

Zero Waste: 'Nil to Landfill' Is Now a Practical Goal

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The push to divert virtually all material from landfills and incinerators is strongest in Europe, but it has also gained a foothold in the U.S. Zero waste goals are increasingly being embraced by progressive communities and companies that see value in turning waste streams into profit streams. And with more than 70 extended producer responsibility (EPR) laws enacted on the state and local level, some with industry support, corporate America is becoming a partner in waste reduction.

Europe is the world's high achiever when it comes to zero waste. Some municipalities there are well on their way to conserving and recovering all the resources that used to be lost to landfills and incinerators, without burying or burning any waste at all — the definition of zero-waste established by the international alliance on the subject.

Capannori, Italy, for instance, has earned enough from selling its former "garbage" to recycling plants that its zero waste scheme (now at more than 80% diversion) is self-sufficient, and even saved the local council more than \$2.7 million in 2009. The city has plowed the savings back into further waste-reduction efforts.

Capannori is likely to achieve zero waste by 2020, which is an overall European Union goal. In 2012, the European Commission and the European Parliament outlined their ambitions: "By 2020 waste is managed as a resource. Waste generated per capita is in absolute decline." That remains a big challenge, especially with Europe's economic downturn. According to Zero Waste Europe, a non-profit coalition bringing together groups and governments, in 2011 the European Union countries were still burning or burying 60% of their waste, and recycling or composting just 40%. That's a long way from the ultimate goal, but better than the United States.

Another early zero waste pioneer is New Zealand. As noted in Paul Connett's *The Zero Waste Solution*, by early 2005 some 72% of the country's local councils had established no-landfill targets, and by 2008 it was adopted as a national goal. New Zealand's effort later lost momentum, but it has pockets of great success, including a 90% diversion rate by the Opatiki District Council.

American Grassroots Progress

According to the Environmental Protection Agency (EPA), America recycled only 35% of its municipal solid waste in 2011, a considerable improvement from the 6% rate of 1960, but far behind other nations. In fact, according to Elizabeth Royte in her book *Garbage Land*, Americans throw out "more stuff, per capita, than any other nation in the world, and 2.5 times the per-capita rate of Oslo, Norway." The latest per-person figure is 4.4 pounds daily (with 1.53 pounds of that recycled or composted).

And yet achieving zero waste has become part of the national conversation, embraced by American corporations with a zeal that would have been unthinkable a decade ago. As the Initiative for Global Environmental Leadership (IGEL) noted in its recent report, [The Green Sports Movement](#), professional and college leagues and teams have endorsed zero waste concepts with fervor, and many have achieved high diversion rates.

To a significant degree, zero waste in the U.S. is being driven by regional, state and private initiatives, including strong corporate participation, without any foreseeable support from Washington. In California, the statewide Integrated Waste Management Board has a zero waste goal, as do the counties of Santa Cruz, Del Norte, San Luis Obispo and San Diego. California cities voting for zero waste

include San Francisco, Berkeley and Palo Alto. Austin and San Antonio in Texas, New York City and Seattle are also leaders.

San Francisco makes an interesting case study, because with partner Recology, an employee-owned and locally based waste management company, it is vying to become the first zero waste city in the U.S., with a goal of 2020. As recently as 1989, 90% of San Francisco's garbage ended up in landfills (some 900,000 tons annually). But now that ratio has been nearly reversed. Among the repurposed waste streams in the city are soda cans that have been crushed and baled as raw material for more aluminum cans, used construction materials that are reused for new buildings, and food scraps and yard clippings (some 400 tons a day) that are turned into compost.

In some San Francisco neighborhoods, consumers can get a 10% discount off the trash bill for each week they don't put out their garbage cans. If they skip collection day twice in one month, they get a 20% discount. Businesses can get waste audits, and households can schedule meetings to talk about reducing garbage streams. "We're proud of the 80% diversion rate, the highest in the country, certainly of any city in North America," Mayor Ed Lee told *PBS*. "And we're not going to be satisfied with that. We want 100% zero waste. This is where we're going."

According to Heather Achilles, an engineer from IBM's Next Generation Computing Research, "Cities have a lot of data related to the collection of trash, including billing, truck routing, frequency of pickup and materials taken in. The problem is that there are no standards, so it's hard to put the information together and use it to make good decisions — such as maybe having only one pickup a week instead of two, if the collections are going out half empty. Our software takes data from many sources and pulls it into IBM's Smarter Cities computing platform that many cities are already using. The data can be analyzed and used to put pilot programs in place for zero waste, if that's the city's goal."

