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PACKAGING SOURCE REDUCTION:

CAN INDUSTRY AND GOVERNMENT COOPERATE?

U.S. ENVIRONMENTAL PROTECTION AGENCY

Packaging Source Reduction: Can Industry and Government Cooperate?

by

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The past several years have witnessed increasingly heated discussions between the environmental community and the business community on the issues of resource use and its effect on the ecosphere. The topics debated have been numerous, and the questions raised too complex to answer in the course of an hour, a day, or perhaps even a lifetime. But the dialogue has clearly established the opposing points of view. On the one hand are those who rest their case on the premise that the consumption of goods is highly desirable and that the success of a society can be measured by quantities of throughput. And on the other hand are those who view each item of throughput in terms of the pressure it creates on the environment and who therefore believe that limiting the quantities of materials and energy consumed is to be applauded.

But despite the divergence of these points of view, there are many specific areas where the two communities can cooperatively work toward constructive change. Because the packaging industry has been in the

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forefront of public debate concerning resource and environmental impact, the avenues for cooperative effort in this industry may usefully be explored.

For background purposes, it is important to review some packaging trend data. Packaging activity in the United States has been growing at a rapid rate over the past decade. Shipments of containers and packaging were valued at $19.7 billion in 1971, an increase of 5 percent since 1970, and an increase of 82 percent since 1960.[1,p.44] In 1958 packaging material consumption equaled 412 pounds per capita. By 1971 per capita consumption had risen to 591 pounds, a growth rate of 43 percent per capita (Table 1).

The growth of packaging consumption has led to increased consumption of raw materials and energy (with attendant adverse environmental effects) and an increased rate of generation of solid waste. In 1971, packaging accounted for approximately 47 percent of all paper production, 14 percent of aluminum production, 75 percent of glass production, more than 8 percent of steel production, and approximately 29 percent of plastic production (Table 2). At that time, total packaging material energy consumption represented an estimated 5 percent of U.S. industrial energy consumption in 1971 (Table 3).[2]

Post-consumer solid waste resulting from the discard of packaging material was estimated at between 40 and 50 million tons in 1971. Packaging was thus estimated to be between 30 and 40 percent of municipal solid waste, based on the EPA estimate of 125 million tons of municipal solid waste in 1971.

Reviewing recent growth trends in consumer packaging by material type and end use, it is apparent that various categories of consumer products have experienced far greater packaging growth than packaging as a whole. All glass packaging, for example, increased by 57 percent per capita between 1958 and 1971, while beer packaging in glass increased by 290 percent per capita between 1958 and 1970 (Table 4). Aluminum packaging grew 573 percent per capita between 1958 and 1971, while aluminum consumer packaging grew 950 percent per capita between 1958 and 1970 (Table 5). These data are particularly meaningful in light of current trends toward the use of lighter packaging materials (i.e., the substitution of aluminum and plastic for steel and glass, as well as usage of thinner gauges of steel, glass, and aluminum).

Another factor of interest is the growth in product consumption relative to the growth in packaging consumption for that particular product. Overall, the consumption of food in the United States increased by 2.3 percent by weight on a per capita basis between 1963 and 1971.[3, p. 15] During the same period, however, the tonnage of food packaging increased by an estimated 33.3 percent per capita, while the number of food packages increased by an estimated 38.8 percent per capita.[4,5] Several specific examples may be of value here. Between 1958 and 1970, milk consumption decreased by 23.1 percent by weight on a per capita basis.[3, p. 18] Milk container consumption, on the other hand, increased by 26.1 percent on a unit per capita basis for the same period.[6, p. 38] Other cases may also be cited. The consumption of vegetables in cans increased by 17.8 percent by weight between 1958 and 1970, while the consumption of cans for vegetables increased by 31.5 percent on a tonnage basis for the same period (Table 6).[7]

This movement toward greater packaging consumption has been accompanied by two other pertinent trends. The first of these is the trend toward greater concentrations of economic activity, where relatively small firms serving local markets have been supplanted by larger firms serving national markets. The general rationale for the concentration of industry is the economies of scale conferred upon large producers. These economies include advantages in diverse areas such as production costs, advertising costs, brand acceptance, input prices, and access to capital. The ability of large firms to employ greater division of labor and specilization within a particular plant or production process results in a general pattern of the larger corporations paying higher wages and salaries to smaller numbers of people, employing more capital intensive technologies, and realizing higher profit margins than their smaller competitors.[8, p. 32]

