



BETTER SOLUTIONS

CAPITALIZING ON CHANGE THROUGH NEW TECHNOLOGIES AND NEW THINKING.

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OVERVIEW

As the leading environmental service and solutions company in North America, Waste Management works with our customers to meet their unique service needs. From residential customers, to small businesses, large corporations, manufacturing and even large public venues — we are tasked with providing comprehensive waste solutions to our varied customer base.

We leverage this expertise in a variety of ways:

- › **Public Sector Solutions:** A team of 215 professionals is dedicated to our work with municipalities across the country. With over 5,000 municipal contracts, Waste Management provides a comprehensive suite of environmental solutions. Our services range from waste collection and disposal, recycling and organics collection, processing market and providing necessary infrastructure to manage waste collection and disposal; recycling and organics collection, processing and marketing; and providing necessary infrastructure to manage waste systems effectively and efficiently. We take our responsibility seriously, engaging as partners with our municipal customers to innovate, protect the environment, and leverage data and technology to drive lasting change. We pride ourselves on being involved in the fabric of the community, ensuring that we understand the unique values of local government.
- › **Direct Support of Our Commercial Customers:** Our commercial customers have unique service support needs depending on state and local requirements, cost or a desire for programs designed around specific type of customer base. Waste Management understands that our customers' sustainability needs are varied, and we work with them to meet service needs — whether it involves managing a range of materials for recycling, or providing specially designed containers or staff education.

- › **Sustainability Solutions:** Waste Management's Sustainability Services (WMSS) experts provide creative and comprehensive waste solutions across a wide range of industries, events and customer types. We leverage this expertise by dedicating nearly 400 trained consultants and service professionals who evaluate service options and manage customers' programs on site. [WMSS](#) ensures efficient operations, minimizes environmental impact and instills a culture of safety, while accelerating performance. In the process, customers gain access to Waste Management's resources, technologies and innovations, which comprise the leading portfolio of environmental solutions in North America.

The complexity of our services is seen in the breadth of the waste solutions that we provide. This includes our policy work to identify the areas of greatest environmental impact associated with our industry. An example is our focus on using life cycle assessment to prioritize areas of focus for the greatest environmental impacts.

Life Cycle Assessment Approach to Recycling

The idea of what successful recycling means has evolved significantly in recent years as the waste stream has shifted. Where goals were once focused on weight and volume, Waste Management — along with many other companies, cities, states and even academic institutions — has turned to goals based on environmental attributes, most notably reductions in greenhouse gas (GHG) emissions through a life cycle approach to assessing recycling.



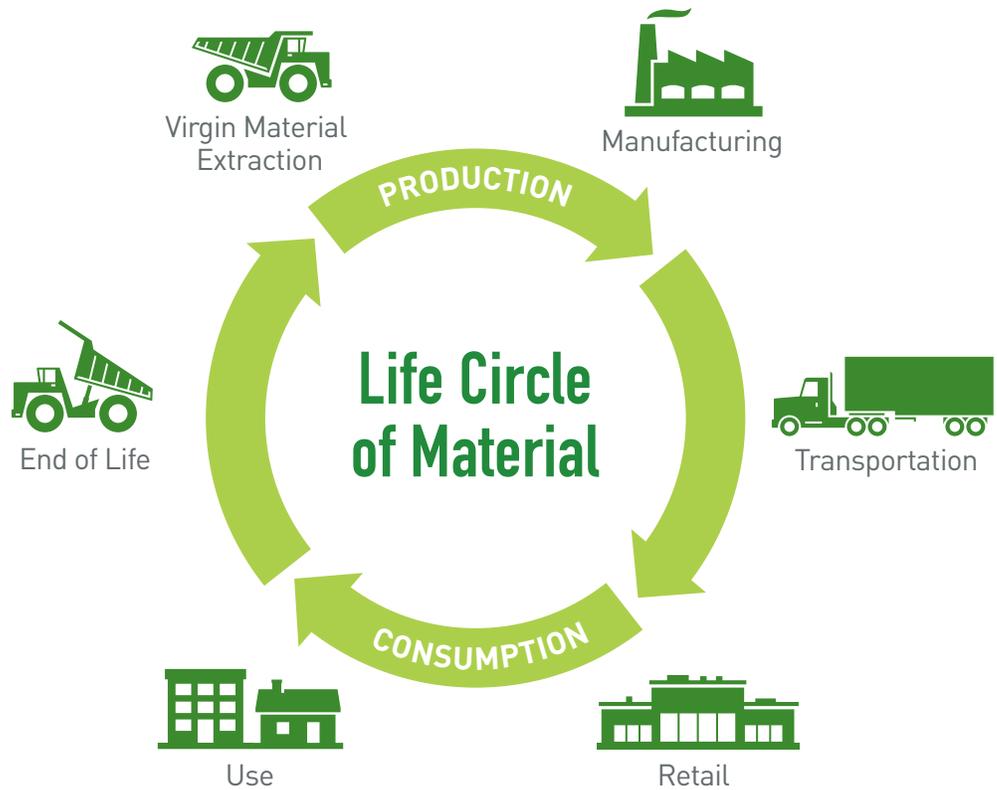
In recent years, Waste Management has aligned with the concept of [sustainable materials management](#) (SMM), a framework that encourages everyone in the recycling value chain to explore the impact of materials across their life cycle. This helps us understand that impacts can occur at all stages — from design and manufacturing, to inputs and outputs of the product, to how people will use and dispose of the product.

The life cycle approach considers the entire life of products from mineral extraction through end of life, and the impacts at each point along the way.

Life cycle thinking quantifies materials, energy consumption and emissions associated with those processes. Evaluating GHG emissions with a goal of reducing them can provide insight into trouble spots or changes that may need to occur to ensure resources are optimized across a product's life cycle.



For our part, we have been closely studying the waste stream to improve our environmental impact, while using more data and marrying the U.S. Environmental Protection Agency's SMM model with Waste Management's cost model to determine cost per ton of GHG emissions reduction in our industry. In doing so, we can prioritize waste management strategies to optimize the environmental benefits from materials across the waste stream.



In 2017, we avoided 32,586,647 MTCO₂e of life cycle emissions through recycling, renewable energy generation and organic material composting.

While we constantly seek to make a positive impact on the environment through a variety of measures, our greatest contribution undoubtedly comes from waste reduction services and recycling. Fully 60 percent of our emissions reduction contribution is tied to our recycling activities alone. And by recycling the right things well, we have the opportunity to reduce GHG emissions by over 80 percent. Significantly reducing GHG emissions is both achievable and essential to ensure our operations have a positive and lasting impact on the environment and the communities we serve.

Establishing New Goals

With this in mind, we've taken a close look at our goals over the past two years. In recent years, the GHG reduction services we offer our customers — recycling, landfill gas-to-energy projects, renewable natural gas projects and carbon sequestration in landfill — helped them avoid over three times the GHG emissions generated by Waste Management's own operations. Recently, we announced our goal to increase those avoided emissions to four times the GHG emissions generated by our operations. Additionally, we've set a science-based goal to increase avoided emissions from recycling by 38 percent by 2028 against a 2010 baseline. This goal aligns with our campaign to improve the quality and quantity of recycling, while reducing its volatility.

WASTE REDUCTION



Through our work on life cycle thinking we have gained renewed appreciation for the first “R” in the waste hierarchy: “Reduction.” While recycling plays an important role in how we manage material, reducing waste offers the greatest environmental benefit of all.



Federal Way Mayor Jim Ferrell (left) with Waste Management driver.

Waste Management has partnered with the City of Federal Way in Washington state for years, to help feed those in need. In 2017, Waste Management drivers collected 12,300 pounds of food — a new record and a shining testament to the giving spirit that makes Federal Way so great.

We work with customers to look beyond diverting waste from landfill to actually eliminating waste to begin with. We analyze choices in procurement, deliveries and packaging and make supply chain recommendations to improve their overall environmental impact and reduce on-site waste. And we implement the recommendations as well. For example, in 2017 our [Sustainability Services \(WMSS\) team](#) worked within customers’ supply chains to implement and expand a returnable parts program that eliminates or vastly reduces single-use parts, along with a launderable wipes program that meets hazardous waste exclusions and reduces waste.

Food Waste Reduction

U.S. EPA, states, local governments and the environmental service sector have increasingly focused on how to avoid food waste and properly manage the food that is ultimately wasted, particularly in terms of capturing its energy resource and avoiding generation of GHGs when disposed. With increased attention to the large quantities and various ways of managing food waste, customers have asked for additional ways to handle source-separated food at its end of life, through composting or anaerobic digestion. The company has responded through its compost and mulching facility network of 40 facilities, 13 of which can accept food waste, and our growing CORE[®] network — four facilities, with more under development.

Preventing food waste upstream, before it becomes waste, benefits both the environment in terms of emissions reduction and communities in need. We are working with U.S. EPA and stakeholders on new ways to avoid emissions from discarded food by reducing the amount discarded.

CUSTOMER SUCCESS STORIES

Reducing Manufacturing Waste

SUCCESS STORY #1

As part of a recent California state grant award, Waste Management of Alameda County, Inc. (WMAC) received funding to purchase equipment for organics processing and to support Alameda County Community Food Bank's (ACCFB) food rescue efforts.

Designed to capture organic wastes not already diverted from landfills through existing Source Separated Organics (SSO) collection programs — and conceived through a meticulous multiyear due diligence process — the facility will dramatically improve organics diversion.

The new processing facility complements the existing three-bin SSO program and is designed to capture organics that remain in the MSW stream. The project is expected to improve Oakland's total waste diversion from 8 percent to 52 percent by diverting 41,540 additional tons per year (TPY) of organics and 26,208 TPY of recycling. The organics diversion alone will avoid 14,459 MT CO₂e per year. And, by 2027, the project will have diverted 305,434 tons of organic waste from the landfill and reduced GHG emissions by 106,495 MT CO₂e.

As part of its overall commitment to the City of Oakland, Waste Management has partnered with Alameda County, the City of Oakland, ACCFB and Stop Waste for food recovery in the county. Founded in 1985, ACCFB has become the hub of a vast collection and distribution network that provides food for 240 nonprofit agencies in Alameda County — distributing more than 25 million meals last year. The funding will support the Food Bank in bringing five additional stores into its network and will match these stores with local ACCFB network agencies. Collection of food from the five additional stores will result in approximately 175,000 meals per year for local populations in need, while diverting 50 TPY in 2018 and 100 TPY from 2019 onward.

SUCCESS STORY #2

WMSS identified alternative processes so that one customer could eliminate a specific type of plastic bag from their manufacturing process. The result of removing this one item from their waste stream was savings in labor, \$214,000 per year for both materials and disposal, and avoiding the life cycle GHGs associated with the product.

SUCCESS STORY #3

A few years ago, we assumed waste/recycling operations for a new customer in the U.S. They had relocated their engine manufacturing operations from the Midwest to the South. During our review of facility operations and waste and recycling practices, we discovered that significant quantities of plastic contaminated with oil were being discarded. The WMSS team discovered that the engine blocks were shipped from the foundry wrapped in plastic and, once received, were submersed in rust preventative and preservative oils. We learned this practice was in effect from when the manufacturing plant was located in the Midwest and the engine blocks were shipped long distances to a high-moisture climate with exposure to both rain and snow. In effect, it was a case of “we've always done it this way.”

