WASTE MANAGEMENT
Research Brief

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WASTE MANAGEMENT

Research Brief

SASB’s Industry Brief provides evidence for the disclosure topics in the Waste Management industry. The brief opens with a summary of the industry, including relevant legislative and regulatory trends and sustainability risks and opportunities. Following this, evidence for each disclosure topic (in the categories of Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance) is presented. SASB’s Industry Brief can be used to understand the data underlying SASB Sustainability Accounting Standards. For accounting metrics and disclosure guidance, please see SASB’s Sustainability Accounting Standards. For information about the legal basis for SASB and SASB’s standards development process, please see the Conceptual Framework.

SASB identifies the minimum set of disclosure topics likely to constitute material information for companies within a given industry. However, the final determination of materiality is the onus of the company.

Related Documents

- Infrastructure Sustainability Accounting Standards
- Industry Working Group Participants
- SASB Conceptual Framework

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INTRODUCTION

A closed-loop or circular economy is perhaps the ultimate sustainable state, where neither virgin materials are extracted nor waste is discarded. As economies like the European Union (E.U.) move toward a circular economy, the Waste Management industry is increasing its scope from managing waste to protect public health and the environment to enabling recycling and resource recovery.

Certain industries, such as steel, are at the forefront of resource recovery: for others, such as technology, it is still a challenge. While the industry plays a major role in safeguarding public health through proper management and disposal of waste, mismanagement can result in harm to public health and the environment, particularly in communities neighboring waste management facilities. The presence of a waste management facility has the potential to affect the local community through odors, respiratory illnesses, and other health impacts.

Waste management services are increasingly being privatized, and a vast majority of the permitted municipal solid waste (MSW) landfill capacity is privately held.1 However, there is a risk that dissatisfied communities will resist waste management companies that mismanage sustainability risks and opportunities. Because the industry provides an essential public service, it relies heavily on its social license to operate. To continue and expand operations, industry players must carefully manage their environmental and social impacts, enhance resource recovery, and protect workers.

Management (or mismanagement) of certain sustainability issues, therefore, has the potential to affect company valuation through impacts on profits, assets, liabilities, and cost of capital.

Investors would obtain a more holistic and comparable view of performance with waste management companies reporting metrics on the material sustainability risks and opportunities that could affect value in the near and long term in their regulatory filings. This would include both positive and negative externalities, and the non-financial forms of capital that the industry relies on for value creation.

Specifically, performance on the following sustainability issues will drive competitiveness within the Waste Management industry:

- Mitigating greenhouse gas emissions from landfills;
- Minimizing impacts on local air quality;
- Improving fuel efficiency and reducing transportation emissions;
- Managing the ecological impacts of landfills and hazardous waste sites;
- Managing worker health and safety, both in terms of acute and chronic risks;
- Addressing labor concerns to ensure strong labor relations; and

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ENVIRONMENT
- Greenhouse Gas Emissions
- Air Quality
- Fleet Fuel Management
- Management of Leachate & Hazardous Waste

HUMAN CAPITAL
- Workforce Health & Safety
- Labor Relations

BUSINESS MODEL AND INNOVATION
- Recycling & Resource Recovery
• Contributing to a circular economy through landfill diversion and recovery of materials from waste.

INDUSTRY SUMMARY

The Waste Management industry includes companies that collect, store, dispose of, recycle, or treat various forms of waste from residential, commercial, and industrial clients. Types of waste include MSW, hazardous waste, recyclable materials, and compostable or organic materials. Certain industry players also provide environmental engineering and consulting services, mostly to large industrial clients. Major players, such as Waste Management Inc. (WM Inc.) and Republic Services, are vertically integrated, providing a range of services from collection to recycling. Some operators specialize in certain segments. Metalico Inc., for example, recycles scrap metal. Note that the SICS industry of Waste Management includes publicly listed companies that offer various waste-related services. Wastes handled on site are covered under the generating sector, for example, Coal Ash Management in Electric Utilities industry.

Waste management companies offer various services to different types of customers. Companies collect residential waste directly from residences under contract with municipalities, homeowners’ associations, or other regional authorities, or under individual monthly subscriptions with households. They also collect waste from commercial businesses, including multi-family housing and institutions.

Companies offer transfer and landfill services to municipalities, construction and demolition companies, and other waste collection companies, as well as to residents who may directly use landfills to dispose of items not collected curbside. Revenue comes from the tipping, or disposal, fees, typically calculated by weight, charged to those using transfer or landfill services. Waste management companies can also generate revenue from processing and selling recyclable materials, including paper, metals, glass, and plastics. Certain companies provide niche services, such as the disposal of medical and other hazardous waste or engineering and environmental consulting for site remediation.

Companies in the global Waste Management industry generate $146 billion annually. Most of the revenue (87 percent) comes from waste collection and treatment and recyclable materials. The rest is generated from environmental engineering and consulting services. U.S.-listed companies and those traded primarily over the counter in the Waste Management industry generated $61 billion in revenues in fiscal year (FY) 2013.

In the U.S., municipalities’ share of the waste management market has been declining as the private sector gains ground. In 2012, the U.S. had 1,908 landfill facilities, a dramatic decrease from 1988, when there were 7,924. The general trend is toward a smaller number of private facilities with greater capacity. Publicly owned landfills fell from 83 percent of total in 1984 to 64 percent in 2004. However, publicly owned landfills accounted for only 17 percent of permitted MSW landfill capacity, indicating the greater role of the private sector in providing waste services.

Per capita waste varies greatly across the world. For example, Organization for Economic Cooperation and Development (OECD) countries generate 485 pounds (2.2 kilograms) per capita of waste...
urban waste daily, compared with 1.43 pounds (0.65 kilograms) per capita in sub-Saharan African countries. In the U.S., per capita municipal solid waste has maintained a steady rate since the 1990s: about 4.4 pounds (2.2 kilograms) per day. U.S.-domiciled firms provide collection, treatment, and disposal services to domestic customers, though some recycled content is traded globally.

Of the 251 million tons of MSW generated by Americans in 2012, approximately 35 percent was recycled or composted. Therefore, a majority of the waste was deposited in landfills. MSW is one of the main drivers of the industry. Per capita MSW in the U.S. is fairly stable, but population growth has led to increases in aggregate volumes. The manufacturing and construction industries produce much of the hazardous and bulky refuse, respectively. Growth in these industries drives demand for waste management services. High commodity prices make recycled content an attractive alternative to using virgin materials, so when commodity prices are low, revenue from recycling shrinks.

The Waste Management industry is relatively capital-intensive, with significant investment in collection vehicles, collection containers, transfer stations, and increasingly complex machinery for sorting, recycling, and other activities. Labor is a significant cost for waste management companies. In FY2013, Republic Services reported that labor and related costs (health and welfare benefits, incentive compensation, and payroll taxes) were 31 percent of its total cost of operations. WM Inc. reported labor costs at 27.2 percent of its FY2014 operating expenses. Other major expenses include those for maintenance and repair; transfer and disposal, which include tipping fees to third-party disposal and transfer facilities; subcontractors, which include payments to individual haulers who transport waste collected by companies to disposal sites; and fuel. Fuel costs accounted for about 9 percent of the cost of operations for Republic Services, and 6 percent for WM Inc. Large waste management companies are vertically integrated, since operating and/or owning transfer stations and landfills can reduce transfer and disposal costs. However, ownership of landfills comes with significant operating costs, including those related to financial assurance, leachate management, remediation, and other maintenance costs.

For larger integrated companies, such as, WM Inc., Republic Services, and Waste Connections, FY2013 net income margins were 0.7, 7.0, and 10.1 percent, respectively. In FY2014, net income margins improved for WM Inc. and Waste Connections to 9.3 and 11.2, respectively, while Republic Services remained relatively consistent at 6.2 percent.

The nonhazardous solid waste industry is composed of entities of varied sizes and ownership—a few national publicly owned companies, several regional private and public solid waste companies, and a multitude of small private operators. Private-sector waste services companies often compete with municipalities for waste collection or disposal services. Vertically integrated companies that collect and recycle waste have a distinct advantage over small industry operators. These large companies are able to keep a stable stream of waste flowing into their recycling facilities, regardless of the market price for recycled commodities, ensuring stable costs of input for their recycling facilities.

U.S.-listed companies in the Waste Management industry are focused on U.S. operations, especially those that provide waste collection and landfill services. Republic Services and Waste Connections received 100 percent of FY2014 revenues from the U.S., while WM Inc. generated 93 percent...
from the U.S. and 7 percent from Canada. Tetra Tech, an environmental engineering firm, generated 74 percent of its revenue from the U.S., and Stericycle, a medical and hazardous-waste services company, generated 70 percent of revenue domestically, with the rest split roughly equally between the E.U. and other regions. Therefore, the focus of this brief will be the U.S. market.

In the industry, plastics grew from 10.5 percent of MSW in 2000 to 12.7 percent in 2012, while textiles grew from 3.9 to 5.7 percent. Other waste categories also increased, in terms of both amount and percentage of MSW, with the exception of glass, paper, and paperboard. The quantity of paper and paperboard discarded shrank from 87,740 tons in 2000 to 68,620 tons in 2012. During the same period, recovery of materials from MSW has improved across the board, from 28.5 to 34.5 percent of MSW generated. One exception to this is aluminum recovery, which decreased from 27 to 19.8 percent of aluminum waste generated over the same period. Notable increases in recovery include food, which more than doubled, from 2.2 to 4.8 percent of food waste generated.

Company valuation is earnings-driven, so measures that lead to higher revenues or lower costs will improve company valuation. A company’s valuation depends on its current market share, the extensiveness of its networks, and its ability to grow through acquisitions. Forecasting of financials is likely to be more accurate if various business segments are considered separately, as financial characteristics may differ significantly. In particular, a company’s exposure to recycled commodity prices and the electricity market, for those generating power from MSW and landfill gas (LFG), will affect its earnings potential.

Since labor costs are high and worker safety is a major concern, companies looking to automate operations and create a safer working environment are seen favorably. Fleet conversion to natural gas engines is considered as a factor for improved margins. The development of alternative revenue sources from the waste stream could be another key factor in further boosting industry revenues.

LEGISLATIVE AND REGULATORY TRENDS IN THE WASTE MANAGEMENT INDUSTRY

Regulations in the U.S. and abroad represent the formal boundaries of companies’ operations, and are often designed to address the social and environmental externalities that businesses can create. Beyond formal regulation, industry practices and self-regulatory efforts act as quasi-regulation and also form part of the social contract between business and society. In this section, SASB provides a brief summary of key regulations and legislative efforts related to this industry, focusing on social and environmental factors.