New packaging developments both encourage this trend and are induced by it. Perhaps the best example of this may be found in the brewing industry. The number of breweries has declined substantially since 1940 when there were over 12 breweries on the average for each State until today when the average is less than two per State. Over the same period, the average output per brewery has increased. The desire to achieve economies of scale is frequently cited as a major reason for the reduction in the number of breweries. However, the introduction of both non-refillable bottles and cans as economical, one-way containers for beer which do not incur the transportation costs that refillable bottles must, has provided brewers with the opportunity to ship beer longer distances at less cost than would otherwise be possible.

The second trend of significance is the rising cost of the package as a portion of the total price of the product. Thus since 1958, the share of consumer product costs represented by packaging has more than doubled for items as diverse as dairy products, produce, beverages, and candy.[8,p.42-43] These trends seem to reflect the greater use of packaging and the incorporation of package design features that offer consumers convenience.

Based on the foregoing, we can conclude the following: (1) that packaging consumption has grown considerably since 1958, (2) that, in many cases, it has far outstripped the consumption of the product being packaged, (3) that its growth has resulted in increased uses of materials and energy, (4) that its growth has been concurrent with greater concentrations of industry and (5) that its cost has increased relative to the costs of the product being packaged.

Review of these conclusions by both the business and environmental communities has, however, led to vastly different action plans. The environmental community, for example, has suggested that increases in packaging consumption have resulted in the depletion of our natural resource supplies and in the pollution of our environment. As a consequence, there have been calls for the source reduction of packaging - decreasing the consumption of packaging materials through increased utilization of reusable containers and decreased uses of materials and energy in the manufacture of each package.

The business community, on the other hand, has pointed to resource recovery as the only environmentally sound option for conserving resources and decreasing the pollution caused by solid wastes. They have also

suggested that increases in packaging consumption are necessary if we are to maintain our standard of living and increase our national productivity.

Some of these issues and responses, however, require more scrutiny. It is important to point out, for example, that packaging resource recovery and source reduction are not alternative but complementary approaches and that both should be pursued. Decreases in the growth of packaging consumption or in the absolute quantity of packaging in the waste stream do not obviate the need for the recovery of the packaging wastes that cannot reasonably be reduced. It is for this reason that the Environmental Protection Agency has urged the consideration and implementation of both source reduction and resource recovery. For example, a refillable bottle (which is superior to a one-trip container) can be recycled after it has made twenty or more trips; in fact it is more easily recycled since refillable bottles are typically culled from the bottle stream at the filling point, hence the glass is concentrated and automatically color sorted.

The issue of the correlation between our nation's standard of living and packaging consumption is also important to analyze in some detail. It is quite clear, for example, that a relationship exists between standards of living, the Gross National Product and energy consumption when one compares the developed nations with those that are less developed. But it is important to point out that there is little correlation between energy consumption, Gross National Products and standards of living if one restricts the comparison to the developed countries.[9,p.4] Thus the

United Kingdom and New Zealand have similar standards of living, but vastly different levels of energy consumption.[9,p.6] The same kind of comparisons can be used to look at the relationships with packaging consumption (an energy-intensive process) with similar results.[9,p.7]

Finally, we need to assess the issue of increases in productivity made possible by increased use of automated equipment and packaging. If we look at food and beverages, for example, we note that between 1967 and 1972, the number of containers shipped rose 32 percent, from 78 billion units to 103 billion units.[10,p.199-243] At the same time, the value of food and beverage shipments rose 30 percent, from $84 billion to $110 billion.[11,p.175-177] Yet this period also witnessed an employment decline in the food and beverage industries, from 1.7 million employees to 1.6 million employees.[11,p.175-177] Here then, is a case of increased productivity where output increased with a move toward increased use of energy intensive modes of production and packaging at the expense of labor (Table 7).