After the relocation, the engine blocks were shipped only a few miles and within a dry climate. We engaged multiple stakeholders, including the facility engineering team and convinced them that there was no need to use rust preventatives or preservative oils. This resulted in substantial savings to the facility by eliminating the use of the expensive oils and their subsequent disposal. Since the plastic wrap was no longer contaminated with oil, it could now be recycled instead of disposed.

CASE STUDY

Waste Management Earns “Hunger Hero” Status in Oregon



Oregon Food Bank CEO Susannah Morgan (third from left) with members of the WMSS Public Sector Solutions team.

Waste Management has partnered with the Oregon Food Bank to fight hunger, advance zero waste and strengthen emergency preparedness since 2014. That’s why the food bank honored Waste Management with its prestigious “Hunger Hero of the Year” award.

Oregon Food Bank is the hub for a statewide network of 21 regional food banks and more than 950 hunger-relief agencies. The food bank is based in Portland, Oregon, which is also a world-class sustainability leader and among Waste Management’s most progressive city partners when it comes to innovative approaches to waste reduction.

“At both the City of Portland and the Oregon Food Bank, bold leadership is resulting in important initiatives that synch up with community values,” said Mary Evans, director of Public Sector Solutions for WM-PNW/BC. “For Waste Management, our partnership with the city has helped us see the value of investing in the Oregon Food Bank — to help those in need, bolster emergency preparedness and advance zero waste across the food bank’s statewide network.”

Waste Management first launched its relationship with the Oregon Food Bank in 2014 with a \$200,000 donation, funding an emergency generator for the central warehouse and a back-up fueling system. Together, the emergency generator and the back-up fuel system provide critical emergency support when storms hit and the power fails. The generator keeps food cold and fresh; the fuel system ensures trucks can deliver critical food supplies even when the power fails.



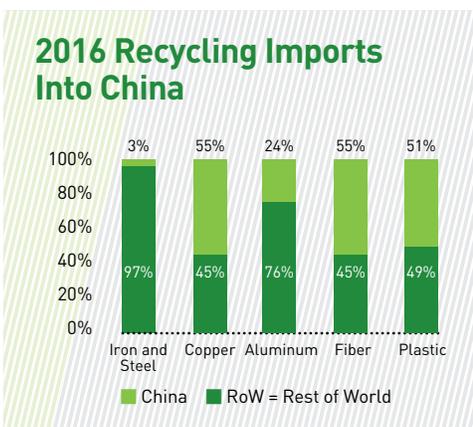
FAST FACT

Portland became the largest U.S. city to initiate every-other-week garbage collection as it added weekly pickup for compost and yard debris in 2011. The city’s goal was to incentivize curbside composting while keeping overall rates the same. And the city achieved this goal, with Waste Management as a partner. [Read more here.](#)

RECYCLING

As North America’s leading post-consumer recycler, Waste Management has been leading change in the ever-growing and dynamic recycling industry for more than three decades. During this period, we’ve also invested more than \$1 billion in processing infrastructure alone, including almost \$22 million in 2017, up more than \$13 million year-over-year. This leadership resulted in 15.3 million tons of recycled goods in 2017, a 91.25 percent increase in recycling tons since 2007.

Our industry and the materials recycled have evolved significantly over the years — from small collection bins full of newspapers and glass bottles in the 1980s to today’s large wheeled carts full of plastic water bottles and cardboard boxes used for home delivery of online orders. What amazing changes in just a few decades!



Courtesy: Institute of Scrap Recycling Industries (ISRI)

We were presented with a new set of challenges in 2017. In July, China notified the World Trade Organization of its intent to ban the import of 24 materials, including mixed waste paper and mixed plastics. While the news was met with skepticism at the time, China has indeed followed through with the ban, resulting in 13.2 million tons of material looking for alternative markets across the globe.

Then, in March 2018, the Chinese government implemented a 0.5 percent contamination limit, which has elevated quality expectations for all buyers across the globe. The new contamination limit also increased recycling processing costs in material recovery facilities (MRFs) as recyclers work to remove unacceptable items. With the Chinese government’s subsequent announcement of a ban on all imports of recyclables by 2020, the global recycling community began to scramble to adjust to this new market reality.

Changing Market Dynamics

In an already dynamic recycling market, China’s policy created perhaps the greatest change the recycling industry has experienced to date. The Chinese government’s decision serves as a stark reminder of the global nature of our business. According to the U.S. Census Bureau and U.S. International Trade Commission, China imported over 13.2 million tons of paper and approximately 776,000 tons of plastic from the U.S. in 2017. Prior to late 2017, a third of the world’s recyclables had been imported by China, including more than 50 percent of the paper and plastics recycled across the globe.

China’s policies have had a far-reaching effect, creating an excess global supply of recyclables. Costs are up for customers due to increased processing and sorting of materials required to meet China’s new stringent quality requirements, while commodity values are down.

Developing Alternative Commodities Markets

With China taking bold steps to rebalance its economic needs with quality of life — clean air, water and a safe climate, the U.S. recycling industry has been forced to recalibrate its thinking and focus on what it can control. Developing diverse domestic and global end markets is the best way to ensure long-term successful, sustainable and economically viable recycling programs.

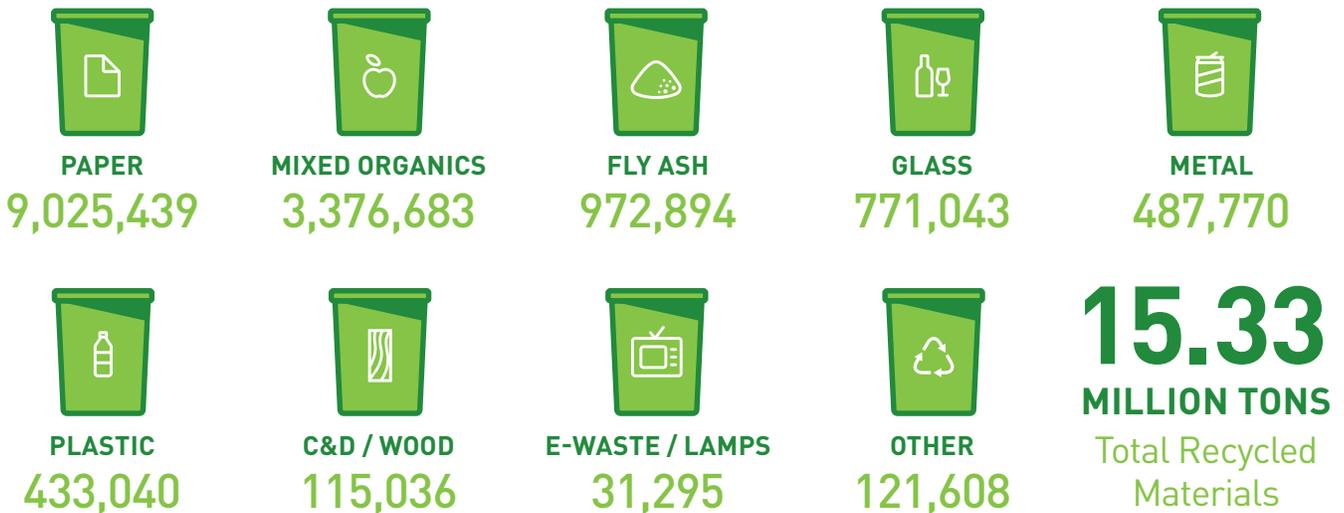
Beginning in 2013, with China’s first import restrictions on plastics, Waste Management began to diversify our markets, sending more plastics to domestic markets and more paper to India, Mexico, South America and other countries. In the five years since, we have grown our markets and strengthened our international commodities team. With more than 50 contractors in four offices around the world, including Mexico City, Mexico, Shanghai, China, and Bhopal, India, we have been able to develop a robust international trade business.



2017 Recycling Performance

Waste Management managed over 15 million tons of material for beneficial use in 2017, broken down as follows:

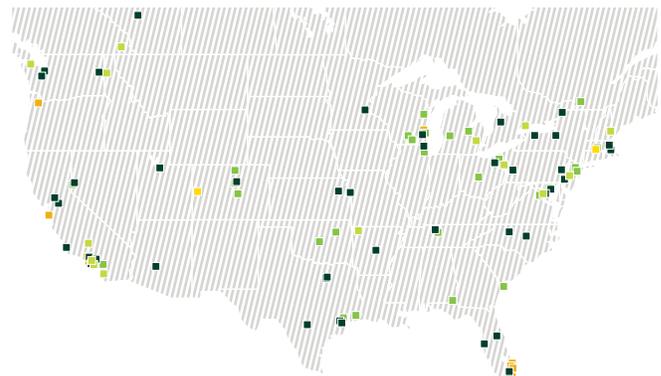
WHAT WE RECYCLED (in tons)



WHY WE RECYCLED

- ▶ To save **117.8 million** mature trees
- ▶ To fulfill the annual power needs of **1.59 million** homes
- ▶ To avoid **32.5 million** metric tons of GHG emissions
- ▶ To supply enough fresh water for **28.1 million** people for a month
- ▶ To meet the annual municipal waste needs of **27.9 million** people
- ▶ To save **63.2 billion** gallons of water
- ▶ To conserve **17.4 billion** kWh of electricity
- ▶ To preserve enough timber resources to produce **2 trillion** sheets of printing and copy paper
- ▶ To save **24.5 million** cubic yards of landfill space

WHERE WE RECYCLED



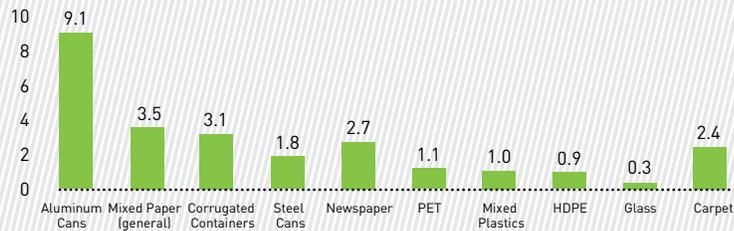
Material Recovery Facilities

- 44 Single Stream
- 28 Paper Only or Other Commercial Materials
- 14 Other
- 11 Construction and Demolition Debris
- 2 Dual Stream

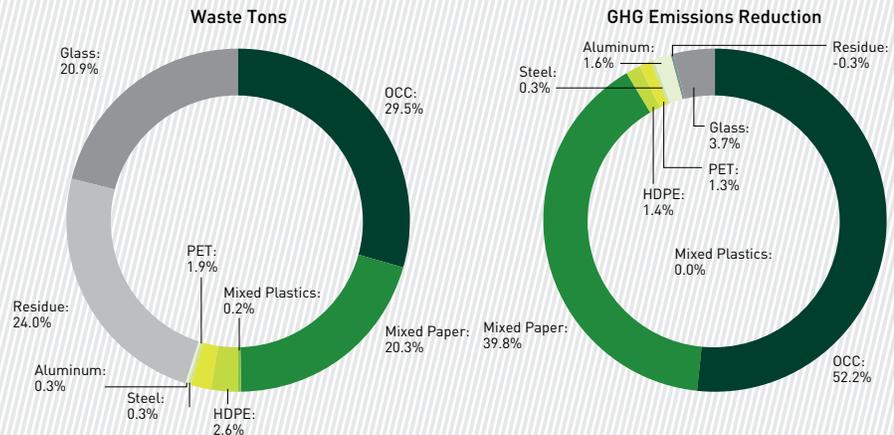
Using Life Cycle Thinking to Prioritize Recycling Efforts

With constrained resources and weakened market demand, evaluating recycling through the lens of life cycle thinking helps our customers grapple with a changing commodities market for recycling, helping to prioritize their efforts. It's imperative that we remain focused on the materials that provide the most environmental benefit from recycling. As an example, the reduction in GHG emissions from recycling an aluminum can is exponentially more than recycling a glass bottle.