The main types of regulations affecting the Waste Management industry are related to the environment, worker health and safety, and transportation. These issues are governed at the federal, state, and local levels.

Federal environmental statutes in the U.S. affecting waste management facilities and operations include the 1970 Resource Conservation and Recovery Act (RCRA), which amended the 1964 the Solid Waste Disposal Act, the Comprehensive Environmental Response, 

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8 This section does not purport to contain a comprehensive review of all regulations related to this industry, but is intended to highlight some ways in which regulatory trends are impacting the industry.
Superfund or Compensation and Liability Act (CERCLA), the Clean Water Act (CWA), and the Clean Air Act (CAA), among others.  

The RCRA establishes a regulatory framework for the transportation, treatment, storage, and disposal of hazardous and nonhazardous solid waste. Various federal, state, and local regulations govern the design, construction, and operation of landfills, where waste is deposited into lined cavities in the ground, compacted, and topped with earth or another covering to prevent its contact with the air and keep it from attracting rodents, birds, and other pests. Landfill operations must utilize available space and maintain environmentally safe conditions.

The closure of landfills is also regulated. Landfill owners must have a plan to maintain and monitor closed sites during a 30-year post-closure period or longer, if necessary to protect human health and the environment. During this period, there are costs associated with maintaining the site, monitoring the LFG collection and groundwater systems, sampling groundwater, preparing analysis and statistical reports, managing leachate, and controlling erosion related to the final cap. At the end of the period, the operator must certify that the post-closure care has been completed in accordance with the official plan.

The CERCLA requires cleanup of priority contaminated sites such as landfills and other waste facilities. It may also impose liabilities for the cost of cleanup and damages to the natural environment onto the current and past owners and operators of a contaminated site, parties that generated the wastes that were sent to the site, and waste transporters that selected the site. Financial-assurance provisions in CERCLA settlements help ensure that responsible parties bear the cost of cleanup. In addition to hazardous waste sites, MSW landfills are also subject to strict state waste regulations and financial liabilities for cleanup of CERCLA sites.

The CWA regulates the discharge of pollutants into streams, rivers, and other bodies of water. Since runoff from landfills may enter surface waters, regular monitoring and sampling is required to limit the quantities of pollutants discharged.

LFG has been regulated under the RCRA since 1980. In 1996, the U.S. Environmental Protection Agency (EPA) promulgated regulations under the CAA imposing more extensive LFG controls. States implement these national programs. By law, new source performance standards and revised standards for existing landfills are updated and made more stringent incrementally over time. States like California have particularly stringent standards, going beyond the baseline federal program. States must require monitoring and control of LFG pursuant to RCRA and the CAA, but conversion of LFG into renewable energy and fuel is voluntary on the landfill operator’s part.

The CAA imposes limits on air pollutants from various waste-related operations, including landfills, incineration, and waste transportation. However, there is uncertainty around the limits on LFG and whether existing landfills will be required to further reduce methane emissions.

In 1990, the EPA developed the maximum achievable control technology (MACT) standards under the CAA to reduce air pollution from MSW combustors. This resulted in emissions of hazardous air pollutants declining by 94 percent over the following 15 years.

The U.S.’s intended nationally determined contribution for the 2015 Conference of the Parties in Paris has implications for all sectors contributing to the greenhouse gas (GHG) inventory. However, the specific impact on the
waste sector is not definite. The Intergovernmental Panel on Climate Change’s sectors include all large emitters: energy supply, transport and its infrastructure, residential and commercial buildings, industry agriculture, and forestry, along with waste management. While there are large uncertainties regarding the quantification of emissions from the global waste sector, it is estimated that waste is the smallest contributor to the GHG inventory (less than 5 percent), with LFG accounting for more than 50 percent of the sector’s emissions. Widely implemented LFG collection systems have led to a stabilization of landfill methane emissions from developed countries. The focus now is on decoupling waste generation from economic growth through recycling, reuse, and waste minimization, and on using waste to generate energy.

The U.S. Clean Power Plan, which includes emissions cuts for power plants, could play a role in the growth of the waste-to-energy market. Energy from waste is considered renewable energy under this plan and could be used by states to generate emission rate credits. However, in February 2016, the Supreme Court issued a stay on the implementation of the Clean Power Plan pending judicial review. Whether the plan will be implemented or have an impact on the Waste Management industry remains to be seen.

Solid-waste transportation operations are regulated by the Federal Highway Administration, the Federal Motor Carrier Safety Administration, and other regulatory agencies. Heavyweight vehicles, such as those used to collect and haul trash, are subject to increasingly stringent emissions requirements. In 2015, the Obama administration proposed new rules on increasing the fuel economy of heavy-duty vehicles. However, there is concern about the impact of such regulations on the cost of vehicles, which will likely be borne by vehicle manufacturers, fleet owners, and operators. Regulators estimate that fuel economy standards may increase the initial cost of new vehicles but that the fuel cost savings over the lifetime of the vehicle would make up for this increase.

The Occupational Safety and Health Administration (OSHA) enforces occupational standards for industry workers. Waste workers are often near heavy vehicles and equipment and so are exposed to many hazards. Safety violations that create unsafe work environments can be fatal for industry workers.

In 2007, the U.S. Supreme Court ruled that state and local governments could specify a disposal or processing facility for waste generated within their jurisdictions. Widespread adoption of this rule could drive up industry operating costs, as economies of scale may be limited. There is a similar movement regarding the transboundary transport of electronic waste (e-waste), which can be very labor-intensive to recycle and toxic to human health and the environment if it is not handled properly. Strict limitations on the export of e-waste could provide new opportunities for waste management companies. The international transport of hazardous waste is regulated by the EPA and is limited to consenting foreign companies under the Basel Convention.

Federal laws regulate the recycling of hazardous waste and nonhazardous special wastes, such as electronics, batteries, and fluorescent lights. However, no federal law directly concerns the recycling of nonhazardous MSW, which is regulated under local and state laws. Zoning restrictions control the properties available for such facilities. Most cities perform or contract for services to perform residential recycling, but
commercial and industrial recycling is usually handled by private contractors.

State regulations are often quite extensive. For example, California law mandates that there must be a recycling collection center in every shopping zone where businesses bring in more than $2 million per year. States such as New York, Vermont, and Michigan have a deposit-refund system that requires recycling centers to pay a specific deposit amount (5 to 10 cents per bottle or can) to any person or business that brings recyclables to their center. 54

As of March 2014, businesses in Massachusetts that produce more than one ton of food waste a week cannot landfill their waste if composting or anaerobic options are available. 55 Connecticut, Vermont, and the cities of Seattle, San Francisco, and Portland, have all banned large generators of food waste from landfills, although some locales have a more graduated approach to reaching a complete ban. 56 These types of regulations are intended to make the use of landfills less attractive and encourage recycling, composting, and other landfill-diversion methods. Such regulations may have large implications for the industry, as discussed in the Recycling and Resource Recovery disclosure topic. Overall, as waste gets diverted from landfills, less revenue may be generated from tipping fees. Additional opportunities exist to provide recycling and composting services, but there may be competition from other entities for these lines of business.

SUSTAINABILITY-RELATED RISKS AND OPPORTUNITIES

Industry drivers and recent regulations suggest that traditional value drivers will continue to impact financial performance. However, intangible assets such as social, human, and environmental capitals, company leadership and governance, and the company's ability to innovate to address these issues are likely to increasingly contribute to financial and business value.

Broad industry trends and characteristics are driving the importance of sustainability performance in the Waste Management industry:

- **Environmental impacts:** The Waste Management industry is uniquely positioned to manage the environmental impacts of waste generated by other industries and consumers. To play this role effectively, the industry must manage the impacts of its own operations and constantly innovate ways to dispose of new types of waste.

- **Closed loop system:** Related to the point above, there is a growing trend from individuals, municipalities, and others to divert waste from landfills—a movement toward a closed-loop economy. This challenge presents new opportunities for waste management companies to provide additional financially viable lines of business.

- **Extensive license to operate:** Because the industry provides an essential public service, it relies heavily on its social license to operate. Recent trends have been toward privatization, and the industry’s management of environmental and social impacts will help ensure industry growth.

As described above, the regulatory and legislative environment surrounding the Waste Management industry emphasizes the importance of sustainability management and performance. Specifically, recent trends suggest a regulatory emphasis on environmental protection, which will serve to align the interests of society with those of investors.
The following section provides a brief description of each sustainability issue that is likely to have material financial implications for companies in the Waste Management industry. This includes an explanation of how the issue could impact valuation and evidence of actual financial impact. Further information on the nature of the value impact, based on SASB’s research and analysis, is provided in Appendix IIA and IIB.

Appendix IIA also provides a summary of the evidence of investor interest in the issues. This is based on a systematic analysis of companies’ 10-K and 20-F filings, shareholder resolutions, and other public documents, which highlights the frequency with which each topic is discussed in these documents. The evidence of interest is also based on the results of consultation with experts participating in an industry working group (IWG) convened by SASB. The IWG results represent the perspective of a balanced group of stakeholders, including corporations, investors or market participants, and public interest intermediaries.

The industry-specific sustainability disclosure topics and metrics identified in this brief are the result of a year-long standards development process, which takes into account the aforementioned evidence of interest, evidence of financial impact discussed in detail in this brief, inputs from a 90-day public comment period, and additional inputs from conversations with industry or issue experts.

A summary of the recommended disclosure framework and accounting metrics appears in Appendix III. The complete SASB standards for the industry, including technical protocols, can be downloaded from www.sasb.org. Finally, Appendix IV provides an analysis of the quality of current disclosure on these issues in SEC filings by the leading companies in the industry.

ENVIRONMENT

The environmental dimension of sustainability includes corporate impacts on the environment. This could be through the use of natural resources as inputs to the factors of production (e.g., water, minerals, ecosystems, and biodiversity) or environmental externalities and harmful releases in the environment, such as air and water pollution, waste disposal, and GHG emissions.

The Waste Management industry, by its very nature, seeks to manage the environmental impacts of waste generated by households and other industries. It plays a key role in the consumption value chain by properly disposing of items that have reached the end of their useful lives and, where possible, turning them into valuable inputs for production.

Proper handling of waste is important, as both hazardous and nonhazardous waste can have detrimental effects on the environment and local communities. Organic waste is a significant contributor of methane, a potent GHG. Other wastes, including e-waste and hazardous waste, must be treated carefully to ensure that harmful substances do not migrate into the environment. In addition to managing the environmental impacts of waste, companies that collect, haul, or transfer waste must also manage vehicle emissions.

