特別講演会　要旨

If Recycling Is the Answer, What Is the Question?

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What have you, personally, done to help the environment? Unless you are a committed activist or work in an environmental profession, the answer is probably that you have tried to make ecologically informed purchases, reduced (or eliminated) unnecessary trips in your automobile - and recycled your household solid waste.

Recycling has become the universal environmental activity of the 1990s. In the United States, more than 7,000 municipal programs collect recyclable paper, packaging, and yard waste from households. More adults participate in recycling on a regular basis than vote for president. "Recycling," says journalist Jerry Powell, "is more popular than democracy."

In Europe, Germany's 1991 packaging ordinance has led to the collection and recycling of more than two-thirds of the nation's used packaging, though at great expense. Other European countries have modified the German approach in the hope of achieving similar results at lower costs. Additional recycling initiatives have appeared in urban areas around the world.

Why do we recycle? It is a profitable activity only for relatively low-income people (and for a handful of specialized businesses). In the cities of developing countries, countless scavengers pick over the waste found on the streets and in land fills, pulling out anything of value in order to resell it. But as economies grow and incomes rise, scavenging tends to disappear, displaced by higher-wage occupations. Recycling as it occurs in developed countries is a different process, motivated by altruistic concerns for the community, the environment and the future rather than by hope of personal economic gain.

The erratic economics of scrap markets

Recycling enjoys broad popular support, but there is no consensus about the benefits it is expected to provide. Some people believe that recycling is saving money for their municipality, by reducing the costs of garbage collection and disposal. Analysis of U.S. recycling costs, however, suggests that only the best programs, such as the one in Seattle, consistently save money for their communities. Average programs save money in some years, but add to municipal costs at other times.

It is difficult to predict the "normal" costs of recycling, not only because there is wide variation in the efficiency of local operations, but also because of the continual changes in scrap prices. Recycling programs receive revenues from selling recovered materials in scrap markets, where prices fluctuate wildly. Some grades of scrap paper sold for six to eight times as much in 1995 as in 1993, and then came

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crashing back down in 1996.

My estimate is that an average American recycling program would have reduced municipal waste management costs by $5 per household in 1995 when scrap prices were high, and increased municipal costs by $21 per household in 1993 when prices were low. Efforts to improve the efficiency of recycling will of course continue -- but so will the fluctuations in scrap prices, frustrating any attempt at a precise analysis of costs and benefits.

The vanishing landfill crisis

Another popular reason for recycling is the perceived lack of land fill space, and the fear that there will soon be nowhere left to put our garbage. Five to ten years ago, it was commonly believed that the United States faced a "landfill crisis." Many landfills were closing, while few were opening; no one wanted to live near a dump. The future of traditional waste management was generally agreed to be bleak.

For some densely populated parts of the world, a shortage of land fill space is a reality today -- but in most of America, the crisis never arrived. The few new landfills that opened were huge, while most of the old ones that closed were small. As a result, available landfill capacity increased in some regions of the country.

It is reasonable to worry about the environmental implications of discarding and burying useful materials in our trash. But that long- term concern is not the same as an immediate landfill problem. A misplaced air of crisis may make it harder to understand the underlying issues, just as in the "energy crisis" of the 1970s, when panic over a fictitious short-term scarcity of gasoline obscured the real long-term dilemmas about the sources and uses of energy.

Materials, manufacturing, and health hazards

There is still an important meaning and value to recycling, even in the absence of a land fill crisis or an immediate opportunity for profit. Waste disposal is not the whole story; a stronger case for recycling rests on its benefits in resource use and manufacturing. The products that consumers buy and discard are made by industry, and the process of manufacturing most goods has far greater environmental impacts - for example, much greater toxic emissions ~ than disposal of the same things in modern land fills. Recycling is good for the environment because making almost anything out of recycled material causes lower industrial emissions than making the same thing out of virgin material. Using less stuff in the first place is even better for the environment than recycling.

Recycling and waste reduction are also important because they minimize the use of irreplaceable natural resources. The future for the paper industry can be made secure because its raw material - mainly trees - is renewable, can be grown in sustainable, carefully managed tree plantations and its product is recyclable. Metals cannot be grown; burying them in landfills reduces the useable supply of metals for future generations. Plastics, interestingly enough, could be made on a sustainable basis from renewable biomass (plant) materials, but so far this process has remained prohibitively expensive. Today's plastics, of course, are made from nonrenewable fossil fuels and production of fast-food packaging may not be the highest-value use

of the world's finite supply of petroleum.

Which production processes are worst for the environment? I directed a three-year study that performed a life-cycle analysis of the leading packaging materials used in the U.S.; similar studies have been done in other countries. We found that production of one common material caused by far the greatest toxic emissions, per ton of output: polyvinyl chloride (PVC). Several of the chlorinated organic compounds released during PVC production are known to be human carcinogens. Production of most other common materials, including the other leading plastics, results in much smaller quantities of hazardous emissions.

Waste reduction: when less is more

Among materials other than PVC, we found a simple pattern: the best choice for the environment is almost always the lightest-weight one. In some cases this is a matter of common sense. When the same food can be bought with differing amounts of packaging, the environmentally best option is the one with the least packaging per unit of food. In other cases the choice is less obvious.