What Reduces the Most GHGs When You Recycle?



THE GREATER ENVIRONMENTAL IMPACT Waste Tons vs. GHG Emissions Reduction



Focusing only on commodity tonnage misses the bigger picture — how much emissions reduction benefit has been achieved regardless of the tons processed. For example, GHG emissions achieved by recycling Old Corrugated Cardboard is far greater than its weight would suggest. Our data makes it abundantly clear that we should be focusing our efforts on recycling cardboard and paper first, then, metal, PET and HDPE bottles to maximize the environmental benefits of the materials that we manage.

Consumer Awareness

Among the most pressing priorities in recycling today is the need to reduce the amount of contamination — or the unacceptable items mixed with recyclables — in the stream that we collect for processing at our recycling facilities. Reducing contamination means reducing unacceptable materials in the inbound stream, which directly impacts the quality of what can ultimately be sold and recycled. It's a difficult challenge, and we all play a significant role when it comes to recycling well — starting with consumers. That's why we're so committed to consumer education and awareness in the communities we serve.



Recycling Needs Your Help

Over the years, the changing mix of materials in the waste stream combined with a shift to cart-based, single-stream recycling has contributed to an increase in the average contamination rate for materials Waste Management collects in curbside programs to 25 percent. That means 500 pounds of every 2,000 pounds collected is ultimately discarded as nonrecyclable. This increases the cost of recycling because we must sort more material as well as transport and dispose of more material as trash. The lost value of good recyclables that are ruined due to contamination also must be considered.

Technology to Combat Contamination

Contamination in the recycling stream not only hinders our efforts to recycle well and efficiently for customers, but it also presents safety concerns. In addition to working with heavy machinery, workers in recycling facilities sort through chemical waste, batteries, scrap metal and organic materials. To provide a safer solution, Waste Management introduced one of the industry's first recycling robots in North America in 2017.

Using sophisticated cameras to identify specific objects such as cans, plastic containers, glass or other recyclable materials within seconds, robots can remove them using suction cups or large tongs. In addition to helping keep human workers out of harm's way, the robots are highly efficient, with a current performance of 55 picks per minute; slightly more efficient than 1.5 humans on a per minute basis.

Recycling the Right Way

We work with recycling community stakeholders to reach as many audiences as possible, using all available communication channels, as this article by Susan Robinson, Director of Public Affairs for Waste Management, demonstrates.

As the impacts of China's new import policies to reduce trash in recyclables begin to affect our collection programs, you may be seeing a lot more articles about the health of recycling, both locally and across the globe. In many cases, these articles are communicating the same basic information:

- ▶ Recycling contamination — or the percentage of trash or unacceptable items mixed with recyclables — has increased, and it's jeopardizing the global recycling industry
- ▶ Going forward, China will not purchase recyclables if there is even a fraction of trash mixed with the items
- ▶ As a result, we all must focus our efforts on recycling the right items the right way



Susan Robinson
Director of Public Affairs
Waste Management

COLLECTION IS NOT THE SAME AS RECYCLING

Simply put, we must reduce the amount of contamination in the recycling stream, and this can only happen if the materials we collect are the right materials. Note the use of the word "collect" above. It's important to highlight "collection," since

the quality of the material we collect directly impacts the quality of what can ultimately be sold and recycled.

To that end, the following quote is from a recent article by Nina Butler of More Recycling, who describes the need to focus on collection:

"Many recycling entities...are facing severe financial challenges right now despite the environmental benefits that come when recovered materials are used to make new products. In short, the market for recycled materials is broken. We have equated collection with recycling when, in reality, that is just the first of many steps to ensure complete reabsorption of resources." — Nina Butler, More Recycling, Plastics Recycling Update, February 2018

Ms. Butler drives to the heart of one of the key challenges we are up against as we struggle to reduce contamination in recycling programs. Messaging has historically emphasized the importance of placing recyclables in recycling carts. As a result, consumers now equate the

placement of materials in their recycling cart with recycling. From there, it is out-of-sight-out-of-mind, and it is up to recyclers to ensure that discarded materials are recycled into new products.

This poses a difficult education challenge, since it's hard to teach consumers that their materials are only recycled when they replace virgin materials — not when they're collected. It's only when this substitution happens that we realize the environmental and economic benefits of recycling. And, in fact, placing unacceptable materials into the cart leads to additional economic and environmental costs, with no benefits and (ironically) less recycling. We call this wishful recycling "wishcycling," and it is lethal to our nation's recycling programs.

WHY IT'S IMPORTANT TO RECYCLE ONLY THE RIGHT ITEMS

So, why is "wishcycling" such a problem? There are multiple reasons, but what it all boils down to is that unacceptable materials in the recycling carts ultimately get sorted out at the recycling facility and disposed of as trash. In other words, "wishcycling" does no one any favors, except adding costs and reducing the amount of material that can ultimately be recycled.

For example, the average contamination rate for materials that we collect in curbside recycling programs has grown to about 25 percent. That means that 500 pounds of every 2,000 pounds that we collect at the curb is ultimately discarded. This increases the cost of recycling by increasing the cost of sorting materials, transporting and disposing of trash, and also includes the lost value of good recyclables that are ruined due to contamination.

At a global level, years of "wishcycling" across the world have contributed to end markets like China becoming stricter on what they'll ultimately purchase and recycle into new materials.

Toward the end of 2017, China began instituting a new contamination limit that requires processors like Waste Management to shrink that 500 pounds of contamination to 10 pounds (0.5 percent). That's like shrinking something the size of a grizzly bear down to a puppy. And with these new guidelines come even higher processing costs, while at the same time commodity prices are at long-time lows. Mix all this together and the economics of recycling are certainly under pressure.

IT'S TIME TO RIGHT THE SHIP

Focusing on recycling the right things correctly has never been more important. At Waste Management, we are focusing on quality, increasing demand, and reducing the economic and environmental impact of the materials we manage for our customers. However, for recycling to be successful and sustainable for years to come, we must all commit to recycling only the right things the right way.

Collecting materials is not the same as recycling them. It's only when a material is recycled into something else that we realize the economic and environmental benefits. Anything short of this, and we're simply creating a problem that results in a negative environmental impact.

Educating Our Communities

Consumers want to recycle. But recycling can be confusing. It's hard to keep up with what should and should not go in the bin while leading a fast-paced daily life. Plastic bags might seem like obvious items for the curbside collection bin, but they are a huge problem for recycling facilities.

That's why we continue to invest in public education programs to help consumers better understand smart recycling practices. It's hard to imagine that one wrong item in a recycling bin can spoil an entire batch of otherwise good materials, but it's true, which is why we've created our Recycle Often. Recycle Right.® (RORR) program.

Waste Management's dedicated website details myths, resources, and the do's and don'ts of recycling, as well as providing tools tailored for various entities that might be seeking recycling know-how — including residents, businesses, educators, property managers and government institutions. Our most visited page on the RORR website busts myths and provides accurate information about the most frequently asked recycling questions. For the past three years, we have updated this site with relevant questions on how to recycle the right things correctly.



Keep Plastic Bags Out of Your Recycling

We're also putting information where consumers are most likely to find it — 45 percent of individuals look to municipalities for recycling information, and they primarily seek it out on the municipalities' websites. As part of our RORR program, we developed a widget for municipal customers to put on their websites that provides targeted recycling education. The widget is user-friendly, hosted by the municipality and comes at no cost.

While we do our absolute best to educate consumers through the RORR program, we find that "tagging efforts" is the most effective way to teach customers how to recycle right. Tags placed on bins along our routes that use both positive and negative reinforcement have proven effective because of the immediate feedback to consumers on how to recycle correctly.

Finally, as a last resort, we find that charging for contamination serves as a strong deterrent. Using this "tough love" tactic, we're taking a two-pronged approach to contract enforcement: we are reviewing contracts and seeking cost recovery or price adjustments as allowed for contamination; and, moving forward, fully enforcing contracts when it comes to charging for contamination.

WASTE MANAGEMENT DRIVERS ON THE FRONT LINE OF CONSUMER EDUCATION

Just as consumer awareness on the dos and don'ts of recycling is critical, so too is ensuring that our drivers are consistently trained across the company to help solve the problem of contamination in the waste stream. Drivers can enhance consumer awareness through Waste Management's tagging campaigns and help educate consumers on the best ways to decrease contamination.

We've found that Driver Recycling Surveys are a useful way to engage our drivers, and administering the survey is vital before kicking off any education or tagging and enforcement campaign. The surveys help us assess the current recycling knowledge of drivers, uncover common contaminants on their routes, identify Waste Management's tagging practices and help drivers better understand any barriers that prevent tagging. Waste Management also issues a Facilitator Guide with directions for site leaders to administer the survey, with talking points to introduce the contamination issue, and explanation of the driver's role in prevention. Evaluating results of the driver surveys helps target our campaign materials around a problem contaminant or address barriers that are preventing drivers from identifying and tagging contamination.

For new driver training, and for use when rolling out a tagging and enforcement campaign, training videos available on our company intranet university, "Talent Central," show drivers how to identify and report contamination through the use of enforcement tags and onboard computing. These videos, in both English and Spanish, are provided to each driver internally or can be found on Waste Management's [YouTube](#) channel.

We also offer a Guide to Contamination & Recycling Frequently Asked Questions (FAQs) for employees. The Guide to Contamination introduces drivers to the basic RORR rules. The Recycling FAQ is a quick reference guide to help drivers identify problem materials and to help accurately answer any customer questions on their route.

To incentivize drivers to stay engaged and actively serve as RORR ambassadors, we publicly recognize drivers who are most actively involved in tagging and enforcement. We all play a role in helping reduce contamination. And when our drivers are properly informed, their efforts to enforce proper recycling during their routes, as well as educating customers along the way, serve as a dual positive.



ORGANICS



One-third of food goes uneaten across the globe. Wasted food can add billions of tons of GHG emissions to the atmosphere. In the U.S. alone, more than 60 million tons of food is wasted each year, and displaced food carries a price tag of well over \$160 million. The EPA estimates more food reaches landfills and incinerators than any other single material in our everyday trash, making up 22 percent of the disposed stream. Organic materials — primarily discarded food and yard trimmings — comprise approximately 30 percent of the waste stream — and Waste Management continues to utilize new technologies to extract economic and environmental value from these materials.

In 2017 Waste Management processed 3.38 million tons of source-separated organic materials, including yard trimmings, food waste and biosolids — sludge sourced from wastewater treatment facilities. Most of the organic waste collected goes to facilities that create marketable compost and soil amendment products.