Greenhouse Gas Emissions

Many publicly listed waste management companies own or operate landfills. Publicly owned landfills accounted for only 17 percent of permitted MSW landfill capacity in 2012, meaning that the vast majority are managed by the private sector. Because of the natural decomposition process, landfills generate emissions, known as LFG. Though the exact composition and volume of
the LFG generated varies depending on the type and amount of waste and the environment, it consists of roughly equal parts methane and carbon dioxide, with trace amounts of non-methane organic compounds and inorganic compounds. Methane has 25 times the global warming potential of carbon dioxide, making LFG a significant anthropogenic contributor to global GHG emissions.

Given methane’s potency, federal regulations limit LFG emissions, and it is likely that those regulations will become more stringent over time. Separate state laws, such as California’s Assembly Bill 32, also require the monitoring and collection of LFG. Landfills are therefore subject to compliance costs and risks associated with climate change mitigation policies.

Landfill emissions associated with new waste can be mitigated by separating organic materials from other waste prior to depositing it in a landfill. LFG generated from already disposed waste or new waste that includes organics can be reduced through a variety of control technologies: LFG-collection-efficiency improvements, LFG-control devices, and increased methane oxidization. Methane trapped through LFG-capture systems can be combusted in a flare, an engine, or a turbine to dramatically reduce the overall toxicity and potency of raw LFG.

LFG capture is particularly important for owners and operators of large landfills, which have been the target of regulations. Although capital costs are associated with LFG collection, the resulting gas can be refined and sold for revenue or used to fuel company operations.

Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Gross global Scope 1 emissions, percentage covered under emissions-limiting regulation and percentage covered under emissions-reporting regulation;
- Total landfill gas generated, percentage flared, percentage used for energy; and
- Long-term and short-term strategy or plans to manage Scope 1 emissions, emissions-reduction targets, and an analysis of performance against those targets.

**Evidence**

Postconsumer waste is a significant contributor to global GHG emissions, accounting for nearly 5 percent of total emissions. The EPA estimates that 18 percent of methane U.S. emissions are generated by landfills; methane emissions constitute 9 percent of total U.S. GHG emissions. Therefore, even though landfill methane accounts for only 1.6 percent of domestic GHG emissions, landfills are among the top man-made sources of methane.

Despite the Waste Management industry’s relatively low contribution to total U.S. GHG emissions, the high potency of methane compared with that of carbon dioxide emissions and the potential for significant mitigation have led to regulatory actions that affect the industry. Current federal regulations require large landfills to install LFG collection systems. In 1996, the EPA enacted legislation requiring the monitoring of large MSW landfills and mandating that significant emitters have an LFG collection system. Some state laws also require LFG emissions monitoring.

San Francisco also mandates the diversion of food scrap and yard trimmings in order to reduce LFG emissions. In general, landfill-diversion policies, including banning organics from landfills, reduce
the amount of waste landfilled and can reduce revenues for waste management companies—or at a minimum, require revised business-model approaches to handle and monetize these alternative waste streams.

The EPA estimates that gas collection systems could come with capital costs of about $24,000 per acre, with $4,100 per acre in annual operating and maintenance (O&M) costs. For a large company like Republic Services, with 37,000 permitted acres of landfill, this translates to about $888 million in capital costs alone, not including annual O&M costs of $152 million.

After collection, LFG can be flared to reduce methane emissions; however, no revenue is generated from this option. The typical capital costs to generate power from LFG vary from about $1,400 per kilowatt for turbines to $5,500 per kilowatt for microturbines.

Given the high costs of control technologies and the upfront costs of power generation from LFG, it is generally more economical for large landfills with high LFG-generation rates to install LFG-control technologies than it is for small landfills. In fact, many operators of large landfills currently operate energy projects. As of March 2015, 595 U.S. landfills operated 645 projects to generate electricity or supply gas as fuel. WM Inc. reports in its FY2014 annual SEC filings that 123 of its solid-waste landfills and four third-party landfills have beneficial-use projects for LFG. The company had 247 active solid-waste landfills in 2015. Of these, 107 generated electricity sold to utilities or power cooperatives, and gas from the rest of the landfills was either sold to industrial customers and natural gas suppliers or processed into liquefied natural gas for vehicles. WM Inc. earned 13 percent of its FY2014 revenue from such “green energy.”

In addition to generating revenue from the sale of LFG, LFG-capture systems may be eligible to generate GHG credits if a project developer can demonstrate that methane reduction goes beyond what is required by federal or other regulations. Landfill energy projects can qualify for subsidies, which may sometimes be necessary for a project to break even. Federal subsidies include payments from the Renewable Energy Production Incentive program and Section 29 tax credits, which were established to encourage energy production from unconventional sources. Additionally, several states provide incentives for electricity generation from renewable sources.

**Value Impact**

Evidence suggests that GHG emissions from the industry, particularly methane emissions, pose a regulatory risk, with potential impacts on operational costs and capital expenditures. Diversion of waste from landfills can negatively impact revenues from tipping fees, while increasing the opportunity to process alternative-waste streams.

Mismanagement of emissions could result in more regulations that aim to curb landfill emissions or divert waste from landfills. Depending on the type of regulation, permits could be denied for setting up new or expanding existing landfills, or terms and conditions related to emissions abatement could be required for issuing new permits. On the other hand, an opportunity could exist to generate revenue from sales of gas, as well from as renewable energy credits from energy projects.

As more stringent or extensive GHG regulations are implemented, the probability and magnitude of these impacts are likely to increase in the future.

The magnitude of regulatory impacts can be estimated using companies’ Global Scope 1 GHG...
emissions and the ratio of those covered by regulatory programs. GHG mitigation strategies and targets constitute forward looking indicators of a company risk exposure to stringent emissions reduction schemes, which could significantly impact high emitters in the form of taxes or cap-and-trade.

**Air Quality**

Air pollution is the presence of air contaminants in such quantities and duration that they can be injurious to humans, animals, plants, or property. It also includes contaminants that interfere with enjoyment of life or property. Therefore, odors and toxic gases, such as those emitted from landfills, landfill fires, waste incinerators, and waste treatment plants, are considered air pollution.

Financial impacts from excessive air emissions vary depending on the specific location of operations and the prevailing air emissions regulations, but they can include capital expenditures, increased operating costs, fines, and lawsuits from affected communities. Active management of the issue—through technological and process improvements—can mitigate the impacts of increasingly stringent air-quality regulations. Human health impacts and financial consequences of poor air-quality management are likely to be exacerbated by the proximity of waste management facilities to communities. Management of air pollutants and odors therefore can help companies secure permits and protect their license to operate.

The global waste-incineration market is expected to grow. In certain European countries, incineration already plays a large part in waste management. As point sources, waste incinerators have to comply with strict air pollution regulations. Between 1990 and 2005, the EPA’s MACT standards for MSW combustors drastically cut emissions of mercury, cadmium, lead, particulate matter, hydrogen chloride, sulfur dioxide, and nitrogen oxides (NOx). With the exception of NOx, which was reduced by 24 percent, all other pollutants were reduced by between 88 and 97 percent from 1990 levels. The EPA’s Air Pollutant Emissions Trends Data shows that waste disposal and recycling emissions of major air pollutants—including carbon monoxide, nitrogen oxide, particulate matter, sulfur dioxide, and volatile organic compounds—have been on the decline.

Historically, hazardous waste sites, municipal landfills, waste transfer sites, incinerators, and other hazardous facilities have been disproportionately located in low-income and minority neighborhoods. A 1983 U.S. Government Accountability Office report confirmed that racial minorities are burdened with a disproportionate amount of environmental risks and that income was a factor in siting hazardous and toxic facilities.

Studies have established links between ailments such as asthma, childhood cancer, and abnormal brain development and environmental factors, including exposure to air pollutants and chemicals. People with low incomes and inadequate access to health care are more vulnerable to these health threats.

The presence of a nearby landfill is linked to a decrease in property value. The historical decline in the number of landfills indicates the potential difficulty of obtaining permits to expand or create landfills in proximity to communities. Because the industry provides an essential public service, the effective management of environmental impacts such as air pollution is necessary to maintain a social license to operate.
Actively managing emissions through implementing industry best practices across operations can lower the risk of violations and monetary penalties. Informing the local population in a timely manner about the hazards of operational and incident-related emissions, and steps to address these, can lower reputational and litigation risks.

Company performance in managing air quality can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Air emissions of the following pollutants: NOx (excluding N2O), SOx, non-methane volatile organic compounds, and hazardous air pollutants;
- Number of facilities in or near areas of dense population; and
- Number of incidents of non-compliance associated with air emissions.

**Evidence**

Waste management facilities can be a significant contributor of localized air pollution. Poor management of air pollutants can lead to fines, penalties, and mandated capital expenditures to reduce emissions. For example, emissions of harmful air pollutants resulted in a Department of Environmental Quality (DEQ) fine for the owners of Pilot Rock, a landfill for sawmill wood waste in eastern Oregon. According to the DEQ, “years of neglect” led to repeated landfill fires, which are a source of harmful air emissions. The $790,000 fine was levied for Pilot Rock’s failure to properly close its landfill and post a bond for closure costs.84

In 2012, Forward Inc. of Manteca, California, agreed to a settlement to resolve alleged violations of air pollution laws resulting from excess landfill and vehicle emissions. The settlement required the company to spend $1.7 million to improve gas control and collection at its Manteca landfill to minimize likelihood of fires. The company was also required to pay $200,000 as a civil penalty for violating air pollution laws and to upgrade its diesel trucks to cleaner-burning vehicles. As a result of the settlement, local communities are expected to benefit from reduced emissions of particulate matter and NOx, a pollutant that can have negative health impacts and create haze and smog.85

Waste treatment facilities can also be a source of air pollutants. Stericycle, one of the largest waste management companies, agreed to pay a $2.3 million fine to settle allegations that its Salt Lake City medical waste incinerator violated emissions limits and falsified stack test results. Under the settlement, the company can avoid paying half the fine if it relocates its facility to a sparsely populated area of the state in Tooele County.86

In 2012, 29 million tons of MSW—nearly 12 percent—was combusted for energy recovery in 86 facilities across the U.S.87 Waste incineration has many by-products, including ash (roughly 10 percent of volume), greenhouse gas emissions, and air pollutants such as lead, mercury, cadmium, particulate matter, NOx, sulfur dioxide, and hydrogen chloride. The CAA mandates the reduction of these pollutants to mitigate harmful effects on human health.88 About 15 to 25 percent of the weight of the MSW processed remains as ash, of which 10 to 20 percent is fly ash, which must be scrubbed from emissions; the rest is bottom ash. The ash recovered from MSW combustion is sent to landfill89 or used to make cement. Facilities must carefully monitor emissions to ensure that they are in compliance with air quality standards.
Although MSW incineration is still a relatively small portion of the Waste Management industry, the energy-from-waste market is likely to grow, both in the U.S. and globally, as various air pollution and carbon regulations come into effect that may further drive the waste-to-energy market. One example is the Clean Power Plan, which includes energy from organic waste in its definition of “renewable energy.” At the same time, MSW incinerators must meet strict emissions standards, such as those promulgated in Title V permits. In its 2015 third-quarter earnings call, Stericycle Chief Operating Officer Brent Arnold acknowledged that new Title V requirements for incinerators is leading to “higher operating costs, particularly associated with the ongoing maintenance of [this] new, more stringent equipment to reach these levels.”