Many cities perform annual trash inventories known as waste audits, Achilles said, but don't always optimize their use of the information that comes out of them. "We can take that data and produce a breakdown that will help identify which waste streams can and should be diverted — like valuable scrap aluminum, if there's enough of it being collected." The city of Dubuque, Iowa is also working with IBM on more efficient waste management.

According to the Institute for Local Self-Reliance, some 30 years ago, "many solid waste planners thought no more than 15% to 20% of the municipal waste stream could be recycled. Today, numerous communities have surpassed 50% recycling, and many individual establishments — public and private sector — such as office buildings, schools, hospitals, restaurants, and supermarkets, have approached 90% and higher levels." The growing zero waste buy-in on the corporate level is impressive. Zero waste programs that advanced rapidly in Europe, Canada, Japan, Israel and China have run into business lobbying roadblocks in the United States, but that opposition is eroding as companies, realizing there is revenue in waste, set their own ambitious waste reduction goals.

Industries have begun to make striking zero waste claims. General Motors has 110 landfill-free facilities worldwide, with 97% of generated waste either recycled or reused — an average of 3% is converted to energy, a process not allowed by some zero waste guidelines. For its 109th plant, in Rochester, New York, GM spent four years and seven attempts to figure out a recycling process for a stubborn, oily filter sludge. The 110th was GM's 12,000-worker, 5.5-million-square-foot corporate headquarters in Detroit, announced in December of 2013. Other U.S. automakers are not far behind. According to Andy Hobbs, director of the Ford Environmental Quality Office, 14 of the company's plants worldwide are "nil to landfill." In 2012, Ford recycled 586,000 tons of scrap metal in North America, and generated \$225 million in revenue through the process. Ten of Honda's 14 American plants are also zero waste to landfill.

In something of a milestone, California's Sierra Nevada Brewing Company, with a closed-loop approach, has achieved a 99.8% diversion rate from landfill, incineration and the environment. A number of things helped Sierra get there, including reducing packaging and ensuring it was recyclable, capturing and reusing carbon dioxide (such as for pressurizing tanks), addressing transportation, and recycling or composting nearly all the solid waste produced in the brewing process.

Founding members of the U.S. Zero Waste Business Council (USZWBC) include the City of Los Angeles, Austin Resource Recovery (with a 90% reduction goal by 2040 or sooner), the Walt Disney Company (which calls zero waste a "journey"), Raytheon, Earth Friendly Products and the American Licorice Company. In March of 2013, the USZWBC issued zero waste business certificates to Whole Foods for its achievement at three stores in San Diego County. The stores achieved more than 90% diversion from landfill, incinerator and the environment, and that entitled them to a bronze-level award. Sierra Nevada was the first to reach the highest level, which is platinum.

Is Zero Waste Possible?

Many experts say it's possible to divert all of America's waste from its landfills. But such a zero waste achievement would require a national consensus involving manufacturers, the federal government, the non-profit sector, states, municipalities and consumers.

"Yes, zero waste is possible, but I don't think it's likely," said [Robert Giegengack](#), a professor in the department of earth and environmental science at the University of Pennsylvania. "It's not a new idea — it characterized subsistence agrarian societies for millennia; it was sought as a goal during World War II, and it has been resurrected in the last 30 years or so — and we are making progress in getting there. People are working together on the common goal, particularly on food waste." Giegengack pointed out that landfill dependence is in many ways a post-World War II phenomenon, as the U.S. switched to a disposable society.

High diversion rates — and even zero waste — are increasingly practical as waste streams are turned into revenue streams for companies and municipalities. For companies such as Rubicon Global, Terracycle and Heritage Interactive, the prime directive is repurposing materials and keeping them out of landfills. "Zero waste is absolutely possible," said Nate Morris, co-founder and CEO of Rubicon Global, which services clients such as 7-Eleven, and Wegmans. Wegmans' uniforms, for example, are transformed into car insulation. "Waste is the biggest piece of low-hanging fruit out there, with bigger environmental results than installing solar panels or changing fleets to biodiesel. Eighty percent to 90% diversion is possible today."

"A future without waste and toxic materials is not just a dream, it's a necessity," says the Zero Waste Alliance (ZWA), based in Oregon. "Waste reduces the effectiveness of our businesses and harms the vitality of our communities." ZWA counsels companies to "map" their waste streams, identifying volume, make-up and sources, and locate opportunities to turn that often-useful material into a revenue stream. If your organization wants to compost its garbage stream, is there local infrastructure that can accept the material?

According to Lynn Landes, founder of Zero Waste America, "Under current conditions, it is possible to achieve zero waste. It has to be that way, so we don't burn or bury our waste. Landfills and incineration should be off the table. Zero waste is the only practical way of managing our resources — and minimizing the harmful results of manufacturing and production."