Organic Waste At-A-Glance

3.38 Million Tons of Organic Material Recycled

15.4

MILLION GALLONS

of EBS produced

Food converted to biogas produced enough renewable energy to power over 1,350 homes

*Total gallons of the EBS® (organic slurry) produced as of 8/2018

44

ORGANICS RECYCLING FACILITIES

The largest organics recycling infrastructure

- ▶ 40 Waste Management managed composting and mulching facilities, 13 of which can accept food waste
- ▶ 4 CORE® facilities

19

BULKBIN™ PROGRAMS

Utilizing 2,500+ Bins

Serving customers across various industries, including manufacturing, distribution and retail

FAST FACTS Co-Digestion



50-100%+

BIOGAS PRODUCTION

Increase in renewable **biogas** production with as little as 10 percent **EBS®** **volume addition**



>99%

CONTAMINATION REMOVAL

CORE® produces a clean EBS® product by **removing packaging** and other non-degradable material



~0%

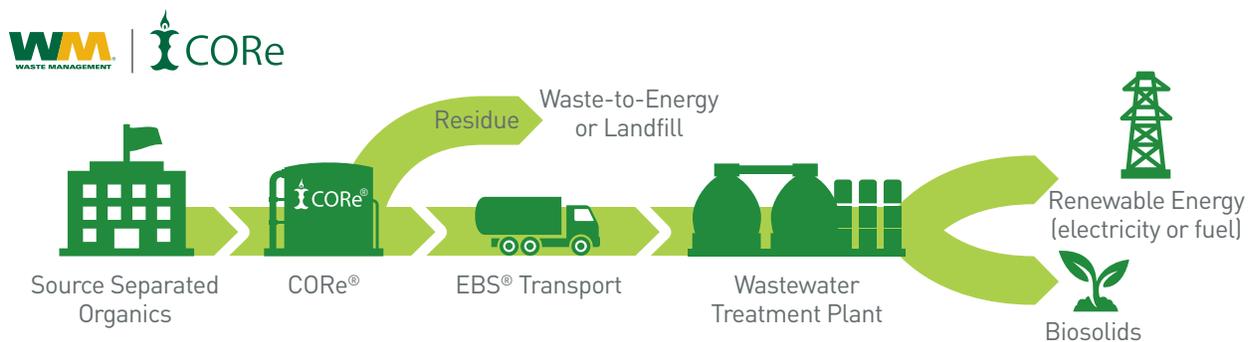
BIOSOLIDS GENERATION

Little to no additional generation of biosolids with **EBS®** according to **independent, peer-reviewed** research

CORe®: Turning Food Into Energy

CORe® is Waste Management’s organic recycling process that converts food waste into EBS®, an organic slurry product used to generate green energy. With CORe®, we collect commercial food waste from restaurants, schools, food processing plants and grocery stores, screen it to remove contaminants such as plastic, packaging and bones, and blend the waste into an engineered slurry that has a consistency like cooked oatmeal. The slurry dramatically increases the production of biogas in anaerobic digesters, which is used to create renewable energy.

Waste Management’s CORe® Process



Waste Management’s **CORe®** process is a **local, urban solution** that converts food material into our **EBS® product** through our proprietary process.

EBS® is a high-quality, consistent product produced with **more than 99%** of the **physical contaminants** found in urban waste.

The **EBS®** product is used to create **renewable, sustainable energy** in partnership with **long-term** local partnerships, helping them approach **zero waste**.

Adding additional organic material in the form of engineered slurry to a water treatment plant’s anaerobic digesters typically increases energy output from 50 percent to 100 percent or more. We use simple figures to communicate to the public the environmental benefits realized from their cities’ use of CORe® organics recycling.

CORe® Facilities

Waste Management’s CORe® facilities in Southern California, New York, Boston and New Jersey deliver EBS® to municipal wastewater facilities, which increases their energy output. Waste Management has made over 40 million gallons of EBS® from our facilities to date. Each ton of processed food waste can power between eight and 10 homes.



Food is Energy; let's not waste it.



Co-Digestion is a **proven solution** for large scale, urban food waste



Helping solve climate change with the **lowest GHG footprint** of food waste processing options

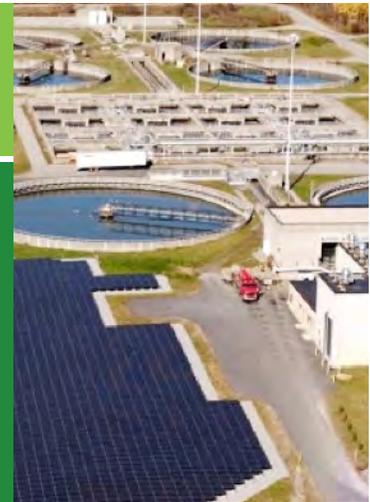


Through co-digestion, food waste can be **recycled** as both **fertilizer** and a **renewable energy** source

CASE STUDY

Waste Management Boston CORE®

- › Progressive Waste Water Treatment Plant in New England
- › Recognized by MassDEP and EPA for innovation
- › Investing over \$24 million in the “Organics Energy Project”
- › Over \$7 million provided by Massachusetts agencies
- › Renewable energy produced will be used for facility heat and electricity
- › Energy savings of \$2.5 million per year, with potential to export to grid
- › Longstanding, successful program creating fertilizer from biosolids
- › 100 percent of the fertilizer product sold to local agriculture and landscape businesses



Greater Lawrence Sanitary District

CASE STUDY

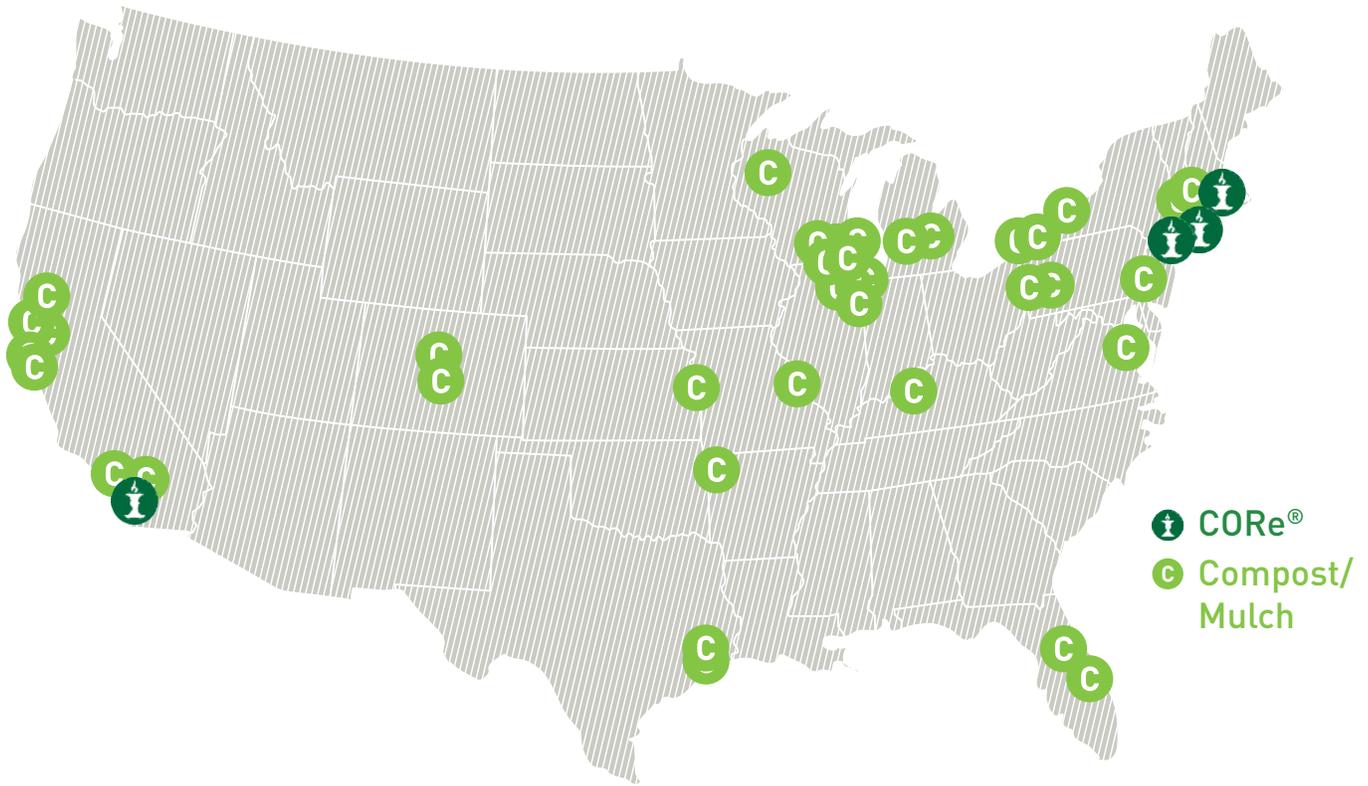
CORE® in Los Angeles County

What began as a demonstration project is now an award-winning, proven technology that is creating renewable energy. Waste Management and the Sanitation Districts of Los Angeles County (LACSD) received the Municipal Project of the Year Award for their Food Scrap-Wastewater Biogas System at the American Biogas Industry Awards. The partnership demonstrates the full-scale co-digestion of urban residential and commercial source separated organics (SSO) at an existing community wastewater treatment facility in a way that can be replicated at other water utilities.

The process involves food waste being pre-processed at the Waste Management facility in Orange, California, through Waste Management’s CORE® process — removing physical contaminants and de-casing plastic and metal containers — to ultimately provide EBS® for energy generation at the Joint Water Pollution Control Plant in Carson, California.

Waste Management Organics Processing Sites

Composting and mulching are proven, low-cost solutions for managing large volumes of organic materials. Waste Management's portfolio includes 40 facilities that produce compost and mulch products. We also work with customers to innovate new composting solutions.



I CORE®
C Compost/
 Mulch



CORE®

- Boston CORE®
- NNJ CORE®
- Orange Transfer and MRF Recycling
- Varick I Transfer



Compost/Mulch

- Altamont Landfill
- Autumn Hills Landfill
- Coastal Plains Landfill
- Countryside Landfill
- CT Valley Landfill
- DADS Landfill
- Deer Track Park RDF
- Dekalb County RDF
- Eco-Vista LLC
- Fitchburg (RCI) Landfill
- Glanbrook LF
- Green Shadows LF
- GROWS Landfill
- Guadalupe Rubbish Disposal Co

- High Acres Landfill
- Johnson County Landfill
- Kirby Canyon Landfill
- Lake View Landfill
- Lancaster Landfill
- Laraway RDF
- Metro RDF
- Middle Pennisula Landfill
- Midway Landfill
- Milam RDF
- North Valley MRF
- Okeechobee Landfill
- Orchard Ridge RDF
- Outer Loop RDF
- Palmdale Landfill

- Pheasant Run RDF
- Prairie View Landfill
- Redwood Landfill
- South Hills Landfill
- Timberline Trail RDF
- Valley Landfill

- Venice Park Landfill
- Vista Landfill
- Willow Ranch Compost Facility



An Insightful Look at the CORE® Process

Waste Management Bulkbins™ Used for Organics Waste

We continue to innovate to make it easier to capture the value of organics in an efficient, and environmentally protective manner. Over the past several years, Waste Management worked with container manufacturers to create a new bin, Bulkbin™, uniquely designed for commercial generators of organic material. In Denver, Colorado, our Bulkbin™ concept was put to good use with a Waste Management client who was struggling to move its facility to zero-waste status. We utilized our Bulkbin™ containers to divert the heaviest material in their waste stream — animal feed products that did not meet their product sales specifications — from landfill. Today, 100 percent of this material is diverted to a compost facility, with the program filling over 200 Bulkbin™ containers — 20 to 30 tons — daily.

In addition, we worked with a large retailer to provide organics recycling services utilizing the Bulkbin™ as part of a reverse logistics approach to economically transport unusable food wastes. That program has been rolled out to over 170 stores utilizing over 1,300 Bulkbins™.