The value of this increase in productivity is, however, not quite so clear, particularly as resources become scarcer and more costly and the means of extraction become more environmentally undesirable. As has been recently pointed out, we may soon see a necessary shift in the opposite direction as resource prices lower productivity gains throughout the economy.[12,p.196]

Some major technological breakthroughs could, of course, decrease the impact of high resource prices on productivity. But unless they also include shifts in manufacturing processes and in product designs away from resource intensivity it is questionable as to whether they will be sufficient to neutralize otherwise adverse impacts on the economy.

These factors, of course, suggest an area in which the environmental and business communities can meet on common ground - namely in the development and introduction of product designs that utilize less material and energy to manufacture and use and hence are sounder from both an economic and an environmental point of view.

Some progress in these areas has already been made. Shifts to larger package sizes, the two-piece drawn and iron steel can and the more efficient use of paperboard in paper packaging applications have all signalled increased interest in packaging economy and resource conservation. Yet many new package designs still continue to utilize increasing quantities of materials and energy to manufacture as they advertise and display a particular product.

It is certainly clear that much still needs to be done, both in terms of product redesign and also in terms of urging greater use of environmentally and economically proven designs. Because of the nature of these issues, and the very strong interests and constraints of those seeking constructive design changes, a cooperative effort between industry, government, and both consumer and environmental groups would likely serve the public interest best. Voluntary guidelines, drafted together by representatives of both the public and private sectors, may be the ideal means of achieving the desired environmental and resource conservation ends. Certainly, acknowledgment of both the possibility and the desirability of working together in a voluntary framework would be a welcome shift away from the seemingly endless confrontations that have only served to polarize the differences between the business and environmental communities rather than accentuate their common interests.

TABLE 1

CONSUMPTION OF PACKAGING MATERIAL

Packaging Material	Total (10^3 tons) 1958	1971	Percent Change 1958-1971	Per Capita (lbs.) 1958	1971	Percent Change 1958-1971
Paper*	16,552	27,700	+ 67.3	193.0	271.3	+ 40.6
Glass	5,933	11,100	+ 87.1	69.2	108.7	+ 57.1
Steel	6,198	7,255	+ 17.1	72.3	71.1	- 1.7
Aluminum	97	757	+680.4	1.1	7.4	+572.7
Plastic	368	2,900	+688.0	4.3	28.4	+793.0
Wood and Miscellaneous	6,212	10,613	+ 84.2	72.4	103.9	+ 43.5
TOTAL	35,360	60,325	+ 70.6	412.4	590.8	+ 43.3

Source: 1958 data from:
Darnay, A., and W. E. Franklin. The role of packaging in solid waste management, 1966 to 1976. Public Health Service Publication No. 1855. Washington, U.S. Government Printing Office, 1969. 205 p.

1971 data from:
Containers and packaging, U.S. Department of Commerce, Bureau of Domestic Commerce, 1971-1972.
The statistics of paper. New York, American Paper Institute, 1972. 41 p.
Shipments of steel products by market classifications. Washington, American Iron and Steel Institute, 1972. 9 p.

*Paper figures represent tonnage of paper packaging produced rather than tonnage of paper packaging consumed. Other material categories reflect consumption of packaging material.

TABLE 2

PACKAGING MATERIAL CONSUMPTION
IN RELATION TO TOTAL MATERIAL CONSUMPTION (1971)

Material	Packaging[1] (10^3 tons)	Total Packaging and Nonpackaging (10^3 tons)	Packaging Percentage
Paper	27,700	58,652	47.2
Glass	11,100	14,900	74.5
Steel	7,255	87,038	8.3
Aluminum	757	5,074	14.1
Plastic	2,900	10,000	29.0

Source: The statistics of paper, American Paper Institute, 1972.
Shipments of steel products by market classifications, American Iron and Steel Institute, 1972.
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TABLE 3

ENERGY CONSUMPTION ASSOCIATED WITH PRODUCTION OF RAW MATERIALS FOR PACKAGING, 1971[1]

Packaging Material	1971 Consumption (10^3 tons)	Energy Per Ton (BTU X 10^3)	Total Energy Consumed (BTU X 10^9)
Paper	27,700	40,800	1,130,000
Glass	11,100	15,256	169,342
Steel	7,255	29,590	214,675
Aluminum	757	196,632	148,850
Plastic	2,900	37,088	107,557
TOTAL	49,712	319,366	1,770,424

Source: Gordian Associates, Energy consumption for six basic materials industries.