Covanta Holding Corporation, a leading player in the global energy-from-waste market, estimates that the market will grow by 400 facilities by 2023, adding 100 million metric tons of processing capacity globally. Many of the company’s facilities are located near population centers, which is likely to pose risks associated with air pollution, as well as opportunities related to supplying energy efficiently and sourcing waste.

Landfills and waste processing and transfer stations can be a source of odors. Bridgeton Landfill LLC, a subsidiary of Republic Services, faced a 2013 class action lawsuit filed by local residents for enduring foul odors. The company agreed to a settlement of more than $6.8 million that will be paid out to residents who live in the 400 homes closest to the facility. According to the plaintiff’s attorney, the money is intended to offset the loss in property values as well as anxiety caused by the odors.

Fines for landfill odors are not uncommon. An industrial and hazardous waste landfill in Yukon, Pennsylvania, was fined $70,000 by state authorities for allowing odors to reach neighboring properties. Another Pennsylvania landfill was fined $160,000 for failing to control odors. The financial impact of emitting an excessive odor can be significantly higher when the cost of remedial actions is taken into account. Florida’s Broward County fined WM Inc. $99,000 and required the company to undertake odor-mitigation activities at its Monarch Hill Renewable Energy Park landfill. The total cost, including the fine, equaled $1.6 million. Complaints from New Jersey residents about odors from the landfill in nearby Tullytown, Pennsylvania, resulted in fines of $500,000. The Department of Environmental Protection also limited waste-disposal operations at the landfill to no more than two years, meaning the landfill must be closed by May 2017.

Value Impact

Air quality management primarily has implications for a waste management company’s cost structure and operational efficiency. Companies are likely to face higher ongoing operating costs due to greater limits on emissions. Companies could face one-off impacts on cash flows as a result of fines or capital expenditures. There could be legal challenges from the local population or businesses that are directly affected by poor air quality, resulting in liabilities.

As seen in the Tullytown example, in extreme cases, poor air emissions and odor management can lead to the closure of facilities, restrictions on the amount of waste processed, or nonrenewal of permits, all of which affect companies’ ability to generate revenue.

Active management of the issue—through technological and process improvements—could
allow companies to limit the impact of regulations and benefit from operational efficiencies that could lead to a lower cost structure over time.

If MSW incineration grows, the probability and magnitude of the impact of air emissions management on financial results will likely to increase in the medium to long term.

The quantity of key pollutants emitted is an indicator of a company’s success in mitigating regulatory risk and costs associated with harmful emissions. The number of facilities in or near areas of dense population provides additional context for analyzing a company’s risk exposure.

**Fleet Fuel Management**

In the Waste Management industry, the main sources of GHG emissions are waste collection vehicles and nonstationary equipment, waste sorting, and landfill emissions. Although landfill emissions, which are discussed in a separate topic, are the greatest source of GHG emissions, the emissions from transportation fuel use can be significant. Fuel accounts for a significant operating cost, and there is an opportunity for large operators to fuel their natural gas fleets with gas from landfills and organic waste digesters.

Fossil fuel consumption in vehicle fleets can contribute to environmental impacts, including climate change and pollution. These impacts have the potential to indirectly affect the operations of waste management companies. Hedging fuel purchases is a common tool used to manage fleet fuel risks; however, more and more waste management companies are upgrading to more fuel-efficient fleets or switching to natural gas vehicles. Companies are recognizing the importance of managing their overall fleet fuel efficiency, their reliance on different types of energy and the associated risks, and their access to alternative energy sources.

Companies can adopt various strategies to reduce their direct GHG emissions. Since waste collection relies on a heavy-duty fleet that generates GHGs, a lower-emission fleet can help reduce vehicle emissions. Another strategy is to use LFG to fuel operations and vehicles, which is beneficial in three ways: First, it diverts potent LFG emissions to beneficial use, lowering regulatory risk and providing an opportunity to generate returns on capital expenditures for capture technology. Second, it reduces fuel purchases. Third, LFG is less carbon intensive and cleaner burning than diesel, the fuel that usually powers heavy-duty vehicles.

Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Fleet fuel consumed, percentage renewable; and
- Percentage of alternative energy vehicles in fleet.

**Evidence**

In terms of private fleets, those belonging to WM Inc. and Republic Services are among the largest. It is no surprise, then, that fuel costs make up 9 percent of operating expenses for Republic Services and 6 percent for WM Inc. As of FY2014, fuel costs were $500 million for Republic Services and $553 million for WM Inc. According to its CDP survey, Progressive Waste Services’ 2012 energy costs were between 5 and 10 percent of total operational spending.

WM Inc. has nearly seven times more GHG emissions related to transportation than it does from its operational energy use (both direct and
In its 2013 investor CDP report, Progressive Waste Services breaks down its energy use by type: 1,300 gigawatt-hours (GWh) of fuel, 47 GWh of electricity, and 28 GWh of heat. Most of the energy used is fuel, indicating the potential for greater cost and emissions savings by focusing on improving transportation efficiency.

Nearly 10 percent of WM Inc.’s 32,000 trucks are natural gas vehicles. The company intends to transition the rest of its 19,000 collection vehicles from diesel to natural gas vehicles. With its updated fleet, the company has so far reduced emissions from 2.13 million tons of carbon dioxide equivalent (CO₂e) to 1.75 million tons of CO₂e in 2013, an 18 percent reduction. In addition to reducing GHG emissions, switching from diesel to natural gas has the added benefit of lowering NOₓ and particulate matter emissions.

Investing in cleaner-burning vehicles can not only save energy costs but also mitigate the risk of fines and penalties. In 2012, Forward Inc. agreed to a settlement to resolve alleged violations of air pollution laws resulting from landfill and vehicle emissions. The settlement required the company to replace 19 diesel trucks with cleaner-burning vehicles, estimated to cost $2.1 million. It was also required to pay $200,000 as a civil penalty. As a result of the settlement, local communities are expected to benefit from reduced emissions of particulate matter, which can have health impacts and create haze and smog.

Republic Services has 16,000 trucks; of these, 2,200 run on CNG, fueled through the company’s natural gas stations. Transitioning to a natural gas fleet reduces fuel consumption and fuel costs, as well as emissions. Since CNG is not broadly available, companies that are able to refine LFG to fuel their fleets are likely to be more successful in transitioning to lower-emissions vehicles. A review of historic natural gas prices shows that in the past five years, since 2011 the price has been between $1.95 and $6 per million British thermal units (Btus), with current prices down at around $2. Since the market price of natural gas is volatile, companies that are able to fuel their CNG fleet with natural gas they produce will protect themselves from the volatility.

Republic Services and WM Inc. have the fourth and fifth largest private fleets in the U.S., respectively, according to the industry publication Fleet Owner. Given the significance of fuel consumption, many companies, including Waste Connection and Republic Services, have hedged their fuel purchases. During 2014, approximately 20 percent of Republic Services’ fuel volume purchases were hedged with swap agreements. The company disclosed that hedging is a way to manage its “exposure to volatility in fuel prices.”

In 2014, Republic Services was able to recover 78 percent of its fuel costs by charging customers fuel-recovery fees. The company estimates that a 20-cent-per-gallon difference in the price of diesel fuel would change its fuel costs by approximately $26 million and its fuel recovery fee by $25 million. Accordingly, a substantial rise or drop in fuel costs could substantially impact its revenue and cost of operations.

The EPA has finalized fuel economy regulations for heavy-duty vehicle fleets through 2018 and light-duty vehicles through 2025. Companies in the industry have mixed views about whether increasingly stringent vehicle emissions regulations will materially impact their financial performance.

In its FY2014 Form 10-K, WM Inc. stated that while the EPA continues to increase fuel economy standards that could lead to higher fleet operating costs, such regulations are unlikely to
have a material adverse impact on its business.\textsuperscript{116} Republic Services was less certain about the impact from federal fuel economy standards, noting, “We cannot assure you that federal efforts . . . to increase the fuel efficiency of light-duty and heavy-duty vehicles will not have a material effect on our consolidated financial condition, results of operations or cash flows.”\textsuperscript{117} The difference in impacts could be due to a large number of factors, including the average fuel economy of its existing fleet and the company’s ability to produce fuel for its fleet.

**Value Impact**

Fleet fuel management has direct implications for a company’s operating costs. Changes in the total amount of transportation fuel consumed by a company relative to revenues indicate changes in operational efficiency. Given that much of the cost of fuel is currently passed on to customers, significant changes in fuel prices can also affect revenue.

Companies managing this issue well will likely decrease their risk profiles stemming from volatility in energy markets, climate change-related regulations, and the EPA’s new fuel economy standards for trucks.

Although the cost of energy and fuel is already captured in financial results, overall fleet fuel consumption indicates companies’ exposure to possible increases in prices, resulting from internalizing the growing environmental impact of energy consumption. The use of alternative fuel vehicles indicates a company’s performance in mitigating its fleet’s environmental footprint, and potentially, its exposure to fuel price volatility.

**Management of Leachate & Hazardous Waste**

This topic focuses on the main ecological impacts of the Waste Management industry, which are leachate from MSW and the accidental releases of hazardous waste from facilities that manage them. Air emissions from waste management activities are discussed under the Greenhouse Gas Emissions, Fleet Fuel Management, and Air Quality disclosure topics.