WASTE-BASED ENERGY

Americans produce about 4.4 pounds of waste per capita every day, according to the EPA, and not all of that waste can be successfully processed. After recycling, composting and other beneficial use efforts, about 65 percent of that waste — a total of about 164 million tons each year — is disposed in landfills. Yet even as waste reaches the landfill, there remains a meaningful opportunity to recapture value. There, as organic material decomposes in an anaerobic environment, it naturally produces landfill gas, a mixture of carbon dioxide and methane, a major component in natural gas fuel and a potent GHG. Waste Management is finding opportunities to create economic and environmental value by turning landfill gas into energy — in effect, making sure that trash doesn't go to waste.

From Trash to Power

As trash decomposes it produces gas, which is roughly half carbon dioxide and half methane. At our landfill gas-to-energy (LFGTE) facilities, we capture this methane and use it beneficially as an alternative to fossil fuel to power homes and provide fuel for industrial uses and commercial vehicles, including our own. The U.S. EPA endorses landfill gas as a renewable energy resource, putting it in the same category as wind, solar and geothermal resources.



New Redwood LFGTE Plant

Today, Waste Management is the largest LFGTE developer and operator in North America, with projects generating the equivalent of nearly 4.5 million megawatt-hours per year, enough energy to power 460,000 homes, or the equivalent of replacing nearly 2.5 million tons of coal annually. In 2017, approximately 55 percent of landfill gas collected at Waste Management-owned and -operated facilities was used for beneficial use projects, and we did not directly incinerate waste for energy recovery.

Waste Management has continued to invest in technologies to maximize the capture of energy from our landfills. In 2017, we commissioned new LFTGE facilities at the Redwood Landfill and Recycling Center in Novato, California, to produce renewable electricity, while we are producing renewable natural gas at our Outer Loop Recycling and Disposal Facility in Louisville, Kentucky.

Waste Management Landfill Gas Beneficial Use Projects

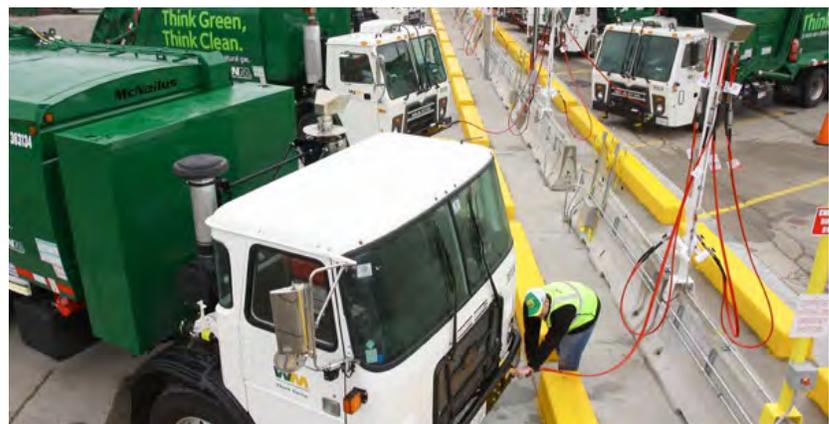
Type of Project	Projects	MW
Power	97	528
Off-Site Power	5	56
Medium BTU Fuel	9	25
Liquid Waste Disposal	4	3
Renewable Natural Gas	4	36
Total Projects	119	648

Totals and Conversions	
Total LFG Utilized (mmbtu)	56,960,000
Equivalent Megawatt-Hours/Year	4,480,000
Equivalent No. of Households	460,000
Equivalent Tons of Coal/Year	2,480,000
Indirect CO ₂ e Offset (tons/year)	2,400,000

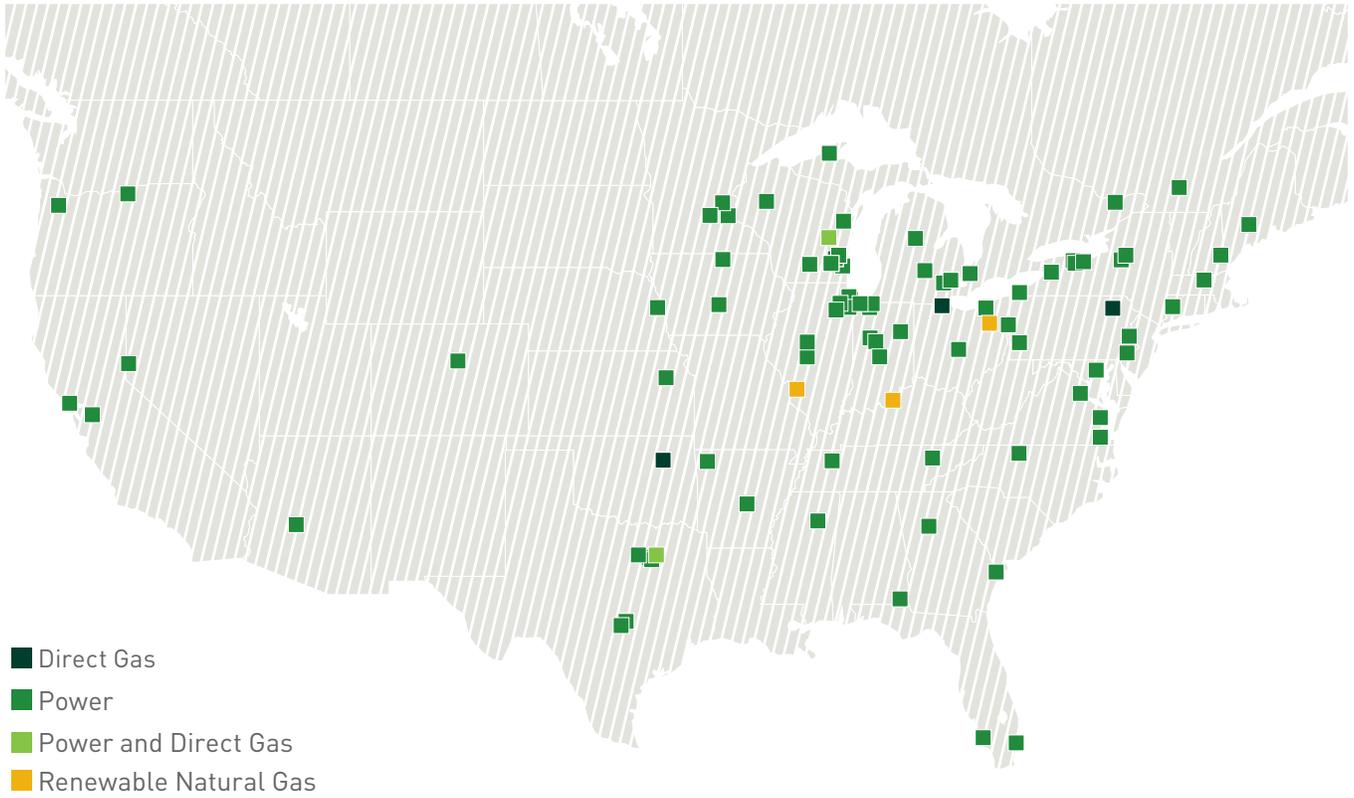
Renewable Natural Gas Power

Our most frequent application for collected landfill gas is to use the processed methane to generate electricity that is sold to public utilities, municipal utilities and power cooperatives. Beyond electricity generation, we are also a leader in converting landfill gas into natural gas fuels that are distributed for use in residences, businesses and transportation. Renewable natural gas (RNG) produced from processed landfill gas now fuels over 33 percent of our natural gas trucks.

With RNG infrastructure at Waste Management’s Altamont, California, Milam, Illinois, American Landfill in Ohio and now our Outer Loop landfill in Kentucky, over 33 percent of our natural gas fleet was fueled by RNG by the end of 2017.



Waste-Based Energy Facilities



Innovation That Closes the Circle

THE LOUISVILLE STORY

1 Compressed Natural Gas (CNG)

collection trucks pick up waste at homes and businesses. The waste is transported to landfills for permanent disposal.

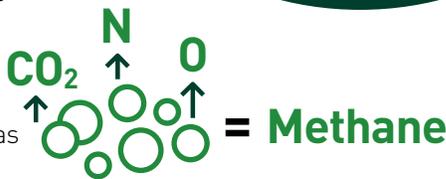


3 Methane is recovered by a series of wells drilled into the landfill. The wells are interconnected to form a collection system.

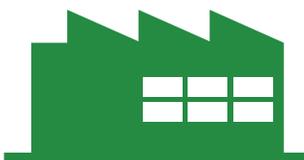
2 Much of landfill waste is organic, including food and cardboard. Bacteria digest this material, producing methane and carbon dioxide as natural byproducts.



4 The gas is routed to the RNG facility for advanced processing. Carbon dioxide, nitrogen and oxygen are removed from the gas to produce high-purity methane that meets natural gas pipeline specifications.



The large geographic footprint of landfills and their proximity to existing infrastructure can make them ideal locations for large-scale solar installations. Read more about how we contribute to solar energy generation [here](#).



5 The facility can process up to 5,000 standard cubic feet per minute (SCFM) of incoming landfill gas, producing high-purity methane that is injected into a natural gas pipeline.

6 The Outer Loop RNG facility in Louisville, Kentucky, produces enough RNG to fuel up to 800 Waste Management CNG collection trucks each day, reducing GHG emissions by more than 80 percent compared to those powered by diesel fuel.

INVESTMENTS & INNOVATION

It's often said that waste is simply a resource out of place. That's the idea behind investments we have made in the last decade in companies focused on transforming certain materials in the waste stream into materials of higher value. As these relationships have matured, we have already begun to see opportunities to increase our environmental impact through expanding into broader markets.

Enerkem

Enerkem converts nonrecyclable municipal solid waste (MSW) into biofuels for transportation and renewable chemicals used in everyday products. Enerkem Alberta Biofuels is the world's first commercial biorefinery to use MSW to produce methanol and ethanol. This facility in Edmonton, Canada, began producing methanol from waste in 2015 and has now initiated ethanol production. The potential annual output of the facility is 10 million gallons.

In 2017, Enerkem received EPA registration for the Edmonton facility to sell ethanol under the U.S. Renewable Fuel Standard, becoming the first MSW-to-ethanol facility to do so. Additionally, the facility received the lowest carbon intensity value issued to date by the British Columbia Ministry of Energy and Mines under the Renewable and Low Carbon Fuel Requirements Regulation.

Enerkem also recently signed an agreement with Air Liquide, AkzoNobel Specialty Chemicals and the Port of Rotterdam to create an advanced waste-to-chemistry facility in Rotterdam. The facility will be the first of its kind in Europe to provide a sustainable alternative solution for nonrecyclable wastes, converting waste plastics and other mixed wastes into methanol for transportation and chemical uses. The company is developing additional projects in Canada, the United States, Europe and China.





Fulcrum Bioenergy

Fulcrum processes MSW into an engineered feedstock, which is gasified and converted into renewable crude. This renewable crude can then be further refined into low-carbon, drop-in jet and diesel fuels. A part of our portfolio since 2011, Fulcrum is constructing its first commercial plant near Reno, Nevada, which will be operational in 2020. When completed, the facility will convert 175,000 tons of MSW to 10.5 million gallons of transportation fuel per year. Fulcrum is planning additional projects across North America, each of which will be able to produce 30 million gallons of fuel per year.



