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Recycling: Background Information*

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Summary

Recycling is defined as returning the major portions of trash and garbage components to the economy in a useful form. Trash is better viewed as secondary material or a valuable resource, since it is estimated to have an overall value of over \$50 per ton. Potential benefits to be gained from recycling are both economic and ecological. Secondary materials have been recycled for many years, with a peak use during World War II, but most of the scrap has come from industry, not from municipal or household waste. Many changes are needed for increased recycling to occur, including different collection procedures, increased markets for secondary materials, and changes in government regulations.

Introduction

In 1966, Webster's New World Dictionary did not contain the word "recycling." Now, only five years later, recycling is an everyday word, and definitions abound. Recycling literally means returning to the start of the cycle or to return trash components to the place of original manufacture. However, for economic or environmental benefit it is not necessary to cycle waste back to its original use. In this report, recycling is seen as any method which returns the major portions of trash and garbage components to the economy in any form which provides some utility.

In the words of Undersecretary of the Interior, Hollis Dale, "Trash is our only growing resource." The increasing amount of trash generated has been obvious, with almost 200 million tons of trash currently being collected each year in the United States. It has been less obvious to many that trash can represent a resource, but an estimated value of more than \$50 per ton has been placed on trash.

Potential Benefits of Recycling

We see in the following table that the potential value of paper dwarfs the other values in ordinary trash (3). The reason, of course, is twofold: paper predominates in trash, and the unit value of cellulose fiber is high. That value, however, represents an extreme upper limit for high grade, pure paper pulp.

* This report is based primarily on "Recycling Municipal Wastes: A Preliminary Report, by the Recycling Committee of the Rochester Engineering Society Task Force on Solid Waste Disposal," June 21, 1971. The original paper was submitted to Mr. Milton Gross, Eng., and to Mr. Roger Hoadley, P. E., for review.

<u>Material</u>	<u>Potential Value of Component</u>		
	<u>Percent by weight</u>	<u>\$/Ton of Component</u>	<u>\$/Ton Trash</u>
Paper, Paperboard	50	100 ^a	50
Ferrous metal	9	20	2
Glass, Ceramics	10	10	1
Aluminum	1	200	2
Garbage, Yard Waste	20	5 ^b	1
Misc., Plastics, Textiles, etc.	10	5 ^c	0.50

- a For high grade pulp
b Value as compost
c Value as fuel

Many economists see another potential benefit. They believe that large-scale recycling could serve as a valuable anti-inflationary force by reducing a portion of the needless waste in the United States.

The ecological advantages of recycling are far more important than the economic benefits. For example, today about 20% of used paper is recycled; this amount represents about 200 million trees saved each year (4). The National Academy of Engineering estimates that the rate of recycling must be raised from 20% to 35% by 1985 merely to keep the nation's wood resources in balance (1).

The supply of iron ore is not infinite. The supply of aluminum or bauxite has been estimated as sufficient to last from 40 or 50 years or 80 to 100 years depending on whether accessible reserves or total known reserves are being considered. However, large amounts of electricity are required for the refining of aluminum from ores. Sand or silica used to make glass is in abundance, but the fossil fuels required must also be considered. Plastics are made from oil or natural gas and, since most plastics are not degradable in natural conditions, will not return to the original form.

Less is heard about the availability of rubber trees to supply the demands of the automobile industry for rubber tires. However, the problems involved in disposing of used tires makes recycling desirable. They are difficult to bury in landfills and often "float" to the top; they provide other problems in incineration.

Recycling in the Past

Recycling did not begin in the last two years. The secondary materials industry reached its peak during World War II, when about 40% of used paper was recycled. More recently the salvage of wastes (chiefly from industrial sources) has amounted to between five and seven billion dollars per year (4). In addition to the paper already mentioned (salvaged almost entirely from commercial sources), major secondary materials include the following:

- Iron and steel:** About 55% of the raw steel produced in 1969 was reused steel scrap (4).
- Non-Ferrous metal:** Over 50% of copper production is from reprocessed material. The one-quarter million tons of aluminum recovered constitutes 25% of the annual requirement (4).
- Glass:** Scrap glass (cullet) has made up only about 5% of the raw materials used in the glass manufacturers industry (4); but, since voluntary individuals' recycling has made used glass more available, some plants are using 30% cullet (2).

Textiles: It is estimated that about 1.2 million tons of textiles are generated per year as waste from manufacturing operations; about 30% of this waste has been recycled, chiefly as wiping rags for industry (4).

If some of the above percentages seem high, it should again be noted that most of this scrap has come from industry. Municipal trash is mainly unmined, despite the fact that, in many communities, there is a more concentrated source of raw material than from virgin ore or pulp. For example, it is estimated that the percentage of cellulose fiber in a garbage truck is about that found in a tree (50%).

At the present market levels, however, even the most optimistic estimates indicate that 50% of municipal wastes cannot be absorbed in the recycling stream (4).

Steps Necessary for Increased Recycling

The lack of markets is only one of the problems confronting those who wish to recycle more materials. Various changes are needed, such as changes in rubbish collection procedures, new marketing programs for new products, and greater public acceptance of non-virgin materials. Government can provide tax incentives (capital gains and rapid depreciation, investment tax credits), depletion allowances, freight rate equalization (so that shipping virgin materials is not considerably cheaper than shipping secondary materials), elimination of purchasing prejudices (paper purchases, especially by government, have favored virgin fiber content). A further step could be taken by providing legislation to prohibit the use of hazardous or scarce products which cannot be effectively recycled (4).

References

- (1) "Papermakers Study Recycling," Chemical Engineering, December 14, 1970
- (2) "Recycling Glass Containers," Glass Containers Manufacturing Institute Recycling Day, New York City, February 2, 1971
- (3) Grinstead, R. G., "The New Resource," Environment Magazine, Vol. 12, No. 10, December 1970, pp. 2-17
- (4) Kupchik, George J., PHS, Address to Congress on Environmental Health, New York City, April 26, 1971

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