MSW landfills receive household waste, nonhazardous sludge, industrial solid waste, and construction and demolition debris. Certain household wastes, such as paints, cleaners and chemicals, motor oil, batteries, and pesticides, may be banned from landfill disposal because of their hazardous nature.\textsuperscript{118} Landfills structures are carefully designed to isolate waste from the surrounding environment to prevent contact with air, groundwater, and soil. The isolation of leachate is accomplished with a bottom liner, while a daily covering of soil prevents rodents from reaching waste matter. Although under these dry conditions trash should not decompose much, over time water percolates through the trash, dissolving contaminants (organic and inorganic chemicals, metals, and biological waste products of decomposition). This liquid is called leachate and it must be collected and treated like sewage, after which it can be released.\textsuperscript{119}

Only designated facilities can accept hazardous waste, as they are especially designed to permanently contain waste and prevent the release of harmful substances into the environment.\textsuperscript{120} It is generally best to recycle hazardous waste; however, if that is not possible, it may be disposed in a number of ways, depending on the substance. These methods include incineration, stabilization, neutralization, fuels blending, and disposal in a secure chemical
landfill. Disposal involves placing waste in a land disposal unit—a landfill, surface impoundment, waste pile, land treatment unit, or injection well. Although there is a risk of groundwater contamination when liquid hazardous waste is mishandled, placement in a land disposal unit is the most common method of disposal.

Companies operating landfills are required to manage all associated ecological impacts, such as migration of gas and leachate away from the landfill boundaries, groundwater pollution, and soil contamination. Poor management of landfills and other disposal sites can lead to contamination of the soil, groundwater, and other nearby water bodies, which can carry the pollutants a long distance. Contamination can lead to adverse health outcomes for humans and animals that may be exposed to them.

Companies that release pollutants into the environment may be found in violation of the CAA, the CWA, and other laws, potentially resulting in fines. They may also face reputational risk and community pushback leading to permitting delays and litigation.

Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Total Toxic Release Inventory (TRI) releases, percentage released to water;
- Number of corrective actions implemented for landfill releases; and
- Number of incidents of non-compliance associated with environmental impacts.

**Evidence**

Landfills, waste processing, and waste transfer facilities manage hazardous and nonhazardous waste to mitigate their environmental impacts. The 1,908 currently active and approximately 6,000 waste facilities closed since 1988 in the U.S. can be a source of environmental harm if not managed properly. Specifically, this disclosure topic includes management of hazardous waste and leachate.

Companies that provide hazardous waste management services rank high in the EPA’s toxic release reports. They aggregate, handle, store, and dispose of others’ hazardous waste, putting them at higher risk of ecological impact than companies in other industries because of the amount of hazardous waste they need to manage effectively. The TRI defines a release as “the amount of a toxic chemical released on-site (to air, water, underground injection, landfills, and other land disposal), and the amount transferred off-site for disposal.”

The Montmorency-Oscoda-Alpena Solid Waste Management Authority avoided fines after reacting swiftly to an accidental leachate spill in December 2013. The spill affected a 15-by-15 foot area, and workers removed about a foot of the soil that had absorbed the leachate.

The EPA listed hazardous waste facilities owned by Clean Harbors and Chemical Waste Management as top TRI emitters in California for 2011. That year, Clean Harbors’ Buttonwillow facility released 9.8 million pounds of chemicals, while Chemical Waste Management’s Kettleman Hills facility released 3.9 million pounds. The statewide total was 38 million pounds, meaning that these two facilities alone accounted for 36 percent of the state’s annual toxic releases. These two facilities are also among top emitters of persistent bioaccumulative toxic (PBT) chemicals, which are of particular concern since they remain in the environment for long periods of time and accumulate in body tissue.
Companies involved in providing hazardous waste services must be diligent to avoid environmental harm. Many cases of environmental law violations are caused by the mishandling of hazardous waste and have resulted in litigation, regulatory risk, and remediation costs. In March 2013, the California Department of Toxic Substances Control announced that Chemical Waste Management agreed to pay $311,000 in fines for failing to report 72 hazardous materials spills over the previous four years. In 2011, the company agreed to pay $400,000 in fines for failing to manage polychlorinated biphenyl, a carcinogen. It also agreed to spend an additional $600,000 on necessary laboratory upgrades. As early as 1985, the EPA levied fines of $2.1 million for violations including operating additional waste ponds without authorization. Furthermore, the company has faced community pushback; residents from nearby communities opposed the expansion of the Kettleman landfill because of concerns over PBTs. However, in 2014, California regulators approved expansion of the hazardous waste facility.

Leachate management is a significant operating cost for landfill owners, and the costs extend beyond the life of the landfill, as leachate continues to be produced. For landfills in temperate climates, leachate management can be 20 to 30 percent of operations and maintenance expenses.

When waste management companies grow through acquisitions, they may be legally responsible for the environmental harm that occurs or has occurred as a result of actions taken at facilities prior to purchase. Closed landfills need to be monitored for 30 years, and additional remediation may be required to contain pollutants. The Missouri state attorney is suing the owner of closed Bridgeton Sanitary Landfill, alleging that a fire at the landfill contaminated air and water, jeopardizing the health of area residents. Republic Services acquired the landfill when it bought Allied Waste in 2008. As of December 2014, the company estimated that it has environmental liabilities of $240.3 million, of which $30 million should be paid during 2015. In FY2014, the company spent $64.3 million on a leachate management facility and related infrastructure, as well as management and monitoring of the remediation area at Bridgeton Sanitary Landfill. Republic Services reported that this “increase in operating loss primarily relates to unfavorable remediation and litigation adjustments in 2014 of $227.1 million recorded at [its] closed Bridgeton Landfill in Missouri, compared to $108.7 million recorded in 2013.”

In December 2011, Harris County and the state of Texas filed a lawsuit against WM Inc. subsidiary McGinnis Industrial Maintenance Corp., alleging that the company disposed of toxic paper-mill waste in the San Jacinto River. The plaintiffs sought attorneys’ fees and civil penalties for violations of the Texas Water Code and the Texas Health and Safety Code. Three years later, the case was settled for $29.2 million. The company is continuing its remediation efforts on the contaminated site.

**Value Impact**

Waste treatment and disposal requirements are stringent, and violations of regulations create the risk of acute impacts such as fines and contingent liabilities from legal action. Waste management companies may require capital expenditures or regulatory compliance costs to remediate ecological impacts, reducing operating income and cash flows. Frequent fines or unexpected abatement costs could result in a higher cost of capital.
The quantity of hazardous waste released gives insight into the risks of regulatory fines and remedial action, as well as ongoing operational costs and capital expenditures related to waste pollution abatement. Number of corrective actions and incidents of non-compliance indicate company success in mitigating environmental impacts of releases and associated fines.

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**SOCIAL CAPITAL**

Social capital relates to the perceived role of business in society, or the expectation of business contribution to society in return for its license to operate. It addresses the management of relationships with key outside stakeholders, such as customers, local communities, the public, and the government.

The presence of a waste management facility has the potential to affect the health of the local community through odors, respiratory illnesses, and health impacts. These issues can be addressed by managing environmental issues discussed earlier. Companies that are unable to address community concerns may erode their social license to operate. This could come in the form of denied permits, lost market share, or frequent disruptions to operations, as discussed above.

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**HUMAN CAPITAL**

Human capital addresses the management of a company’s human resources (employees and individual contractors), as a key asset to delivering long-term value. It includes factors that affect the productivity of employees, such as employee engagement, diversity, and incentives and compensation, as well as the attraction and retention of employees in highly competitive or constrained markets for specific talent, skills, or education. It also addresses the management of labor relations in industries that rely on economies of scale and compete on the price of products and services. Lastly, it includes the management of the health and safety of employees and the ability to create a safety culture within companies that operate in dangerous working environments.

Waste collection and processing has significant workplace risks, since it involves working with heavy machinery, vehicles, and potentially dangerous waste materials. Maintaining a healthy, productive workforce directly impacts worker morale and labor productivity through the avoidance of lost working hours and can lower the payout of medical benefits. The industry is dependent on a large workforce with many union members who have a strong bargaining power. The ability to maintain good labor relations will reduce the risks of strikes and work stoppages.

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**Workforce Health & Safety**

Hazardous working conditions mean that safety is critical to waste management operations, and accidents can have a great impact on workers. The Waste Management industry has a high fatality rate compared with that in other industries. Fatal injuries are mostly due to transportation incidents, contact with objects and equipment, and exposure to harmful substances. Additionally, temporary workers may be at a higher risk due to lack of training or industry experience.

Poor health and safety records can result in higher health care costs, lawsuits, fines, and penalties and an increase in regulatory compliance costs from more stringent oversight. Conversely, companies with a strong workforce health and safety track record have the potential to create a competitive advantage when seeking to secure new contracts. Considering the dangerous working conditions and the financial
repercussions of accidents, waste management companies must ensure that facilities and vehicles are operated with the highest safety standards and that the number and magnitude of injuries and accidents is minimized. Creating a safety culture is highly important. Companies can develop proactive safety management plans and training requirements for their employees and contractors as well as conduct regular audits.

Companies in the industry recognize the importance of maintaining high standards of health and safety to their long-term value, despite pressures to reduce costs in the near term to protect profitability. Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Total recordable injury rate, fatality rate, and near-miss frequency rate for direct employees and contract employees;
- Safety Measurement System BASIC percentiles for: Unsafe Driving, Hours-of-Service Compliance, Driver Fitness, Controlled Substances/Alcohol, Vehicle Maintenance, and Hazardous Materials Compliance; and
- Number of vehicle accidents and incidents.

Evidence

While the injury rate for the industry is slightly higher than the U.S. average, the fatality rate is significantly higher, indicating that incidents can result in serious harm to workers. In 2013, there were 61 work-related fatalities in the Waste Management and Remediation Services industry,\(^\text{11}\) which has nearly 400,000 employees.\(^\text{138}\) Workers in this industry were five times more likely to encounter a fatal work injury than employees in other industries were.\(^\text{139}\) The total recordable injury and illness rate was 4.7 per 100 full-time workers, compared with the national average of 3.5.\(^\text{140}\)

Waste workers are exposed to physical, biological, chemical, mechanical, and psychosocial hazards. A five-year (2003–2007) review of OSHA logs from 37 MSW establishments in 11 states found that workers suffer from respiratory illnesses due to inhalation of various gaseous compounds, skin disease, and musculoskeletal disorders. The leading cause of injury was lifting heavy objects, which can be attributed to moving heavy waste bins. In the same study, authors compared worker days away from work or on job restriction and transfer and found that the solid waste industry had the highest rate: 6 compared with 3.4 for manufacturing, 3.3 for construction, and 3.9 for truck transportation.\(^\text{141}\)

Several major waste service providers have been cited and penalized by OSHA following worker fatalities. In 2011, Metalico was cited for repeated and serious violations of safety standards after a worker was fatally crushed. The company faced penalties of $73,300.\(^\text{142}\) After a worker died from fatal injuries at an Illinois recycling company, OSHA cited the company for eight violations and assessed nearly half million dollars in penalties. The citations were for “failing to implement lock-out tag-out and Confined Space Entry procedures, in addition to not providing training to employees who operate and maintain such equipment.”\(^\text{143}\)

As noted, temporary workers are particularly at risk. In November 2000, WM Inc. was cited for violations after a temporary worker died after falling from a recycling truck. OSHA cited the company for repeat violations for not training “temporary employees about safety procedures

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\(^{11}\) Waste Management and Remediation Services industry falls under North American Industry Classification System (NAICS) code 562.
and practices when riding modified trucks and working the routes.” The proposed penalties for violations totaled $122,500. Republic Services was cited for seven safety violations for exposing workers to excessive heat after a temporary worker died from heat stress in June 2013. The proposed penalties totaled $20,000 for Republic Services and $13,000 for the temporary labor provider.