Fulcrum Corporate Video

Dolphin Services

Another source of innovation today is Waste Management Dolphin Services, a leader in dewatering solutions across numerous industries. The Waste Management division has introduced modern, skid-mounted, high-g decanter centrifuge technology for processing industrial sludges and recovering oils from refineries, chemical complexes and food processing operations. This process significantly reduces solids going to landfills, returns water for reuse and recovers oil for recycling. In addition, Waste Management Dolphin Services is piloting autonomous centrifuge dewatering and oil recovery technology for waste streams such as biological sludge and oily tank bottoms to reduce on-site safety risks and exposure.

Industries



FOOD PROTEIN PROCESSORS



UPSTREAM EXPLORATION & PRODUCTION



MIDSTREAM TERMINALS & PIPELINES



DOWNSTREAM REFINING



PETROCHEMICAL COMPLEXES



CHEMICAL COMPLEXES



REMEDIATION & DREDGING



INDUSTRIAL WASTEWATER TREATMENT PROCESSES



Bigbelly

Since 2009, Waste Management has been an investor in Bigbelly — the world’s leading smart waste and recycling system. Deployed in communities, campuses and organizations in over 50 countries and all 50 U.S. states, Bigbelly transforms waste operations and drives efficiencies with a smart, connected system. Solar panels on high-capacity cans harvest energy for compaction and communication. Each can holds 150 gallons, five times that of the average receptacle, because waste contents are compressed as the container fills. Bigbelly enables visibly sustainable operations, measurable recycling and contained waste for cleaner public spaces.

Bigbelly helps cities enhance their public spaces by extending their smart bins into multipurpose platforms capable of hosting telecom equipment. Communities and solution providers share the challenge of how and where to deploy wireless equipment in the public right-of-way without additional clutter or negative aesthetic impact. Bigbelly enables communities to transform multiple core city services with a single infrastructure — waste management and wireless connectivity — during the pivotal 5G network roll out. The platform hides small cell equipment in plain sight, in an aesthetically accepted form, and exactly where the people are.

Fund Investments

An important element of innovation is research — who’s developing what, what’s working and what isn’t, and where’s the next innovation with potential for commercial success. Waste Management is a Limited Partner (LP) investor in three funds: [EnerTech Capital Partners](#) (“EnerTech Capital Partners IV”), [Emerald Technology Ventures](#) (“Emerald Industrial Innovation Fund”) and [Zouk Capital](#) (“Zouk Renewable Energy and Environmental Infrastructure Fund II”).

HARD-TO-HANDLE MATERIALS

Homes and businesses are filled with ordinary items and materials that require extraordinary disposal handling and recycling methods, due largely to their chemical composition. Think paint, automotive products, swimming pool chemicals, household cleaners, flammable and combustible items, garden chemicals, batteries, consumer electronics and items containing mercury, such as fluorescent lamps, to name a few — all items that should not be placed into regular solid waste bins. We've developed several programs to help our residential and business customers dispose of these materials properly.

At Your Door Special CollectionSM Service

At Your Door Special CollectionSM service provides easy and convenient collection of home-generated special materials for single and multiunit homes in several states where logistics and customer preference support the service. As part of our home collection service, each participating household with qualifying materials receives a collection kit with a containment bag and instruction sheet. In 2017, Waste Management collected 3,590,733 pounds of materials through the At Your Door Collection service. Materials collected include consumer electronics, latex paint, hazardous materials and universal waste items, such as batteries.

In addition to at-home collection services, we also collect fluorescent lamps, batteries, sharps and noncontrolled pharmaceuticals through containers placed at public locations, such as libraries, municipal buildings, pharmacies and community centers. Residents can simply place items in the collection containers, which are managed by a special collections team.

For commercial customers, we offer our Tracker service, which enables businesses to dispose of universal and special wastes through a simple, safe and compliant mail-back method. This comprehensive program includes recycling kits for fluorescent lamps and bulbs, lighting ballasts, batteries, electronics, aerosol cans, thermometers, thermostats and dental amalgam, as well as safe disposal kits for sharps, medical waste and prescription and over-the-counter drugs. Containers, such as the patented Mercury VaporLok® packaging for fluorescent lamps, are specifically designed for safe storage and shipping via national carriers. Customers can obtain kits through our website and receive certificates that provide proof of recycling compliance via email.



E-Waste

Electronic waste material (e-waste) — such as old or broken computers, printers, copiers, etc. — is a topic of significant environmental concern and remains the fastest-growing waste segment in North America, with more than 3 million tons* generated annually in the U.S. alone. Waste Management delivers electronic recycling solutions that are convenient to use, cost-effective and environmentally responsible. Supported by a comprehensive network of third-party processing centers certified and independently audited to the highest standards across the U.S. and Canada, our eCycling services can meet an organization's specific needs, with secure transport options from any point in the U.S. or Canada.

All processing partner locations are audited to meet e-Steward®, R2®/RIOS certification standards and are obliged to:

- › Prevent hazardous e-waste from entering municipal incinerators or landfills.
- › Prevent the exportation of e-waste to developing countries.
- › Provide for visible tracking of e-waste throughout the product recycling chain.

Products can be refurbished and resold for value or managed at the end of their useful life for commodity recovery. Commodities such as gold, silver, copper, plastics and more are recovered, while byproducts such as mercury, lead, barium and cadmium, the inherently hazardous byproducts of electronics, are carefully managed. Waste Management satisfies customer compliance with consumer take-back programs in the 25 states mandating these eCycling programs and provides the same comprehensive management in nonlegislated states as well.

Coal Ash Recycling

Air pollution regulations require particulates such as fly ash, a byproduct that can be used as a cement replacement in concrete production, to be captured rather than emitted. However, the methods used to capture fly ash lead to increased carbon levels in the fly ash. Power plants use activated carbon injection (ACI) systems to remove mercury from flue gases, which is then recaptured in the electrostatic precipitators or bag houses.

*U.S. EPA Facts and Figures, 2015

This process prevents mercury from escaping the smokestack into the atmosphere, but the resulting fly ash contains elevated carbon levels that negatively affect the durability of concrete. Our patented Carbon Blocker fly ash treatment system is widely used by utilities to improve the quality of fly ash, making it suitable for recycling in concrete product applications.

With more ACI systems in use today, fly ash recycling is a growing business for us. Since we acquired this proprietary technology in 2012, revenues have quadrupled, and in 2017 we beneficially utilized 972,894 tons of fly ash, with 863,763 metric tons of carbon dioxide (MTCO₂e) avoided.



Healthcare Industry Waste

Two divisions of Waste Management work with the healthcare industry to reduce infectious medical waste and to provide facility-specific advice on means to reduce waste, recycle and assure protective disposal of the diverse streams of waste coming from hospitals and other healthcare providers. Waste Management Healthcare Solutions (WMHS) focuses on protecting the environment from potential impacts of infectious medical waste. In 2017, WMHS treated over 12.8 million pounds of infectious medical waste, then sent the noninfectious residue for secure disposal at secure landfill facilities. Healthcare Integrated Customer Solutions (ICS) works with healthcare customers, including 80 hospitals and more than 500 smaller locations, to manage their entire waste generation. In 2017, WMHS — ICS hospitals collectively achieved a total waste-to-recycling diversion rate of 20.4 percent and regulated medical waste generation rate of 7.7 percent. Our PharmEcology business unit works with over 300 healthcare customers and has implemented pharmaceutical waste programs at these institutions that have diverted over 2,500 tons of pharmaceuticals from entering our national waters through proper disposal management.

Case Study: Progress Adds Up

Simi Valley Hospital in Southern California serves the surrounding communities with a full range of medical services. Following a large-scale renovation nearly 10 years ago, the hospital found that it was producing more solid, liquid and biomedical waste. The medical center's leadership partnered with Waste Management Sustainability Services (WMSS) to both divert waste from landfill and strengthen their relationship with the community through environmental stewardship. Since then, the WMSS team has developed recycling, safety and analysis programs that have delivered strong results:

- › **RECYCLING:** Successfully planned and implemented a hospital-wide, single-stream recycling program that resulted in a 63 percent increase in recycling in one year
- › **CONSTRUCTION & DEMOLITION RECYCLING:** Identified 80 percent of material as recyclable and diverted from landfill
- › **COMPLIANCE:** Designed a universal waste program for regulatory compliance and safety
- › **DIVERSION:** Increased waste diversion rate from 21 percent to 47 percent in six years
- › **DATA TRACKING:** Collected and monitored various waste stream data for document diversion programs

CONSULTATIVE AND CUSTOMIZED APPROACH

Waste Management
Sustainability Services
(WMSS)

Every organization, no matter the size or type of business or service, is in a different place on their sustainability journey. For this reason, a consultative and customized approach is often necessary.

As one of the leading environmental service and solutions companies in the world, we are experts at optimizing efficient operations, minimizing environmental impact, instilling a culture of safety and accelerating performance. We leverage this expertise to customers across a wide range of industries through Waste Management Sustainability Services (WMSS). In the process, customers gain access to Waste Management's resources, technologies and innovations, which comprise the leading portfolio of environmental solutions in North America.

Our certified team of experts — executives, engineers, scientists, analysts and innovators — work in collaboration with customers to design, develop and implement a wide range of solutions to meet sustainability, regulatory and cost-saving goals that adapt to a company's evolving needs. We work closely with each customer to offer customized, comprehensive solutions, whether the customer is starting out on the path toward sustainability or has already begun their journey.

WMSS engages around the concepts of sustainability with 100 percent of its customers. Understanding how a customer defines sustainability within their own organization is considered a critical first step in discussing their overall business goals and strategy. Every initial conversation requires five questions related to sustainability:

1. Where are you on your sustainability journey?
2. Where do you want to be?
3. When do you want to arrive?
4. What resources (financial, expertise, relationships, upper-level support) do you have to get there in that time frame?
5. What is your company's footprint and what kind of impact do you want to have?

Waste Management Sustainability Services

AT-A-GLANCE

FOUNDED IN
1997

\$200M+
CUSTOMER
COST SAVINGS
Since 2003

\$14.8M
SAVED IN 2017

>400
PROFESSIONALS

Each customer is assigned their own personalized team of materials management experts who embed themselves in the organization, on site or remotely, to ensure that the programs they construct are executed to drive environmental, social and economic value. Our implementation and management services seamlessly bridge the gap between conception and actualization. We also help track and measure results, amplify progress toward sustainability goals, and promote and celebrate accomplishments.

Industries served include:

- › Petrochemical
- › Commercial Properties
- › Construction
- › Automotive
- › Manufacturing & Industrial
- › Healthcare
- › Transportation & Logistics
- › Retail
- › Public Sector
- › Events & Venues

For some customers, the best options for sustainable materials management involve leveraging both Waste Management's local assets and a broader network of third-party specialized providers. Customer solutions can span on-site support with local services and remotely managed specialized service providers. In this regard, we can serve as both broker and asset provider to increase efficiencies and meet customer goals for maximum reuse and recycling.

Our remote and on-site resources programs place one or more Waste Management staff members on site at a single customer location or cluster of proximal customer locations. Designed for large, complex facilities, these centralized, customized and proactive industrial waste management strategies offset the expense of the dedicated resource. Our on-site, single-point-of-contact experts work upstream into each of the customers' processes that generate waste, seeking ways to eliminate cost and capture byproducts at their highest point of value.

WMSS's centralized solutions use experienced people, a nationwide network of vendor-partners and an innovative IT software platform to manage environmental programs that achieve business improvement targets, corporate environmental goals and ISO 9001 and 14001 objectives. A materials management expert serves on site, off site, or a combination thereof as a single point of contact to develop and drive all elements of a customer's program or project.

