disposal in the past, it will become more and more expensive as existing landfills close and new sites must be located at greater distances. It has been estimated that many of the existing operating landfills will reach capacity by the early 1980's at the existing rate of fill (ABAG Draft Solid Waste Management Plan, 1977).

The urbanized portion of the region has grown from 100 square kilometers (42 square miles) in 1852 to about 3,300 square kilometers (1,300 square miles) today. In future years, the Bay Area is expected to continue to grow and to convert additional open space to urban uses. As the result of projected growth for the Bay Area it is expected that 13 million metric tons (MT) (15.5 million tons) of solid waste will be generated in the Bay Area in 1990 or roughly 4 million more tons per year than in 1975. Costs of reducing wastes and increasing recycling are difficult to estimate.

In spite of higher than average unemployment during the 1960's and 1970's, the Bay Area has continued to attract people convinced that jobs are available. At the same time unemployment is more widespread here than in the rest of California and the nation. In 1977, the Bay Area's jobless rate was 7.6% compared to 7.4% for the State and 6.9% nationally. Jobless rates in Contra Costa, Marin, San Francisco and San Mateo counties have nearly doubled since 1970. In the two counties that have gained most in population since 1970 -- Santa Clara and Sonoma -- the jump in unemployment rates was about 50%, while increases in Napa and Solano Counties were about 10% (ABAG, 1977).

In this report, attempts to estimate the employment creation possibilities of several methods of solid waste management will be made. Recycling became popular during the early 1970's, but has dwindled since. It still is and can be a major part of solid waste management. A second technique, composting of

solid waste, has been with us for some time; but the economic feasibility has been the major question in its implementation. A third, pyrolysis, the newest system to be introduced, has been met with much enthusiasm; but as yet, there is still apprehension, since it has not gone beyond experimental stages. Its technology is still being improved upon at present. Assessment of the effects of each of these methods on employment will be made.

#### Resource Recovery / Recycling

Presently the City of Berkeley has recycling programs that are considered successful in terms of public participation and the quantity of solid waste removed from the stream. Using Berkeley as a basis for extrapolation in order to make projections into areas where there has been no detailed study, certain assumptions are necessary. Such an extrapolation assumes that Berkeley is representative of other districts and that the statistics used for Berkeley can be applied for the Bay Region. Realizing that accuracy in projections of this sort is achieved only with detailed study, only rough estimates of possible employment expansion are sought.

Berkeley presently recycles 15% of material removed from the solid waste stream that would otherwise be landfilled. Four organizations are accomplishing the bulk of this task with ever-present aspirations to increase the percentage. They collectively employ approximately one hundred employees. Their combined hours (since not all are full-time workers) make up 50 forty-hour-per-week jobs (attributable to recycling in Berkeley).

TABLE 1. RECYCLING IN BERKELEY

<u>ORGANIZATION</u>	<u>NUMBER OF EMPLOYEES</u>	<u>NUMBER OF EQUIVALENT 40 HR/WEEK JOBS</u>	<u>MATERIALS ACCEPTED</u>
Ecology Center	11	1.5	Newspapers, cardboard, glass
Community Conservation Centers	49	42	Newspapers, cardboard, glass, tin, aluminum, bimetals
Pacific Recycling Environmental Ecology Project		3*	Newspapers, glass bimetals
ENCORE	8	3.5*	Wine bottles
<b>TOTAL</b>		<b>50.0</b>	

\* Estimated number of 40 hr/week equivalents due to Berkeley. These organizations serve municipalities other than Berkeley.

According to its own Department of Public Works, in 1977 the City of Berkeley collected 33,000 MT (37,000 tons) of solid waste. Berkeley has been able, through those four organizations and independent

scavengers, to re-direct 15% of its solid waste toward recycling. That is the highest percentage nationally, for a city of Berkeley's size. The four organizations are responsible for approximately 7% of Berkeley's re-directed solid waste. Making use of the numbers, an index can be arrived at to apply to the Bay Area.

For a closer approximation of the amount of residential solid waste that is generated in Berkeley, an additional 2,000 tons will be added to that given by the Berkeley Public Works Refuse Collection Department for an approximated total of 35,000 MT (39,000 tons) of solid waste generated per year in Berkeley.

Seven percent of 35,000 MT (39,000 tons) is equal to 2,450 MT (2,730 tons). 2,450 MT (2,730 tons) divided by 50 people gives 49 MT (54.6 tons) of solid waste extracted per employee involved in any of the four organizations. Included among the fifty employees are those involved in the bookkeeping and transport of materials as well as those directly sorting and separating.

