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Can We Make Garbage Disappear?

By Ivan Amato

Whoever said "waste not, want not" hasn't had much influence on 276 million Americans. In 1997 we gave a collective heave-ho to more than 430 billion lbs. of garbage. That means each man, woman and child tossed out an average of nearly 1,600 lbs. of banana peels, Cheerios boxes, gum wrappers, Coke cans, ratty sofas, TIME magazines, car batteries, disposable diapers, yard trimmings, junk mail, worn-out Nikes--plus whatever else goes into your trash cans. An equivalent weight of water could fill 68,000 Olympic-size pools.

And that's just the relatively benign municipal solid waste. Each year American industries belch, pump and dump more than 2.5 billion lbs. of really nasty stuff--like lead compounds, chromium, ammonia and organic solvents--into the air, water and ground. That's about 400 Olympic poolfuls of toxic waste.

The really bad news is that most of the planet's 6 billion people are just beginning to follow in the trash-filled footsteps of the U.S. and the rest of the developed world. "Either we need to control ourselves or nature will," says Gary Liss of Loomis, Calif., a veteran of recycling and solid-waste programs who advises clients aiming to reduce landfill deposits. As he sees it, garbage--maybe every last pound of it--needs to become a vile thing of the past.

That may seem impossible, but it's not unprecedented. In nature, Liss points out, there is no such thing as waste. What dies or is discarded from one part of an ecosystem nourishes another part. Liss says humanity can emulate nature's garbage-free ways, but it will require innovative technology and a big change in attitude.

We can get a glimpse of a less profligate future in Kalundborg, Denmark. There, an unusual place called an "eco-industrial park" shows how much can be gained by recycling and resource sharing. Within the park, a power company, a pharmaceuticals firm, a wallboard producer and an oil refinery share in the production and use of steam, gas and cooling water. Excess heat warms nearby homes and agricultural greenhouses. One company's waste becomes another's resource. The power plant, for example, sells the sulfur dioxide it scrubs from its smokestacks to the wallboard company, which uses the compound as a raw material. Dozens of these eco-industrial parks are being developed all over the world.

Biotechnology is giving us additional tools to cope with waste--and turn it to our advantage. We now have microbes that can take toxic substances in contaminated soil or sludge--including organic solvents and industrial oils--and convert them into harmless by-products. Soon we may be using genetic engineering to create what Reid Lifset, editor of the Journal of Industrial Ecology, calls "designer waste streams." Consider all that stalk, or stover, that every corn plant grows along with its kernels. Scientists at Monsanto and Heartland Fiber are working toward engineering corn plants with the kind of fiber content that paper companies would find attractive. So long as the genetic tinkering poses no ecological threat, that approach could tap into a huge stream of agricultural waste, turning some of it into an industrial ingredient.

In consumer markets, recycling has already spawned an army of alchemists. Jackets are being made from discarded plastic bottles, briefcases from worn-out tires and belts from beer-bottle caps. Even though the U.S. has barely begun to get serious about recycling, about 25% of its 430 billion lbs. of municipal garbage is now salvaged, at least temporarily, for some sort of second life.

Recycling will gain momentum as we develop materials that are easier to reuse. For example, Jesse

Ausubel , director of the Program for the Human Environment at Rockefeller University, predicts that architects will increasingly rely on new types of foamed glass that can be made unusually strong but still lightweight. Glass is a very recyclable material made from sand, and it can be crushed back essentially into sand. Ausubel thinks we could see foamed glass replace much of the concrete in today's buildings.

There are limits, of course, to how many lives you can give a pile of debris. In the long run, we have to reduce the amount of material we use in the first place. Some progress is being made--aluminum cans and plastic soda bottles have become thinner over the years, for example--but more sweeping reductions will require a whole new kind of manufacturing process.

That, says Lifset, is where nanotechnology plays a role. In this emerging field, which employs just about every kind of scientific and engineering discipline, researchers expect to create products by building them from scratch, atom by atom, molecule by molecule. This bottom-up nanotechnological way of making things differs from the traditional drilling, sawing, etching, milling and other fabrication methods that create so much waste along the way.

Researchers have made headway toward molecule-size transistors and wires and even batteries thousands of times as small as the period at the end of this sentence. These laboratory feats make talk of sugar cube-size computers less speculative than it was a few years ago. Says Lifset: "A lot of the consumer goods and industrial equipment could become dramatically smaller when nanotechnology comes online. That, plus more efficient recovery of the discarded goods, ought to translate into huge reductions in waste."

But technology is not enough. Just as critical are changes in attitudes and lifestyles. Brad Allenby, AT&T's vice president for environment, safety and health, believes our move from the industrial age to the information age could help enormously. At last count, he says, 29% of AT&T's management force telecommuted, meaning less reliance on cars. This, Allenby speculates, could be part of something bigger--a shift in our view of what enhances our quality of life. Maybe we'll put less value on things that use lots of materials--like three cars in the family driveway--and more on things that don't swallow up resources--

like telecommuting and surfing the Internet. Maybe downloading collections of music from the Web will reduce the demand for CD cases. And while visions of a "paperless office" have proved wildly wrong so far, we still have an opportunity to use computers to cut consumption of paper and the trees it comes from.

Allenby thinks of such trends as "dematerialization." The deeper dematerialization goes in society, the less stuff there will be to discard. What's more, as society becomes more information-rich, the easier it will be to find uses for the diminishing amount of discarded materials. Maybe, with the help of brokering services on the Internet, we can generalize the principle that governs garage sales: One person's garbage is another's treasure. When that attitude goes global, the human beings of the third millennium may be able to look back on their former garbage-producing ways as a forgivable error of their youth as a species.

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