While the magnitude of individual penalties is small, repeated citations and penalties can be indicative of widespread worker safety problems. Poor safety records can impact worker morale, productivity, and turnover rates. Poor safety programs could also make recruiting difficult, particularly in high-risk industries like Waste Management.

In addition to citations and penalties, companies can also face lawsuits over injuries and fatalities. Allied Waste settled a lawsuit with the family of a garbage truck driver who was killed on the job. The family’s attorneys alleged that the company encouraged drivers to falsify driver logs and that its trucks were not well maintained. The case was settled for $6 million just weeks before going to trial.

Workplace safety is a major concern for industry players and companies are taking steps to improve it. Conventional components of a good safety program, “management commitment, employee participation, hazard assessment, hazard abatement, and medical management” can all help improve worker health and safety. Increasing automation of waste collection and sorting can improve worker productivity while reducing health risks. WM Inc. and Republic Services report injury rates that are better than the industry average by 43 and 42 percent, respectively. In 2001, WM Inc. implemented the initiative Mission to Zero, which promotes zero tolerance for unsafe behavior. As part of the plan, the company offers thorough training, standardized rulebooks, and dashboard video recorders in 95 percent of its collection fleet.

In 2014 annual SEC filings, several major companies stated that worker safety risks are inherent to the business, and also highlighted the importance of safety. For example, Republic Services disclosed that it encourages workplace safety through recognizing and rewarding employees for outstanding safety records. In two of the company’s safety incentive programs, Dedicated to Safety and Dedicated to Excellence, workers earn rewards based on their performance on safety, customer service, attendance, and other factors. During 2014, about 18,000 of 31,000 employees earned one of the two awards.

**Value Impact**

In an industry with higher-than-average accident and fatality rates, a poor safety performance can increase regulatory compliance costs. Recurring health and safety incidents can lead to chronic impacts on company value, affecting operational efficiency. Companies with these records may face higher ongoing regulatory compliance costs, penalties, and medical costs, as well as impacts on profitability from lower employee morale and productivity. Training on processes that relieve workers of physically demanding activities can better protect worker health.

Serious incidents with a low probability of occurrence but a high potential magnitude of impacts can lead to acute one-time costs and contingent liabilities from legal action or regulatory penalties.

The various measures of worker safety illustrate a company’s relative exposure to litigation, chronic
increases in operating costs, and regulatory risks related to workplace safety.

Labor Relations

Labor relations play an important role in the Waste Management industry, as wages account for its largest operating expense. Many workers belong to unions with strong bargaining power. Labor unions are prevalent in industries where there are complete labor contracts—contracts in which the conditions of the contract are explicitly stated when it is signed. For example, complete contracts exist in waste hauling: either workers complete their daily route or they do not. Under incomplete labor contracts, higher performance can be met with higher wages. Because that is not possible in complete labor contracts, wages tend to be low. Therefore, unions play an important role in protecting workers’ rights and negotiating higher wages.155

The presence of unions makes the management of labor relations critical, as conflict with workers can result in labor strikes and other disruptions that can delay or stop operations, leading to losses and reputational damage. Continued labor stresses can impact the long-term profitability of a business.

For companies with low unionization rates in an industry characterized by otherwise high union participation, a short-term view on employee compensation, contract terms, and working conditions could create a potential for disruption if workers begin to demand better standards through increasing unionization or other actions. Companies need to take a long-term view on pay and benefits so that they can protect workers’ rights and enhance their productivity while ensuring the financial sustainability of a company operations.

Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Percentage of active workforce covered under collective-bargaining agreements; and
- Number and duration of strikes and lockouts.

Evidence

As noted, working conditions in the Waste Management industry can be physically demanding and hazardous. Labor unions play a key role in representing workers’ interests and managing collective bargaining for better wages and safer working conditions. Unionization rates within the industry vary.

On the low end, Clean Harbors, Waste Connection, and Stericycle report unionization rates of 11.5, 12.4, and 15 percent, respectively. The largest companies reported higher rates; 21.5 percent of WM Inc. employees and 26 percent of Republic Services employees are unionized.156 Overall industry unionization rates are higher than the U.S. Bureau of Labor Statistics (BLS) nationwide average for 2014. Around 11 percent of wage and salary workers in the industry belonged to unions; this is especially high compared with the private sector average of 6.6 percent for all industries.157

Labor and related benefits are by far the highest operating cost for waste management companies. They make up 31 percent of operating expenses for Republic Services158 and 27 percent for WM Inc.159 Poor labor relations can result in work stoppages that can affect company cash flow and profitability. Unions have more bargaining power to demand better wages and working conditions;
therefore, with unions, the cost of labor disputes can be higher.

In their annual filings, several companies said that the presence of unionized workers and potential labor disputes could have material impacts on their operations. For example, Casella Waste, which has a 4 percent unionization rate, stated that wage conflicts could lead to serious problems: “We may be subject to union-initiated work stoppages, including strikes. Depending on the type and duration of any labor disruptions, our revenues could decrease and our operating expenses could increase, which could adversely affect our financial condition, results of operations and cash flows.”

In their SEC filings, Republic Services and Metalico discussed the risks associated with potential increases in the unionization rates of their workforces. Republic Services stated in its FY2014 Form 10-K, “Additional groups of employees may seek union representation in the future and, if successful, the negotiation of collective bargaining agreements could divert management’s attention and result in increased operating costs.”

According to the BLS, mean hourly wages in the Waste Collection, Waste Treatment and Disposal, and Remediation and Other Waste Management Services industries range from $16 to $19, which amounts to annual wages between $34,000 and $39,000. Mean hourly wages vary by state, with California at $20.37 and New York at $25.38. Some municipalities are stepping in to facilitate wage increases. Teamster recyclers in San Francisco receive $21 per hour, which is much higher than their counterparts in neighboring East Bay cities. In December 2013, the Fremont City Council passed a waste service rate increase on the condition that the city’s contracted recycler agree to raise wages for workers. The union contract mandated a wage of $14.59 per hour in 2014, with annual increases that will hit $20.94 in 2019. The city of Oakland also requires wage increases for recycling sorters under its new recycling contract.

Waste management companies can be subject to worker strikes because of an inability to negotiate wages, pension benefits, and other issues. The presence of some union workers can also result in dissatisfaction among nonunionized workers due to pay differences. Work stoppage data from the Federal Mediation and Conciliation Service indicates that waste management companies experienced at least 26 instances of work stoppages between 2005 and 2014 involving between 14 and 700 workers in each case. The longest strike, at El Paso Disposal, lasted 261 days and involved 60 workers. Major companies WM Inc., Republic Waste, and Allied Waste have all experienced work stoppages.

Strikes can disrupt operations, and in some cases, fines have been levied against companies that have missed garbage pickup. Washington State regulators proposed a $2.14 million fine to WM Inc. for missing garbage, recycling, and yard waste collection during an eight-day labor dispute in 2013. The state’s Utilities and Transportation Commission found that the company failed to deploy sufficient replacement workers to maintain service, which resulted in an estimated 200,000 missed pickups during the strike. Under state law, a penalty of up to $1,000 can be levied for each violation. According to the union the dispute was over health and safety issues; however, drivers involved in the strike mentioned the $2.50-per-hour wage discrepancy between recycling drivers and garbage truck drivers as the cause of unrest.
Value Impact

Labor-intensive industries with well-defined occupations are prone to high rates of unionization, as employees with similar skills and compensation have an incentive to resort to collective bargaining in their negotiations with management. The bargaining power that comes with unionization leads to higher wages and other compensation costs, including pensions.

Operational disruptions stemming from labor unrest can affect profits because of cost increases and operational shortfalls that lead to lost revenue and regulatory fines and penalties.

The number of work stoppages provides a measure of past performance on labor practices, while the percentage of employees unionized provides an indication of companies’ exposure to compensation related cost increases and possible future labor disputes.

BUSINESS MODEL AND INNOVATION

This dimension of sustainability is concerned with the impact of environmental and social factors on innovation and business models. It addresses the integration of environmental and social factors in the value-creation process of companies, including resource efficiency and other innovation in the production process. It also includes product innovation and efficiency and responsibility in the design, use-phase, and disposal of products. It includes management of environmental and social impacts on tangible and financial assets—either a company’s own or those it manages as the fiduciary for others.

Emerging environmental and social trends, along with stricter regulatory requirements and scrutiny of waste management practices, are creating new innovation and business opportunities for companies in the Waste Management industry.

The emerging focus on the lifecycle assessment of products and cradle-to-cradle (C2C) design is driving landfill diversion and waste reduction.

Recycling & Resource Recovery

Waste management companies can play a critical role in the circular economy, particularly in separating and recovering reusable materials. Pressures from new regulations, customer demand, and increasing costs of extracting virgin materials are initiating the move toward a circular economy. As a result, waste management companies in developed countries are facing stagnant or declining volumes of waste per capita and an expanding recycling market, shifting their sources of revenue growth.

C2C approaches initiated by other industries have the potential to break down if the recovery and recycling infrastructure or its technologies do not exist. Waste management companies have to be positioned to address the industry’s shifting landscape through innovation and potential business model shifts, or risk losing their competitive advantage. Companies in the industry need to both improve recovery and recycling rates for easily recyclable materials and make recovery and recycling of difficult materials, such as e-waste, feasible and more cost-effective.

Innovation is necessary to make up for the loss of landfill revenue, since companies can charge recycling fees as well as generate revenue from sales of recyclable materials.