For example, although glass has a clean image and is easily recycled, it is also heavy. A glass bottle containing juice weighs about ten times as much as a plastic bottle or paperboard carton containing the same amount of juice. If the glass bottle is used only once before it is discarded or recycled, then it is worse for the environment than one of the lighter-weight alternatives. (We reached this conclusion only for single-use glass bottles. It does not necessarily hold when reusable bottles are repeatedly returned to the bottler, washed, and refilled - as is still common for beer and soft drinks in many countries, but almost unknown in the U.S. today. Refillable glass bottles can be the environmentally preferred choice if return rates are high and average distances to bottling plants are short.)

Of course, the choice of packaging is never made on environmental grounds alone. Although one package may be environmentally preferable, another may be easier to hold, drink from, reseal, etc. In practice, trade-offs will inevitably be made between what is best for the environment and what is most convenient for the consumer.

It is also true that making almost anything from recycled materials is better than using the same amount of virgin materials. Making recycled aluminum from old beverage cans uses only 5% as much energy as making new aluminum from bauxite, and avoids most of the pollutant emissions that accompany virgin production. The benefits from recycling other materials are not quite as dramatic, but are still important. If glass bottles are being used, it is desirable to make them from recycled glass. However, the environmental savings quickly vanish if heavier, recyclable products replace lighter-weight, nonrecyclable ones.

In the case of food packaging, for safety and hygiene reasons it is generally not permissible to use recycled paper and plastic materials for food contact purposes. But closing the loop (i.e. using recycled material to make the same product again) is no more environmentally desirable than open loop recycling (i.e. using recycled material to make another product). What is important is that recycled material replaces the environmentally more damaging use of virgin material somewhere in the economy, not that it returns to the same industry or product line.

Can the market be wrong?

Recycling, American style, conserves materials and reduces the environmental impacts of manufacturing. However, as estimated above, an average American recycling program is cheaper than traditional waste disposal only when scrap prices are highest. At other times, it is slightly more expensive than burying everything in a land fill. So without public initiatives, the private sector would not do much recycling, since it would not find recovery of most household materials to be reliably profitable.

Does this mean that recycling is a bad idea? The increasingly cost-conscious debates about public policy often suggest that the free market is never wrong, and that programs such as recycling should be pursued only to the extent that they can save money. But this pessimistic conclusion misses the real reasons for recycling. In fact, recycling is an attempt to answer at least three questions that the market rarely articulates.

First, what new technologies will emerge and become profitable when there is public pressure to reduce, reuse and recycle the material goods that we buy? The techniques of production that are profitable today evolved over the last century, in a context of cheap, often publicly subsidized, virgin raw materials. Policies that push industry in the opposite direction will, over time, lead to a different set of production techniques and a different calculation of profitability. The point is not to reject the market, but to consciously choose the environmental context within which the market will operate. Environmental clean-up services are a fast-growing industry, as a result of the environmental concerns, policies and regulations of the last 25 years. Industries based on recycling may come to prosper as well, for similar reasons.

Second, what provision should we make for the material welfare of future generations? Economic techniques such as cost-benefit analysis are designed to weigh the interests of people who are alive today. Since our obligation to unborn future generations is not expressed in the market, it is not reflected in current prices, costs, and benefits. Yet it is clear that many people care about leaving a liveable world for our descendants. Recycling is in part an attempt to conserve materials for the future, even if they appear cheap enough to waste freely at present.

Third, how should we describe and respect the value of nature? Air and water pollution, and many other forms of environmental degradation, cause a harm that has no price — they diminish something whose worth was never expressed in monetary terms. Economists have proposed methods for assigning prices to environmental damages, but this has remained largely a theoretical endeavor. Even in theory, pricing the environment may miss the point: the things we care most about, such as love, religion, our natural and cultural heritage, are inherently priceless; they have a dignity rather than a price. Recycling is a small step toward a more dignified future.

Conclusion: toward sustainability

While recycling raises sweeping questions about the environment and the future, it also remains firmly anchored in the daily realities of collection trucks, processing

plants and local budgets. Although immediate profits or losses should not be the only criterion for judging a recycling program, neither should they be ignored. Budgets will always be limited, and it will always be worthwhile to try to make recycling more cost-effective, to do as much as possible with the resources that are available.

Remember that recycling addresses long-term environmental goals, not an immediate crisis. Thus it is not necessary, nor is it technically feasible, to recycle everything in the municipal waste stream. Some things remain prohibitively expensive to recycle, and efforts should be concentrated elsewhere. Clarity about the goals of recycling should make it possible to set priorities, selecting areas where the greatest quantities of useful materials can be conserved or recovered, and the greatest environmental gains achieved, at the lowest cost.

Clarity about the goals of recycling also leads to the conclusion that waste reduction can be an even better route to the same destination. When the pursuit of waste reduction and of recycling point to different choices, as in the case of juice containers, the former is often better for the environment. The objectives that motivate recycling can sometimes be best advanced by minimizing material use, rather than by maximizing recycling. Just as energy conservation is often a cheaper and cleaner alternative to new energy supplies, waste reduction can be a cheaper and cleaner alternative to new waste management services.

In the end, recycling makes a modest but valuable contribution to the creation of an environmentally sustainable future. It is far from being the most urgent environmental policy initiative under discussion today; it is distinguished by being the most accessible step for millions of people to take in the course of their daily lives. Recycling is the answer to several important questions, including the one that opened this article. What can you, personally, do to help the environment?

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