Looking at the totals presented in Table 2, the reader is advised to consider that the table was formulated with the underlying reasoning that recycling would be done in the fashion that is being used by the four organizations in Berkeley. The table does not reflect the substantial recycling that is undertaken by private scavengers. The table also ignores the extent of present recycling efforts in each of the counties, which would also detract from the jobs-created totals. In this writer's opinion, taking these factors into account would conceivably reduce the total by as much as one half.

TABLE 2. BAY AREA RECYCLING JOB CREATIONS (1980)

COUNTY	WASTE GENERATION	GOAL AMOUNT	ESTIMATED
	MIXED MUNICIPAL/YEAR 1000 MT/YR (1000 TONS/YR) <sup>a</sup>	OF RECOVERABLE SOLID WASTE 1000 MT/YR (1000 TONS/YR) <sup>b</sup>	NUMBER OF JOBS CREATED <sup>c</sup>
Alameda	1100 (1190.6)	320 (357.18)	6542
Contra Costa	530 (584)	160 (175.20)	3209
Marin	185 (205.6) (1975)	55 (61.68)	1130
Napa	53 (58.6)	16 (17.58)	322
San Francisco	1100 (1175.1)	315 (352.53)	6456
San Mateo	850 (950.9)	260 (285.27)	5225
Santa Clara	1400 (1536.5)	420 (460.95)	8442
Solano	200 (225.5)	60 (67.65)	1239
Sonoma	210 (237.2)	65 (71.16)	1303
TOTAL			32,566 x 1/2 = 16,283

<sup>a</sup>ABAG 1980 figures for residential, demolition, commercial and non-manufacturing

<sup>b</sup>The goal amount is 30% of the county total which represents the proposed extraction from the solid waste stream. For certain communities estimates for possible amount of extraction range as high as 50%.

<sup>c</sup>The number of jobs created is attained by dividing the goal amount of recoverable wastes by the index of 49 MT (54.60 tons) of recycled material per employee.

### Composting

The technology for composting of solid waste has been known for some time and most if not all environmental questions have been answered. However, the traditional markets for compost as a soil conditioner have been limited and thus unless markets for compost change dramatically, it is unlikely that composting will have any influence on the employment situation in the Bay Area (See Section IV, Chapter C for a discussion of composting).

### Pyrolysis

The Central Contra Costa Sanitation District has proposed to construct a 1100 MT (1200 tons) per day processing facility to recover ferrous metals, aluminum, and to produce refuse-derived fuel. The refuse-derived fuel (RDF) will be used at the wastewater treatment plant in its multiple hearth furnaces for sludge volume reduction and generation of pyrolysis gas. The amount of solid waste processed per year on the average will amount to 325,000 MT (365,000 tons). Making similar types of assumptions as was done earlier in the Resource Recovery/Recycling portion of this chapter, estimates of the number of jobs that might be possible through pyrolysis can be made. The main assumption made here is that the number of jobs created is directly proportional to tons of refuse processed. Since the total refuse production for the Bay Area is approximately 1,300,000 MT (1,470,000 tons) per year, pyrolysis plants to handle this tonnage could be expected to employ  $\frac{1,300,000}{325,000}$  (or four times) as many people as the Contra Costa plant will.

If capacity and thus jobs created can also be assumed to be linked directly to capital investments for pyrolysis plants of the kind proposed for Contra Costa County (plant cost: 39,434,000 for plant capacity 325,000 MT per year), then projections for the several Bay Area counties yields the following employment figures (Table 3).

TABLE 3

<u>COUNTY</u>	<u>TOTAL CAPITAL COSTS<sup>a</sup></u>	<u>NUMBER OF TEMPORARY<sup>b</sup></u>	<u>NUMBER OF PERMANENT<sup>c</sup></u>
Alameda	\$108,120,000	2160	510
Contra Costa	57,379,000	780	184
Marin	22,213,000	300	71
Napa	5,915,000	80	19
San Francisco	121,868,000	1660	390
San Mateo	91,638,000	1250	290
Santa Clara	142,946,000	1940	457
Solano	20,754,000	280	66
Sonoma	21,694,000	295	70
TOTALS	\$1,690,000,000	8745	2057

(continued)

<sup>a</sup>Total costs are based on the proposed pyrolysis plant by the Central Contra Costa Sanitation District. Extrapolation is by tonnage, using 365,000 tons/year per \$39,434,000 as the index to deduce a multiple or fraction total cost for each of the counties. The county's total tonnage of solid waste multiplied by the index gives the rough total capital costs.