Waste management companies recycle paper, metals, glass, plastics, and other materials that can be sold to and reused by other parties. Paper, particularly newspaper and corrugates, and metals, like lead, are the most recovered materials. Some companies are innovating not only to increase the percentage of materials recovered but also to expand the range of
materials recycled. There is also an increasing focus on composting, which diverts organic materials from landfills, thereby reducing landfill emissions and generating valuable compost and natural gas, particularly through industrial composting. Incineration is another method for diverting waste from landfills, although its environmental impacts must be managed, as incineration results in ash and can emit toxic air pollutants.

As the digitalization of economies continues, the proliferation of technology is raising concerns about the environmental and social externalities associated with both product manufacturing and end-of-life disposal. The rapid obsolescence of hardware is exacerbating the issue, making e-waste a rapidly growing waste stream. Waste management and other resource recovery companies can play a valuable role in minimizing externalities and improving the reuse and recycling of materials from discarded electronics.

E-waste recycling can be a toxic and labor-intensive process, making it very expensive. As a result, much of the world’s e-waste flows from developed countries, which generate most of the waste, to developing countries, where low-cost labor and lax environmental regulations make it possible to harvest materials from the electronics more cheaply. Much e-waste is dismantled in an unsafe manner, which is harmful to workers and the environments. E-waste can also end up in landfills in both developed and developing countries, although there are growing regulations banning e-waste from landfills because of its toxic nature.

Some companies offer e-waste services, including helping manufacturers and retailers with take-back programs. Growing volumes of e-waste and bans on the transboundary e-waste trade present areas of opportunities for waste management companies.

Recycling, reuse, and composting are general methods of diverting waste from landfills. Prevention of waste at the source is another key component of waste reduction, and waste management companies can encourage customers to prevent waste or divert it from landfills. Landfill diversion can mitigate some of the environmental impacts of landfills and reduce the need for landfill expansion.

Company performance in this area can be analyzed in a cost-beneficial way through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Amount of waste incinerated, percentage hazardous, percentage used for energy recovery;
- Percentage of customers receiving recycling and composting services, by customer type;
- Amount of material recycled and composted; and
- Amount of electronic waste collected, percentage recovered through recycling.

Evidence

Growing awareness of the social and environmental costs of extracting virgin materials and resource depletion is leading to a focus on recycling more and more products across the economy. While diverting waste from landfills can affect landfill-related revenues, waste management companies can still benefit through materials recovery and recycling. These practices generate revenue from the sale of recycled and composted materials, creating value from waste. Additionally, companies can charge fees for recycling, shifting the source of their revenue
streams. Each method of waste diversion has different challenges.

Landfill diversion is growing from all types of customers—residential, commercial, and industries. This is driven by a policy and regulatory push toward a circular economy, growing environmental awareness, and cost and constraints associated with extracting virgin materials.

Recovery and recycling rates vary depending on the type of waste. In 2012, food waste and yard trimmings together constituted 28 percent of MSW generated in the U.S., yet only 4.8 percent of food and 57.7 percent of yard trimmings were recovered. Furthermore, although some metals, such as aluminum, are infinitely recyclable—meaning that they can be used and recycled infinitely without the material losing the integrity—only 19.8 percent of aluminum in MSW is recovered. Paper and paperboard recycling is the most well established, with 64.6 percent recovered from MSW. E-waste is a growing waste stream in which recycling rates are low. The average U.S. household owns more than 20 electronic products. In 2009, the EPA estimated that 215.6 million units of computers, televisions, and mobile devices reached their end-of-life stage, and that between 8 and 38 percent in each category were collected for recycling. In terms of weight, 2.37 million tons of electronics were ready for end-of-life management, of which 25 percent were collected for recycling. Between 2000 and 2012, the amount of e-waste generated in the U.S. increased from 1.9 million tons to 3.4 million tons. This represents a significant area of growth, especially as concerns over e-waste lead to more regulations on its safe disposal.

Another key factor driving the growth of recycling is a commitment by manufacturers to incorporate recycled materials in their products and packaging. This creates demand for recycled commodities, according to WM Inc. Regulations drive growth with specific mandates to recycle or otherwise divert certain waste streams. For example, Connecticut was the first U.S. state to ban commercial food waste from landfills. Other states have followed suit, including Vermont, where all food waste will be banned from landfills by 2020. Between 1990 and 2012, the percentage of MSW recovered for composting grew fourfold, from 2 to 8.5 percent. Twenty-five states have passed legislation on e-waste recycling programs, with most holding the manufacturer financially responsible for recycling.
Landfilling is a significant source of revenue for many waste management companies. It accounts for 20 percent of revenue for WM Inc., and in 2014, revenue from landfill tipping fees alone constituted 12 percent of total revenue for Republic Services. WM’s landfill revenues fell from $3.2 billion in 2006 to $2.5 billion in 2010, the lowest in the past decade. Since then it has been steadily increasing, to $2.9 billion in 2015, still shy of 2006 levels. Recycling revenues also fell during the recession but recovered quickly to pre-recession levels.

Although the volume of waste sent to landfills continues to increase along with population growth, the percentage of MSW waste diverted grew by 19 percentage points between 1990 and 2012. As of 2012, 35 percent of MSW was diverted through recycling, composting, and incineration. As the volume of waste diverted grows, companies that fail to provide waste diversion services will find it difficult to remain competitive. As WM Inc. stated in its FY2014 Form 10-K: “These developments reduce the volume of waste going to our landfills which may affect the prices that we can charge for landfill disposal. Our landfills currently provide and, together with our divested waste-to-energy facilities, have historically provided our highest income from operations margins.”

Republic Services and WM Inc. both recognize the risk to their businesses from changes in customer behavior, such as zero-waste initiatives by large companies. In its FY2014 annual SEC filing, Republic Services stressed the potential impacts to its bottom line: “Alternatives to landfill disposal could reduce our disposal volumes and cause our revenues and operating results to decline.”

While food waste diversion is relatively new, yard trimmings and other such wastes have long been converted to compost or usable heat, electricity, or fuel. These practices can be sources of revenue for companies engaged in processing organic waste. Composting can be done using aerobic and anaerobic processes. The agriculture industry uses the end product of the aerobic process as fertilizers, soil amendment, and mulch. An anaerobic digester produces biogas, a mixture of methane and carbon dioxide. In the U.S., this type of technology is commonly used in wastewater treatment plants and is relatively new in solid waste management.

An alternative way to divert organic and other waste is by incineration. As mentioned in the Air Quality section, waste incineration can result in the production of air pollutants as well as ash. Companies involved in waste incineration must manage its environmental impacts.

Between 1990 and 2012, waste recovery and recycling grew from 16 to 35 percent of MSW, with paper products and certain metals recycled at the highest rates. The range of materials that can be recycled is also increasing, thanks to new technologies and consumer education. Companies that are able to expand their recycling offerings may be better positioned to win contracts, given the growing mandates on waste diversion. Additionally, companies are able to charge their customers extra fees for recycling and generate revenue through sales of recyclable and recycled commodities. In 2014, WM Inc. generated $1.3 billion—nearly 10 percent of its revenue—from recycling, which consisted of tipping fees and the sale of recyclable commodities to third parties. Waste Connections Inc. reported $58 million in revenue from sales of recyclable material to third parties for processing, which accounted for 2.7 percent of its total reported revenue in 2014. (This was down from 4.4 percent in 2012 because of decreases in recycled commodities prices and the closure of two recycling operations.)
Revenues from recycling fluctuate widely, depending on the price of the comparable virgin material. Although prices of virgin materials to produce paper, plastics, glass have been low, the long-run trend is for prices to increase, making the cost of recycled materials relatively competitive. As higher regulations on landfills lead to an increase in tipping fees, bringing waste to recycling facilities may be a more attractive option.191

Besides facing the direct financial impacts of e-waste laws in developed economies, electronics manufacturers can face reputational risks if their products are associated with toxic dumps in developing countries. Studies estimate that around 23 percent of OECD countries’ e-waste is exported to seven developing countries: India, China, and five West African nations.192 Therefore manufacturers look for certified e-waste service providers. For example, WM Inc. has “teamed with major electronics manufacturers to offer comprehensive ‘take-back’ programs of their products to assist the general public in disposing of their old electronics in a convenient and environmentally safe manner.”193

As more regulations on e-waste are implemented in the U.S. and around the world, companies involved in safe recycling will have a growth opportunity. The compound annual growth rate of the global e-waste recycling market is significant: an estimated 10.7 percent between 2014 and 2019.194 Additionally, as strategic metals become constrained because of resource depletion and the increasing cost of extracting virgin materials, e-waste will be viewed as an urban ore; thereby its value will increase, as will the revenue from reselling waste-harvested minerals. Estimates show that 50 pounds of gold, 550 pounds of silver, 20 pounds of palladium, and more than 20,000 pounds of copper can be recovered from one million discarded cell phones.195 At current prices, the value of the recovered metals totals nearly $1.3 million.196 This market has a significant growth potential, as 215.6 million units of electronics reach their end of life annually in the U.S.197

**Value Impact**

Companies that are able to develop service offerings and alternative lines of business catering to the trend toward closed-loop economies are likely to ensure robust revenue growth by meeting market demand for related services. For integrated companies, investing in R&D and capital expenditures in materials recovery may generate economies of scale.

Expanded revenues from materials recovery and recycling could mitigate the impact of slower growth of landfill revenue. In addition, companies diverting organics from landfill could reduce capital expenditures for management of LFG emissions, while staying ahead of related regulation. Growing regulations are resulting in mandatory recycling and the development of producer and retailer take-back programs, which present opportunities for waste management companies to partner with manufacturers to create additional revenue streams. At the same time, the cost of revenue may increase when providing these alternative services. The various metrics measure the extent to which the company and its customers use alternatives to landfilling.