[1]Energy consumption figures include total electrical energy fuel input as well as final material production energy.

TABLE 4

GLASS PACKAGING FOR CONSUMER PRODUCTS

Packaging End Use	Total (10^3 tons) 1958	1970	Percent Change 1958-1970	Per Capita (Lbs.) 1958	1970	Percent Change 1958-1970
Food						
Beer	410.1	1912.5	+366.3	4.8	18.7	+289.6
Soft Drinks	359.3	2511.3	+598.9	4.2	24.6	+485.7
Prepared Beverages	678.6	841.9	+ 24.1	7.9	8.3	+ 5.1
All Other	1988.7	2950.4	+ 48.4	23.2	28.9	+ 24.6
Total	3436.7	8216.1	+139.1	40.1	80.5	+100.7
Household Supplies	108.9	40.3	- 63.0	1.3	0.4	- 69.2
Health and Beauty Aids	1219.3	1244.7	+ 2.1	14.2	12.2	- 14.1
Other General Merchandise	304.8	105.2	- 65.5	3.6	1.0	- 72.2
TOTAL	5069.7	9606.3	+ 89.5	59.2	94.1	+ 59.0

Source: An evaluation of the effectiveness and costs of regulatory and fiscal policy instruments on product packaging, Research Triangle Institute.

TABLE 5

ALUMINUM PACKAGING FOR CONSUMER PRODUCTS

Packaging End Use	Total (10^3 tons) 1958	1970	Percent Change 1958-1970	Per Capita (Lbs.) 1958	1970	Percent Change 1958-1970
Food						
Frozen Food	16.3	52.8	+ 223.9	0.2	0.5	+ 150.0
Soft Drinks	--	151.9	N/A	--	1.5	N/A
Beer	--	273.5	N/A	--	2.7	N/A
Baked Goods	12.3	34.3	+ 178.9	0.1	0.3	+ 200.0
All Other	24.2	300.3	+ 1,140.9	0.3	2.9	+ 866.7
Total	52.8	812.8	+ 1,438.8	0.6	7.9	+ 1,216.7
Household Supplies and Health and Beauty Aids	10.1	20.2	+ 100.0	0.1	0.2	+ 100.0
Other General Merchandise	12.4	31.8	+ 156.5	0.1	0.3	+ 200.0
TOTAL	75.3	864.8	+ 1,048.4	0.8	8.4	+ 950.0

Source: An evaluation of the effectiveness and costs of regulatory and fiscal policy instruments on product packaging, Research Triangle Institute.

TABLE 6

PRODUCT CONSUMPTION IN RELATION TO PACKAGING CONSUMPTION
(Pounds per capita)

Product/Package	1958	1970	Percent Change
Dairy			
Product Consumption	398.0	354.0	- 11.1
Package Consumption	10.6	13.3	+ 25.5
Cereals, Flour and Related Products			
Product Consumption	150.0	140.0	- 6.0
Package Consumption	0.8	0.9	+ 12.5
Produce			
Product Consumption	90.2	80.0	- 11.3
Package Consumption	5.3	7.3	+ 37.7

Source: Packaging data from:
An evaluation of the effectiveness and costs of regulatory and fiscal policy instruments on product packaging, Research Triangle Institute.

Product consumption data derived from:
Food, consumption, prices, expenditures, U.S. Department of Agriculture.

TABLE 7

FOOD AND BEVERAGE INDUSTRY
PACKAGE CONSUMPTION AND EMPLOYMENT

Year	Containers (billions)*	Shipment Value (million $)+	Employment (thousands)+
1967	77.88	83,975	1,650
1972	102.97	109,540	1,568
% Change	+ 32%	+ 30%	- 5%

*Midwest Research Institute, Base line forecasts of resource recovery.

+U.S. Department of Commerce, U.S. industrial outlook 1974.

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