Helping Our Customers Meet Their Sustainability Goals

PRODUCT SOLUTIONS

Product innovation is a critical part of today's business landscape. Consumers are increasingly pressuring manufacturers to innovate products in a manner that provides greater value and minimizes environmental impact. Our team of experts collaborate with our customers during the design phase to minimize the impact of their products on the environment and return valuable materials to the production stream through informed design choices.

A key element of that partnership is helping customers [Design With Intent](#), taking a systems-thinking approach that considers the true recyclability of products early in the design phase. This process takes a systems approach to product design that considers three factors: material selection, ease of disassembly and recycling infrastructure capabilities. Additionally, our Sustainable Innovation Workshop is designed to train customers on how to develop the insight necessary to make sustainability-driven, value-minded business decisions.

SUSTAINABLE INNOVATION WORKSHOPS

A Sustainable Innovation Workshop is a facilitated session between Waste Management and our customer that focuses on gaining a deeper understanding of business objectives and challenges, culminating in a collaborative roadmap to achieve goals. Waste Management engages multiple stakeholders to facilitate the process of sustainability strategy development. The process includes data gathering, interviews and bringing stakeholders from various parts of the company together for a guided workshop.

Technology, Innovation and Strategic Alliances

Realizing the potential for innovation to meet customer challenges, in 2016 WMSS formed our Technology, Innovation and Strategic Alliances (TISA) Group to specifically focus on the landscape of emerging solutions. The group has been tasked with working alongside customers to vet, incubate and operationalize emerging opportunities that Waste Management can uniquely leverage to solve customer challenges.

The TISA team held their first Innovation Lab the week of the 2018 Waste Management Phoenix Open. The goal was to have an intentional dialogue with customers to better understand the innovations they most wanted to see Waste Management develop and offer to solve their biggest challenges. [See an overview of the event, and the response from customers.](#)

We facilitate this by providing an overview of industry trends and shared insights based on our experience in the marketplace to determine where our customer would like to be and how best to get them there. Having conducted a gap analysis of the customer's data and current programs, Waste Management is able to provide specific recommendations and probe for feedback on future sustainability initiatives from the group. By using an interactive, dialogue-based approach, both parties are able to understand challenges and discuss specific opportunities where collaboration can help drive value in the organization.

The benefits to customers participating in a Sustainable Innovation Workshop include the ability to benchmark against other leaders in their industry and discover new ideas and strategies to transform their business. In addition, participating in a workshop takes advantage of having a cross-functional team in one place to identify solutions to multiple issues in one day, thus helping to achieve goals in an expedited fashion and sustain project momentum while saving time and money.

In addition to meeting with representatives of our customers' environmental teams in energy and operations, transportation, and waste and recycling, Waste Management includes representatives from other departments, including executive leaders, procurement, loss prevention, donations, vendor management, reverse logistics, human resources, marketing and employee education, to learn how various programs integrate with overall company policies and practices.

Working alongside one of our manufacturing customers, for example, we were able to help them create the first 100 percent fully recyclable product of its kind on the market by helping the customer analyze collection and processing influences, which validated the input materials for the product from the start.

PROCESS SOLUTIONS

No matter the industry, we consult with customers on a systematic approach to build on existing processes, infuse best practices and cultural improvements, and enhance an organization's ability to implement healthier, more sustainable practices into its operations.

WMSS consulting teams conduct comprehensive audits of the social, environmental and economic impact of our customers' businesses. Audit findings generate recommendations for cost-effective ways to improve energy efficiency, resource management, waste diversion and alternate disposal opportunities. Then, we develop detailed roadmaps for eliminating waste and executing this strategy on site, often through reduced demand for source material and increased recycling.

Our on-site team is embedded with customers seeking sole-source suppliers with the infrastructure and expertise to execute national waste reduction programs. With their understanding of each customer's operations and unique challenges, our on-site employees can deliver low-risk, high-value solutions to complex environmental, business, safety and regulatory needs.



How Data and Analytics Can Power Decision Making

ANALYTICAL SOLUTIONS

Measuring environmental, social and economic impacts helps customers assess progress and provides valuable data to use as a baseline in understanding the environmental impact of materials management decisions. WMSS offers customers a portfolio of tools to measure, manage and communicate sustainability progress and goals, with the knowledge that accurate and clearly communicated data analysis is imperative to making these strategic decisions.

This effort is led by our Nexus team — skilled developers, analysts and project managers who work to recognize, research, develop and implement technology and reporting solutions. The Nexus team provides solutions to customer challenges via services such as customized web-based business intelligence platforms, streamlined invoicing solutions, automated reporting, app and web development and comprehensive data analysis. For example, ENSPIRE® is an online business intelligence platform created by our Nexus team that aggregates and repackages raw sustainability data into one interactive dashboard. Waste Management customers use ENSPIRE® as a platform to consolidate all their waste data from the U.S., Canada and Europe for full transparency and ease of reporting. It helps them understand how waste management choices impact their GHG emissions and allows them to set goals for GHG reduction, reuse and recycling. Providing ENSPIRE® is consistent with our overall approach of serving customers by reducing their carbon footprint — and doing so with clear tracking and ambitious metrics.

ENSPIRE® has managed more than 15 million tons of materials for customers at more than 60,000 locations. In 2017, material managed through ENSPIRE avoided nearly 7 million metric tons of GHG emissions, thereby meeting the need for an increased focus on corporate transparency.



OTHER PLATFORMS THAT WE DEPLOY ARE:

- ▶ **Sustainability Tracker:** A leaner version of ENSPIRE®, this tool is designed for smaller customers who want to focus on specific KPIs in a condensed format for quick data evaluation.
- ▶ **INSIGHTS:** Launched in 2018, this technology generates and sends customized scorecards to customers on their schedule. Customers automatically have the information they need to make important operational decisions.
- ▶ **DART®:** Our Construction group’s Diversion and Recycling Tracking (DART) tool helps project planners, contractors, architects and building owners set “green” performance targets and measure their progress during construction, renovation and demolition projects.

Case Study: Waste Doesn't Take Vacations

How do you create a luxurious hotel environment where guests can get away from it all while practicing responsible environmental stewardship? How do you position yourself as a sustainability leader within your industry while depending on your guests to make diversion goals a reality? And how do you do it on a global scale, with different infrastructural challenges, cultures and attitudes toward waste and diversion?

CONSULTING GOAL: Develop roadmap for client's waste reduction goal achievement through upstream and downstream mechanisms to prevent and divert landfilled waste while considering infrastructure limitations.

Developing robust diversion goals is not an easy task. Realizing those goals is even more difficult, especially when considering the need to align with industry best practices, guest expectations and the ability to replicate strong programs across the globe. Achieving a global diversion goal within the hospitality industry requires the participation of multiple stakeholders — guests, employees, management, vendor partners and beyond. The ability to design and implement an effective strategy to engage all stakeholders and achieve the goal requires solid data, innovation, a collaborative spirit, and deep-seated knowledge of the client's industry and operations.

ADVISORY SERVICES

Waste Composition Studies

- › Completed waste assessments at full- and limited-service properties to benchmark composition and diversion rates across lines of business

Program Implementation and Optimization

- › Created customized educational tools, including multilingual pocket guides and training materials
- › Developed tailored signage and bin placement strategies
- › Recommended programs to reduce newspaper and single-use amenities consumption
- › Recommended additional investment in on-site food waste digestion technologies
- › Recommended optimizations to amenity donation, employee engagement and reporting programs to drive progress toward diversion goal

Life Cycle Analysis

- › Used results of waste composition studies and EPA WARM model to determine greatest opportunity for improvement
- › Layered life cycle thinking with economics of material management to identify the greatest opportunities for carbon and energy use reduction, as well as managing spend on environmental services

Strategy Development

- › Collaborated with customer to develop industry-specific goals with measurable, transparent key performance indicators
- › Analyzed waste composition, cost of ownership and life cycle data to determine primary drivers for goal achievement
- › Aggregated data from the entire portfolio regarding waste generation and supply chain impacts to support the hotels' existing efforts to minimize waste

- › Researched differences in operations and infrastructure for each global region through interviews and other resources
- › Based on data and global context, developed strategy to implement recommendations in order to reach goals

Supply Chain Analysis

- › Requested data including quantities and types of materials purchased to drive recommendations for supply chain optimization
- › Developed alternate metrics and methods for obtaining data where it was not available

Global Playbook Development

- › Completed global market analysis to understand regional infrastructure and growth potential, hospitality trends, and cultural and political drivers impacting waste diversion
- › Provided region-by-region descriptions of how to implement target diversion programs to achieve waste reduction goal
- › Utilized supply chain analysis to determine how programs should be weighted in order to achieve goal
- › Applied normalized metrics to the global portfolio to assign percentage diversion reductions per region, per program
- › Provided tactical guidance for program implementation
- › Formulated vendor questions to reduce primary and secondary packaging on purchased goods
- › Included case studies of the newspaper and amenity donation programs

For customers who want a comprehensive view of their product's environmental impacts, we offer [Life Cycle Assessments](#) that evaluate all stages of a product's life — raw material extraction, manufacture, distribution, use, repair and maintenance, and end-of-life disposal or recycling. WMSS applies carbon reduction factors to material disposition options to maximize the end-of-life solutions for materials a company generates. The analysis provides insights into which stages have the greatest potential to avoid GHG emissions or to conserve natural resources. Using this analysis, WMSS is able to make recommendations for how to manage discarded materials in a way that maximizes the carbon reduction performance of a waste management program.

Our [vendor scorecards](#) are a supply chain management tool that helps customers assess whether their vendors meet sustainability goals, including compliance with sustainable purchasing policies and packaging requirements.

Certifications & Standards

Many of our customers seek external verification of their sustainability efforts to underscore the credibility of their efforts and avoid greenwash claims. WMSS serves as a guide through this process, including advising on these third-party rating and certification systems.

- › Leadership in Energy and Environmental Design (LEED)
- › The WELL Building Standard
- › TRUE Zero Waste Certification
- › UL Zero Waste Validations
- › BOMA 360
- › Council for Responsible Sport Certifications
- › ENERGY STAR Certifications
- › Green Globes Certifications

Measuring Customer Success

Delivering cost savings to customers through our WMSS operations is a primary objective and the key metric by which we measure success. One of our ISO goals is to provide ten percent of annual revenues back to customers as cost savings for contracts of less than five years and six percent for contracts of more than five years.

In 2017, of 97 customer facilities under WMSS service engagements, we delivered savings of at least eight percent of revenues, and 23 percent of those facilities delivered savings of greater than ten percent of revenues. That translated into \$14.8 million in cost savings on \$181.7 million in revenue. 2017 marked the 14th consecutive year that WMSS has delivered more than \$10 million per year in savings. Since 2003, the team has delivered more than \$200 million in cost savings to customers.

2017 Customer Cost Savings by Industry Sector

Industry Sector	2017 Revenues	2017 Cost Savings	Savings as % of Revenue	% of 2017 WMSS Cost Savings
Automotive	\$ 22,781,383	\$ 4,013,576	17.6%	27.3%
Chemical	\$ 23,793,391	\$ 1,312,923	5.5%	8.9%
Metals / Manufacturing	\$ 18,635,614	\$ 2,869,124	15.4%	19.5%
Petrochemical	\$ 65,880,445	\$ 3,933,757	6.0%	26.8%
Remote	\$ 19,584,530	\$ 410,403	2.1%	2.8%
Other	\$ 38,691,805	\$ 2,161,808	5.6%	14.7%
Totals	\$189,367,168	\$14,701,591	7.8%	100.0%

CUSTOMER SATISFACTION RESULTS

Customer satisfaction is another way we measure our performance. Every year we ask our customers how satisfied they are with our results and request their response through our Customer Engagement Index, then we measure the results against WMSS's ISO goals. In 2017, 57 percent of WMSS customers participated in the survey. Of those, 98 percent completely agreed that WMSS met their needs and provided valuable service.