The federal government has zero waste on its radar screen. According to Mathy Stanislaus, assistant administrator in the Environmental Protection Agency's (EPA) Office of Solid Waste and Emergency Response, "It's being discussed at every level, including states, local governments and the corporate

sector. We're seeing a big trend to re-engineer and remanufacture material that would otherwise go to landfills. We're not sure how many companies and organizations have actually adopted zero waste policies, but many are set on reusing as many materials as possible."

The EPA, Stanislaus said, is "moving the marketplace" by recognizing companies that have voluntarily committed to achieving a certain recovery rate — and then achieved that goal. For stakeholders looking at zero waste, the agency provides scientific information and risk analysis. "And we're working on streamlining regulations to foster innovation in the recycling realm. We're providing more certainty for manufacturers that reuse materials."

The EPA believes that recycling is good for the economy. "If you divert one ton of waste from landfills, it pays \$101 more than if it were just managed as waste," Stanislaus said. "There's a delta of increase in salary and wages. And with that same diversion, sales go up \$135." He also noted the value hidden in the waste stream, since a metric ton of obsolete cell phones contains 6.6 pounds of silver, more than half a pound of gold and almost three tenths of a pound of palladium. Landfill elimination "is a goal we want to strive for. If waste goes to landfills, it means we're not doing a good job of managing it."

In July of 2013, Wharton turned its annual human resources lunch into its first-ever zero waste event. According to Rafael de Luna III, the associate director of sustainability for Wharton Operations, the plates and utensils at the lunch were compostable, and not only were waste bins set up with explanatory signage, but three of the five stations had volunteer monitors making sure waste was properly directed. That last precaution proved vital. "The stations with monitors had no contamination," de Luna said. "And those without people being stationed were in some cases so contaminated with non-compostable material that the contents just ended up being thrown out as trash."

Wharton is averaging between 75% and 90% diversion rate at its zero waste events. On average the school hosts 15,000 annual events, many of which serve food (almost half of the school's garbage stream) and now many of the event planners are working with Wharton Operations to make them zero waste. "I approached Amy Reese, the special events manager at Wharton Operations, and asked for an audience with the caterers," de Luna said. "We explained what we're trying to do, and that we want zero waste events to be an option. We don't think we've even scratched the surface of what we can achieve with zero waste, and now we're getting weekly requests for it."

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—The Institute for Local Self-Reliance

Wharton was the first school within the university to perform a waste stream audit, initially only for one of its academic buildings and one of its cafes. Now in its fourth year, the audit program has expanded to another Wharton building, and other schools at Penn are doing the same for their buildings. Besides food waste, the largest categories are plastic (11%) and Styrofoam (10%) containers, reflecting the large amount of takeout meals consumed. Paper in its myriad forms is 18%. After one event, de Luna said he found "200 pounds of perfectly good food that was being thrown away," and the university is taking steps to minimize that kind of waste.

The road to zero waste can be bumpy, says Dan Garofalo, environmental sustainability director for the University of Pennsylvania. "Although we're on a good trajectory for traditional recycling, food waste is really a challenge for us right now." But Penn came up with a comprehensive solution — beginning in 2010, it began sending four tons of organic waste per week to the Wilmington Organic Recycling Center in Delaware, the largest composting facility on the East Coast.

"In theory, it's pretty straightforward," Garofalo said. "Students scrape waste into compost bins, and the material ends up on the loading docks, where it's collected twice a week by Waste Management. Unfortunately, it wasn't happening." Garofalo noticed during spot checks that the bins were often empty at the end of a shift, and he discovered that although the system was in place, it was poorly understood by a kitchen staff with high turnover. "The process had temporarily broken down. And there was no feedback loop to report when it wasn't working." The university facilities and dining staff worked together over the winter break to get the system back on track – first by holding a training program for all kitchen staff and cafeteria managers, and then implementing a program for regular review and quality control.

Composting has been a trial and error process at the university, with some early experiments in on-site processing failing (in part because of challenges in finding on-campus uses for the end product). Now, Garofalo says, BiobiNs (locally made containers based on a design licensed from an Australian company) are used to store organic waste in an aerobic and odor-free state before it's collected.

The university uses its own garbage compactor trucks to collect municipal solid waste in the morning and recycling in the afternoon. "I'm confident that what is supposed to get recycled actually does," Garofalo said. Meanwhile the university purchasing department is "doing an incredible job" of reducing packaging for office supplies and other projects. A printer management project, using consultants, has greatly reduced the amount of campus paper waste. And students are being recruited through a program called Rethink Your Footprint that includes the distribution of reusable water bottles and coffee cups. As part of the campaign, student Eco Reps set up a mini-bin challenge. At one Penn zero-waste event, QuakerFest 2013 (staffed by student volunteers), 600 pounds of waste was diverted by the 1,400 participants, and only 37 pounds ended up in landfills.