The issue has a strong forward-looking impact. Similarly, as the economy shifts to a closed-loop system, companies that offer a range of recycling and composting services may be better positioned to win contracts and gain market share. The e-waste stream is likely to be more strictly regulated in the future, benefiting companies that are currently well-positioned to manage e-waste.
APPENDIX I

FIVE REPRESENTATIVE WASTE MANAGEMENT COMPANIES

<table>
<thead>
<tr>
<th>COMPANY NAME (TICKER SYMBOL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Management Inc. (WM)</td>
</tr>
<tr>
<td>Republic Services Inc. (RSG)</td>
</tr>
<tr>
<td>Stericycle Inc. (SRCL)</td>
</tr>
<tr>
<td>Tetra Tech Inc. (TTEK)</td>
</tr>
<tr>
<td>Waste Connections Inc. (WCN)</td>
</tr>
</tbody>
</table>

This list includes five companies representative of the Waste Management industry and its activities. This includes only companies for which the Waste Management industry is the primary industry, companies that are U.S.-listed but are not primarily traded over the counter, and for which at least 20 percent of revenue is generated by activities in this industry, according to the latest information available on Bloomberg Professional Services. Retrieved on March 12, 2015.
## APPENDIX IIA:
Evidence for Sustainability Disclosure Topics

<table>
<thead>
<tr>
<th>Sustainability Disclosure Topics</th>
<th>EVIDENCE OF INTEREST</th>
<th>EVIDENCE OF FINANCIAL IMPACT</th>
<th>FORWARD-LOOKING IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HM (1-100)</td>
<td>IWGs %</td>
<td>EI Priority</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>42*</td>
<td>72</td>
<td>4</td>
</tr>
<tr>
<td>Air Quality</td>
<td>42*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fleet Fuel Management</td>
<td>33</td>
<td>78</td>
<td>5</td>
</tr>
<tr>
<td>Management of Leachate &amp; Hazardous Waste</td>
<td>100*</td>
<td>89</td>
<td>1</td>
</tr>
<tr>
<td>Workforce Health &amp; Safety</td>
<td>25</td>
<td>83</td>
<td>2</td>
</tr>
<tr>
<td>Labor Relations</td>
<td>25</td>
<td>90</td>
<td>6</td>
</tr>
<tr>
<td>Recycling &amp; Resource Recovery</td>
<td>75*</td>
<td>78</td>
<td>3</td>
</tr>
</tbody>
</table>

**HM:** Heat Map, a score out of 100 indicating the relative importance of the topic among SASB’s initial list of 43 generic sustainability issues. Asterisks indicate “top issues.” The score is based on the frequency of relevant keywords in documents (i.e., 10-Ks, 20-Fs, shareholder resolutions, legal news, news articles, and corporate sustainability reports) that are available on the Bloomberg terminal for the industry’s publicly listed companies. Issues for which keyword frequency is in the top quartile are “top issues.”

**IWGs:** SASB Industry Working Groups

%: The percentage of IWG participants that found the disclosure topic likely to constitute material information for companies in the industry. (-) denotes that the issue was added after the IWG was convened.

**Priority:** Average ranking of the issue in terms of importance. 1 denotes the most important issue. (-) denotes that the issue was added after the IWG was convened.

**EI:** Evidence of Interest, a subjective assessment based on quantitative and qualitative findings.

**EFI:** Evidence of Financial Impact, a subjective assessment based on quantitative and qualitative findings.

**FLI:** Forward Looking Impact, a subjective assessment on the presence of a material forward-looking impact.
## APPENDIX IIB: Evidence of Financial Impact for Sustainability Disclosure Topics

<table>
<thead>
<tr>
<th>Evidence of Financial Impact</th>
<th>Revenue</th>
<th>Operating Expenses</th>
<th>Non-operating Expenses</th>
<th>Assets</th>
<th>Liabilities</th>
<th>Cost of Capital</th>
<th>Industry Divestment Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
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<tr>
<td>Air Quality</td>
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<td>••</td>
<td></td>
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<td></td>
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<tr>
<td>Fleet Fuel Management</td>
<td>•</td>
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<td>•</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Leachate &amp; Hazardous Waste</td>
<td>•</td>
<td></td>
<td>••</td>
<td></td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Workforce Health &amp; Safety</td>
<td>•</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Labor Relations</td>
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<td></td>
<td>•</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycling &amp; Resource Recovery</td>
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<td></td>
</tr>
</tbody>
</table>

- MEDIUM IMPACT
- HIGH IMPACT
## APPENDIX III

### SUSTAINABILITY ACCOUNTING METRICS—WASTE MANAGEMENT

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>ACCOUNTING METRIC</th>
<th>CATEGORY</th>
<th>UNIT OF MEASURE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Greenhouse Gas Emissions</strong></td>
<td>(1) Gross global Scope 1 emissions, (2) percentage covered under emissions-limiting regulation, and (3) percentage covered under emissions-reporting regulation</td>
<td>Quantitative</td>
<td>Metric tons (t) CO₂-e, Percentage (%)</td>
<td>IF0201-01</td>
</tr>
<tr>
<td></td>
<td>Total landfill gas generated, percentage flared, percentage used for energy</td>
<td>Quantitative</td>
<td>Million British Thermal Units (MMBtu), Percentage (%)</td>
<td>IF0201-02</td>
</tr>
<tr>
<td></td>
<td>Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emission-reduction targets, and an analysis of performance against those targets</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>IF0201-03</td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td>Air emissions of the following pollutants: NOₓ (excluding N₂O), SOₓ, non-methane volatile organic compounds (NMVOCs), and hazardous air pollutants (HAPs)</td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>IF0201-04</td>
</tr>
<tr>
<td></td>
<td>Number of facilities in or near areas of dense population</td>
<td>Quantitative</td>
<td>Number</td>
<td>IF0201-05</td>
</tr>
<tr>
<td></td>
<td>Number of incidents of non-compliance associated with air emissions</td>
<td>Quantitative</td>
<td>Number</td>
<td>IF0201-06</td>
</tr>
<tr>
<td><strong>Fleet Fuel Management</strong></td>
<td>Fleet fuel consumed, percentage renewable</td>
<td>Quantitative</td>
<td>Gigajoules, Percentage (%)</td>
<td>IF0201-07</td>
</tr>
<tr>
<td></td>
<td>Percentage of alternative energy vehicles in fleet</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>IF0201-08</td>
</tr>
<tr>
<td><strong>Management of Leachate &amp; Hazardous Waste</strong></td>
<td>Total Toxic Release Inventory (TRI) releases, percentage released to water</td>
<td>Quantitative</td>
<td>Metric tons (t), Percentage (%)</td>
<td>IF0201-09</td>
</tr>
<tr>
<td></td>
<td>Number of corrective actions implemented for landfill releases</td>
<td>Quantitative</td>
<td>Number</td>
<td>IF0201-10</td>
</tr>
<tr>
<td></td>
<td>Number of incidents of non-compliance associated with environmental impacts*</td>
<td>Quantitative</td>
<td>Number</td>
<td>IF0201-11</td>
</tr>
</tbody>
</table>

* Note to IF0201-11—The registrant shall briefly describe the nature and context of any fines and settlements.
### APPENDIX III (CONTINUED)

#### SUSTAINABILITY ACCOUNTING METRICS—WASTE MANAGMENT

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>ACCOUNTING METRIC</th>
<th>CATEGORY</th>
<th>UNIT OF MEASURE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce Health &amp; Safety</td>
<td>(1) Total recordable injury rate (TRIR), (2) fatality rate, and (3) near miss</td>
<td>Quantitative</td>
<td>Rate</td>
<td>IF0201-12</td>
</tr>
<tr>
<td></td>
<td>frequency rate (NMFR) for (a) direct employees and (b) contract employees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety Measurement System BASIC percentiles for: (1) Unsafe Driving, (2) Hours-of-</td>
<td>Quantitative</td>
<td>Percentile (%)</td>
<td>IF0201-13</td>
</tr>
<tr>
<td></td>
<td>Service Compliance, (3) Driver Fitness, (4) Controlled Substances/Alcohol, (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle Maintenance, and (6) Hazardous Materials Compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of vehicle accidents and incidents</td>
<td>Quantitative</td>
<td>Number</td>
<td>IF0201-14</td>
</tr>
<tr>
<td>Labor Relations</td>
<td>Percentage of active workforce covered under collective bargaining agreements</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>IF0201-15</td>
</tr>
<tr>
<td></td>
<td>Number and duration of strikes and lockouts**</td>
<td>Quantitative</td>
<td>Number, Days</td>
<td>IF0201-16</td>
</tr>
<tr>
<td>Recycling &amp; Resource</td>
<td>Amount of waste incinerated, percentage hazardous, percentage used for energy</td>
<td>Quantitative</td>
<td>Metric tons (t),</td>
<td>IF0201-17</td>
</tr>
<tr>
<td>Recovery</td>
<td>recovery</td>
<td></td>
<td>Percentage (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of customers receiving (1) recycling and (2) composting services, by</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>IF0201-18</td>
</tr>
<tr>
<td></td>
<td>customer type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amount of material (1) recycled and (2) composted</td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>IF0201-19</td>
</tr>
<tr>
<td></td>
<td>Amount of electronic waste collected, percentage recovered through recycling</td>
<td>Quantitative</td>
<td>Metric tons (t),</td>
<td>IF0201-20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Percentage (%)</td>
<td></td>
</tr>
</tbody>
</table>

** Note to IF0201-16—The registrant shall describe the reason for each work stoppage (as stated by labor), the impact on production, and any corrective actions taken as a result.
**APPENDIX IV: Analysis of SEC Disclosures | Waste Management**

The following graph demonstrates an aggregate assessment of how representative U.S.-listed Waste Management companies are currently reporting on sustainability topics in their SEC annual filings.

<table>
<thead>
<tr>
<th>TYPE OF DISCLOSURE ON SUSTAINABILITY TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waste Management</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Air Quality</td>
</tr>
<tr>
<td>Fleet Fuel Management</td>
</tr>
<tr>
<td>Management of Leachate &amp; Hazardous Waste</td>
</tr>
<tr>
<td>Workforce Health &amp; Safety</td>
</tr>
<tr>
<td>Labor Relations</td>
</tr>
<tr>
<td>Recycling &amp; Resource Recovery</td>
</tr>
</tbody>
</table>

IWG Feedback*

*Percentage of IWG participants that agreed topic was likely to constitute material information for companies in the industry.

1 The "Air Quality" disclosure topic was introduced after SASB convened IWGs and per stakeholder feedback.
REFERENCES


4. Data from Bloomberg Professional service, accessed March 12, 2015, using the BICS <GO> command. The data represents global revenues of companies listed on global exchanges and traded over the counter from the Waste Management industry, using Level 3 of the Bloomberg Industry Classification System.

5. Author’s calculation based on data from Bloomberg Professional service, accessed on March 12, 2015, using Equity Screen (EQS) for U.S.-listed companies that generate at least 20 percent of revenue from their waste management segment and for which Waste Management is a primary SICS industry.


24. Data from Bloomberg Professional service, accessed March 12, 2015, using the BICS <GO> command.


27. Data from Bloomberg Professional service, accessed March 12, 2015, using the DES <GO> command on company tickers.


29. Ibid., Table 2.
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