Cost Savings by Solutions Type

- Strategic Sourcing: 22%
- Process Improvement: 47%
- Optimized Logistics: 9%
- Recycle/Reuse: 22%



Measuring Customer Success

Our customized, integrated approach is designed to ultimately take our customers' sustainability initiatives to the next level — regardless of where they might be on their sustainability journey. We look at customer success through three different lenses: diversion, safety, and efficiencies and cost savings. Here are some recent examples of customer success.



Auto Manufacturer

RECYCLED NEARLY
90,000 Tons

of materials
in 2017



Petrochemical Facilities

CUSTOMERS ACHIEVED
NEARLY
\$4 Million

in cost savings



Retail Food Customer

DIVERTED
2,240 Tons

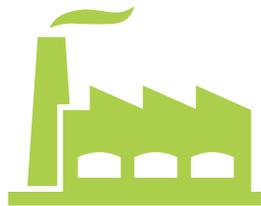
of food scraps, increasing
diversion from 10 percent to
80 percent in 7 months



Commercial Property

ACHIEVED
77% Diversion

up from 20 percent, in less than
a year, resulting in a 30 percent
increase in cost savings



Metals Manufacturer

Through a comprehensive
resource recovery plan,
customer recovered

20-25 Tons
OF BYPRODUCT PER WEEK

reaching its landfill reduction
goal and generating **\$500,000**
annually in discovered value



Construction and Mining Manufacturer

Saved
\$145,000

IN ONE YEAR OF
WMSS PROGRAM

WASTE MANAGEMENT PHOENIX OPEN



Waste Management has been the title sponsor of the Greenest Show on Grass since 2010. Coming up on our 10th anniversary, the Waste Management Phoenix Open remains the most attended PGA TOUR tournament and largest third-party certified zero waste event in the world. We have consistently used this spotlight to engage with stakeholders on environmental issues, as a platform to show the varied and valuable services we provide, and to raise the bar for sustainable sports globally.

The Waste Management Phoenix Open tracks its carbon and water footprints, in addition to being zero waste. Use of water, energy and materials all contribute to the GHG emissions that are warming our planet, and the event commits to balancing all environmental impacts from tournament activities.

As the title sponsor of the Waste Management Phoenix Open, Waste Management works tirelessly to create a unique PGA TOUR tournament with a widespread and lasting positive impact. We challenged our commitment to the fans, local communities, and environment, as well as to hosting Thunderbirds, the PGA TOUR and to our own brand by achieving zero waste for the fifth year in a row with another on the way. It's the ultimate model of what is possible in terms of environmental leadership and vision.

- ▶ Every choice made during the planning process was thoughtfully worked through to ensure that the event lived up to the title of "The Greenest Show on Grass." Year after year, Waste Management is the backbone of this zero waste achievement, making sure all tournament material finds new value — through reuse, recycling, composting, donating or turning it into energy. These efforts are meant to inspire partners, fans and viewers at home to experience and witness what's possible.
- ▶ Waste Management also looks beyond diversion, prioritizing a reduction of waste in the larger sense and establishing programs for water conservation and restoration, renewable energy, GHG monitoring and carbon offsets.
- ▶ The Waste Management Phoenix Open is not only a chance to showcase our services and capabilities — it's a platform through which Waste Management strives to drive environmental responsibility.



Waste Management Phoenix Open AT-A-GLANCE



NATURAL RESOURCE MANAGEMENT

- › 75 million gallons of water restored
- › 100 percent renewable electricity
- › All operations and player travel emissions offset



MANAGING MATERIALS

- › 100 percent landfill diversion
- › Food and material donation



FAN & STAKEHOLDER ENGAGEMENT

- › Zero Waste Station engagement
- › 100 percent vendor compliance with material requirements



COMMUNITY IMPACTS

- › Over \$10 million to charity from Thunderbirds Charities
- › \$105,000 to environmental organizations



TRANSPARENCY & ENVIRONMENTAL IMPACTS

- › Council for Responsible Sport — Evergreen Inspire
- › Golf Environment Organization — GEO Certified®
- › UL — Zero Waste to Landfill Operations with 13.9 percent Incineration with Energy Recovery

Waste Management Sustainability Forum

The Waste Management Sustainability Forum is an opportunity to convene a wide variety of thought leaders, policymakers, business people, experts, entrepreneurs and entertainers on the subject of sustainability. From its early, modest beginning eight years ago in a conference room at Arizona State University to its 2018 event with wall-to-wall screen and a livestream audience watching from home, the Forum has evolved to inform and inspire. It encourages participants to exchange ideas and learn to transform big thinking into bold actions to create a better world.

This year, introductory remarks by The Gates Foundation's President, Bill Gates, and Waste Management's CEO Jim Fish reminded us that sustainability is about more than just environmental goals and measurements. Mike Rowe, Executive Producer and Show Host and Keller Rinaudo, Founder and CEO of Zipline, talked about the amazing power of people, and Chicago Mayor Rahm Emmanuel spoke to resiliency. A recording of the day can be found [here](#).

As in previous years, the Waste Management Sustainability Forum shifted gears in the afternoon, taking a deeper dive into key issues in our industry. The afternoon panels this year covered international recycling trends associated with China's changing import policies and a high-level analysis of the role of life cycle thinking in the recycling industry. With record attendance for the entire day — right up to the last speaker — attendees heard thoughtful presentations on leading efforts in our industry, and where they are heading. These panels included:

ALL ABOUT CHINA

Our recycling panel offered a rare opportunity to hear from the largest domestic mill buyer of mixed paper, Pratt Industries, and from one of China's largest mill groups, Lee & Mann. Ross Lee from Lee & Mann provided a unique insight into his company's approach for managing through changing policies that result from the Chinese government's commitments to a cleaner China. Clearly, material quality takes center stage for mills in China.

And Myles Cohen, President of Pratt Recycling, explained how his company recycles New York City's mixed paper into pizza boxes, and mixed paper from Waste Management into the recycling containers used throughout the Waste Management Phoenix Open course. These efforts exemplify one of the key messages from this panel, which is the need for sufficient

demand for recyclable materials if we are to successfully maneuver through the current global oversupply caused by China's import restrictions.

A critical topic covered by the panelists was the overwhelming need to focus on quality. Both domestic and international mills reminded us that China's quality requirements have generated much stricter quality requirements across the globe.

IT'S ABOUT THE ENVIRONMENT

Linking global markets to state and local policies, the rest of the afternoon dug deeply into the trends, facts and projects associated with life cycle thinking, as well as looking more broadly at our environmental goals and how we can think differently about our materials management programs to maximize our environmental benefit. We were reminded of why we recycle, and the importance of focusing on those actions which offer the greatest environmental benefits versus simply counting tons recycled.

Cheryl Coleman, Director for the Resource Conservation and Sustainability Division within the Office of Resource Conservation and Recovery at the U.S. EPA, described EPA's framework policy, called Sustainable Materials Management, which focuses on using life cycle thinking to evaluate products along their entire life cycle, creating goals and programs that focus on achieving the greatest overall environmental impact — not focusing only on end-of-life programs and goals.

This approach has been embraced by the State of Oregon, with senior policy analyst David Allaway, from the Oregon Department of Environmental Quality's (ODEQ) Materials Management Program, presenting on his state's programs. Allaway's national leadership on this topic centers on the rationale for considering the environmental impact of materials, versus end-of-life, weight-based recycling goals. Evaluating their own waste stream and the environmental impacts of various materials within it, Oregon has come to focus their efforts on reducing food waste by 25 percent by 2025 and recovering 25 percent of their plastic and carpet by 2025.

Mayor Denny Doyle from Beaverton, Oregon, next outlined the efforts that the City of Beaverton is making to reduce food waste, in support of his state's reduction goals.

FROM THE AREA OF ACADEMICS

Dr. Tim Townsend, Jones Edmunds Professor of Environmental Engineering Sciences in the Engineering School of Sustainable Infrastructure and the Environment at the University of Florida, talked about the work he and his graduate students are doing to reevaluate Florida's recycling goals — reshaping their goals away from simple end-of-life, weight-based recycling goals to energy reduction goals. Similar to Oregon's efforts, Dr. Townsend has reviewed waste characterization data for the state through the prism of GHG emissions and energy. From this, Dr. Townsend described how new goals could reflect a realistic 75 percent energy reduction goal from a 2005 base year, with specific programs geared toward recycling the right things.

This panel brought the national discussion around goals and measurements to a new level by clearly describing the case for change and the concept of creating new and different goals that reflect environmental benefits along the entire life cycle of products and packaging.

MODERATED DEBATE OF LIFE CYCLE PRINCIPLES

One of the concerns with a shift to Sustainable Materials Management or Life Cycle Thinking has been the debate over whether it is a distraction from important recycling efforts.

Perhaps one of the best ways to engage in such meaningful discussions is to bring together thought leaders who do not necessarily agree. One of the highlights of the afternoon was a discussion between senior policy analyst David Allaway and Steve Alexander, President and CEO of the Association of Plastics Recyclers. Through a moderated question and answer session, Allaway and Alexander discussed topics such as whether or not life cycle thinking gives packaging producers license to skip the “design for recycling” component of their obligation for packaging improvement. Policies that drive the greatest environmental benefits simply must be incorporated into programs to ensure a long-term and ongoing effort for continuous improvement.

LIFE CYCLE ANALYSIS

U.S. EPA’s Jarrod Bridge, an environmental physical scientist in the Sustainable Materials Management Program, wrapped up the day with a short workshop on EPA’s WARM (Waste and Reduction Model) tool, that calculates carbon and energy

emissions for various materials in the waste stream. This popular workshop was included specifically in response to previous attendee requests and has since been recreated at other venues.

Record In-Person Attendance



An additional 442 people participated in the Sustainability Forum online, bringing the total number of participants to well over 800 individuals.

More information on past and future Sustainability Forums can be found on our [website](#).

RECYCLING PARTNERSHIPS



Recycling operations involve a complex flow of materials. We collect, and our facilities receive, recyclables from a variety of sources: our own trucks, city collection crews, customers and competitors. Because of the complexity of this network, we realize that it makes more sense to work with partners across the industry than to try to identify and solve business challenges on our own.

Waste Management has several key partnerships, including The Recycling Partnership, a nonprofit organization that works closely with cities, counties and states to implement effective programs; Keep America Beautiful, which works with local communities to help teach the fundamentals of recycling to a broad consumer base; and Industry Associations that include the National Waste and Recycling Association (NW&RA), the Solid Waste Association of North America (SWANA) and the Institute for Scrap Recycling Industries (ISRI). Our national partnerships on recycling are important means to educate legislators, regulators and the public about ways public policy can maximize the environmental benefits latent in recycling, or impede progress in this area. They are important means to advance the sustainability of recycling over the long term by serving as resources on recycling technology, end markets, and life cycle analyses. Local partnerships are equally important, and we participate actively with groups around the country. Read more in our [Communities](#) section.