The university's overall recycling rate, if construction waste diversion is included, is 50%. Total waste to landfill is going down 2% per capita annually. The University of Pennsylvania does not yet have a zero waste goal, but it's heading in that direction.

Extended Producer Responsibility

Zero waste made a giant leap forward in 1990, when the Der Grüne Punkt ("Green Dot") program was first enacted in Germany. It made practical the tough national packaging law passed the following year in response to a growing landfill crisis. The law requires companies to either take back their own packaging, or (far more likely) pay a licensing fee and have it recycled through a scheme set up by Duales System Holding. By 1993, 12,000 companies (often branches of U.S. firms that loaded up on packaging at home) had become members. When packaging bears the Green Dot label (now seen in 28 countries) it can be dropped into household bins (paralleling already well-established recycling programs).

Green Dot gave companies a powerful incentive to reduce their packaging, and that's exactly what happened as what's known as Extended Producer Responsibility (EPR) spread throughout Europe and on to Canada, Japan, Israel, Brazil and other countries. "There are more than 30 EPR packaging laws in Europe alone, many of them in place for more than 20 years," says Scott Cassel, CEO of the Product Stewardship Institute (PSI), a U.S. organization that focuses on sustainable end-of-life management for waste streams. In the 1990s, EPR remained below the radar in the U.S., with only a few determined advocates pointing to the success of the German program. Bette Fishbein of the group INFORM, one such pioneer, wrote in 2000, "Since it is the producer that decides how products are designed, providing industry with a direct economic incentive seems the most efficient and effective approach [to reducing waste]."

PSI has been working to change the U.S. status quo. According to Cassel, Massachusetts' director of waste planning from 1993 to 2000, "I came to the conclusion that a key barrier for state waste programs was financing — there wasn't enough money in the system. And so I decided to start an institute aimed at bringing the EPR concept to the U.S." That led to PSI's founding in 2000 as a joint project with the state of Massachusetts. Its first forum that year brought together 100 government officials from 20 states. According to Cassel, 32 states now have at least one EPR law, and more than 76 individual "producer pays" statutes have been enacted. In 2013 alone, nine state or local bills became law. EPR programs for electronics are also growing at the state and local level. More than 25 laws have already been enacted, spurred in part by horrific images of unsafe dismantling operations in Asia.

Connecticut is currently working with PSI through the state's environmental agency to set up product stewardship policies. The initial focus, announced in late 2013, will be on carpeting, batteries, packaging, pesticides and fertilizers. "Recovering the materials in discarded products helps protect the environment, creates jobs and boosts the economy," said Daniel Esty, former commissioner of the Connecticut Department of Energy and the Environment. The prospect for any federal legislation is still slim, though there's been legislative interest in bills on pharmaceuticals and electronics. "Over the next five years, I expect the concept to become much more prevalent at the national level," Cassel said. "It's more efficient to cover all the states with one EPR policy."

Today, companies such as Nestlé Waters North America are embracing EPR. "We've seen the potential power of EPR, and we are bullish on its prospects for recycling in the United States," said Kim Jeffrey, the former president and CEO of Nestlé Waters. When industry signs on, EPR laws can move quickly. The paint industry, via the American Coatings Association (ACA), signed on to an initiative sponsored by PSI to do something about the 75 million gallons of leftover paint, worth \$500 million, that is generated annually and usually ends up in landfills or incinerators. Municipalities spend an average of \$8 a gallon to manage unused consumer paint. The first state law — with manufacturers responsible for collecting and processing waste paint — was enacted by Oregon in 2009, but Cassel says another seven to 10 states are likely to pass similar laws, and seven (including Oregon) already have.

The path isn't always smooth — ACA sued California's environmental agency in 2012, claiming that it had overreached in implementing its paint EPR statute by requiring too much data. According to Alison Keane, a vice president of government affairs at ACA, the state's program was upheld in court, but an appeal is underway. "We want regulatory relief, because the law as currently constituted is unnecessarily burdensome," she said. "But we absolutely remain supportive of EPR laws, and the program in California is ongoing as the case proceeds." Zero waste, said Cassel, "is a concept and a motivator — it's what we all want to see. As we breathe and live, there will always be waste, and getting it down to zero will always be a goal." The good news is that the goal is a lot closer than it has ever been, and an increasing number of advocates dare to think that it's achievable.

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