<sup>b</sup>The number of temporary jobs is attained by assuming:

- 1) construction takes up 68% of the total capital costs
- 2) 40% of construction costs is attributable to labor
- 3) an average salary of \$20,000 per year

(Norma Weisner, personal communication, 1978)

<sup>c</sup>The number of permanent jobs is arrived at by assuming:

- 1) operation and maintenance takes up 32% of total costs
- 2) 20% of operation and maintenance is attributable to labor
- 3) an average salary of \$20,000 per year

(Norma Weisner, personal communication, 1978)

Pyrolysis is, by nature of the costs of capital investment, the most capital-intensive of the methods thus far mentioned. The pyrolysis systems use many of the mechanical separators once utilized by the mining industry as a basis for developing separators to suit their own needs. Many municipalities look forward to the development of pyrolysis plants beyond their present pilot scale demonstrability.

Certain environmental questions remain -- the air quality effects; water quality effects of incinerator residues and pyrolysis wastewater; and the costs of mitigating undesirable effects -- have yet to be answered, as well as the extreme capital costs of implementation. It is unlikely that pyrolysis could be utilized totally for each county as a whole. However, through studies already completed it has been pointed out that for certain municipalities, e.g., Central Contra Costa Sanitation District, it would be advantageous to implement pyrolysis as its method of solid waste management. Further studies might show such a system to be suited for other areas also.

An important subject, especially pertaining to pyrolysis plants, that should be mentioned is that of employment impacts beyond those directly created through construction, operation and maintenance of these plants.

One of the earliest studies of the employment generated by environmental programs was the work carried out by Bruce M. Hannon and Roger H. Bezdek at the University of Illinois (Hannon et al., 1974). Their work, using an input-output model, focused on Federal programs, and analyzed the employment impacts of constructing wastewater treatment facilities compared to possible alternative expenditures. Their analyses showed that one billion (1975) dollars allocated to such construction would employ a total of 82,000 people (full-time equivalents) for one year.

One important point about the Hannon and Bezdek estimates is that they include both the direct and indirect employment. They include not only the direct employment at the construction site and in making the equipment, but also such indirect employment as that involved in providing goods and services for the personal consumption of the people who are employed directly. Most of the 82,000 people would never associate their employment with the construction of wastewater treatment systems. For instance, E.P.A.

estimates that a \$1 billion expenditure creates 20,000 jobs at the construction site; this is only one-fourth the total number of jobs that Hannon and Bexdek estimate are generated by this expenditure.

The Bureau of Labor Statistics undertook a similar employment study, which concentrated on different aspects of Federal environmental expenditures (U.S. Department of Labor, 1975). They estimated that only 53,600 jobs were generated by each billion dollars spent on the construction of wastewater treatment systems, but 76,000 to over 78,000 jobs resulted from each billion dollars spent on administering the pollution control programs. These estimates were apparently based on 1972 dollars, and therefore would have to be adjusted downward to take account of the inflation that has occurred since then.

These are not all new jobs, nor are they all attributable to Federal environmental legislation. To analyze the net increase in jobs resulting from environmental expenditures, one has to look not at the types of studies listed here, but at macro-economic studies such as those sponsored by the Council on Environmental Quality and the Environmental Protection Agency, 1975 (Hannon et al., 1974). These studies indicate that during a period such as the present when environmental programs are forcing increased expenditures while the economy is suffering unemployment, these programs have a net beneficial impact on employment.

#### Conclusion

A comparison of resource recovery/recycling, composting and pyrolysis does not require an all-or-nothing type of decision as to which method of solid waste management to support. Employment estimates for Resource Separation Recovery/Recycling were derived by reducing the amount of solid waste sent to landfills by twenty-five percent. The remaining seventy-five percent must still be dealt with.

Pyrolysis calls for separation before the waste is pyrolyzed. The plants, in order to be cost-effective, must be strategically located and they must match up with other economically deterministic factors. It is not known if each county will find it suitable to implement pyrolysis plants on a full-scale county-wide basis or on a cross-county basis. In this writer's opinion it is doubtful that the funding for the high capital costs of pyrolysis could be met by all the municipalities. More study needs to be undertaken before reaching definite conclusions. However, it seems evident that the future management of solid waste is sure to include increased recycling and development of pyrolysis in some measure. The proportional employment contribution of each of the methods is what remains undetermined at this point. However, the conclusion of this section is that in the management of solid waste, no matter what the contribution from each method is, each provides substantial additional employment opportunities both directly and indirectly in the Bay Area.

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