CONTAINERS & PACKAGING
Research Brief

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CONTAINERS & PACKAGING

Research Brief

SASB’s Industry Brief provides evidence for the material sustainability issues in the Containers & Packaging 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 material sustainability issue (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 sustainability issues likely to be material for companies within a given industry. However, the final determination of materiality is the onus of the company.

Related Documents

- Containers & Packaging Sustainability Accounting Standard
- Industry Working Group Participants
- SASB Conceptual Framework

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INTRODUCTION

Containers and packaging products are essential for the storage, transportation, and protection of goods across industrial and consumer applications. Containers and packaging innovations have enabled the long-term preservation of foods and perishable goods and the safe and efficient transportation of countless products throughout the economy.

Regulatory and social trends suggest a rising concern for the human health and environmental externalities of containers and packaging products throughout their lifecycle.

During manufacturing, environmental impacts can arise from greenhouse gas (GHG) and other air emissions, water pollution, and waste generation. In the use phase and at end-of-life, containers and packaging come into contact with people and consumables, raising the prospect of adverse human health impacts. At end-of-life, the persistence of some packaging products in the environment, and increasing resource scarcity, elevate the importance of product reuse and reduced environmental impact. These trends are driving innovation in the industry, with a focus on alternative, safer materials, enhanced recyclability, and sustainably sourced raw materials.

Management (or mismanagement) of material 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 Containers & Packaging 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 Containers & Packaging industry:

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Reducing greenhouse gas emissions, particularly carbon dioxide emissions;
Reducing non-GHG air pollution, which can create hazards for public health and the environment;
Managing energy use to reduce the cost of inputs and indirect GHG emissions;
Preventing water contamination and securing water supplies without exacerbating local water stress;
Managing waste streams, which can be harmful to the environment;
Ensuring that products do not contain harmful chemicals or present other physical dangers;
Improving the environmental characteristics throughout the product lifecycle through product innovation; and
Implementing sourcing initiatives to mitigate risks from social and environmental issues in the supply chain.

INDUSTRY SUMMARY

The Containers & Packaging industry includes companies that manufacture a wide range of containers and packaging products made of metal, plastic, paper, and glass materials. These products include food and beverage containers, household product bottles, aluminum cans, glass containers, metal containers and packaging, corrugated paper containers and packaging, paper and plastic bags, plastic bottles and packaging, and wood containers and pallets. Some companies also provide packaging services, where a business can outsource the packaging of its products to third parties.¹

Financial Drivers

The Containers & Packaging industry generates annual sales of approximately $314 billion globally. Paper containers and packaging make up the largest segment of the industry, with approximately 40 percent of revenues, followed by plastic at 23 percent, metal at 17 percent, and glass containers and packaging at about 7 percent of total industry sales. The remainder is represented by wood containers manufacturing and packaging services.¹ The majority of the industry’s listed companies are domiciled in the U.S. However, most companies have some operations outside the U.S., and the industry sells internationally as well.²

The glass, metal, plastic, and paper segments of the Containers & Packaging industry share similar characteristics that influence sustainability issues across the industry. Although the production processes between different types of packaging vary, all are relatively resource and energy intensive, resulting in comparable environmental

¹ Industry composition is based on the mapping of the Sustainable Industry Classification System (SICSM) to the Glass, metal, plastic, and paper segments of the Containers & Packaging industry share similar characteristics that influence sustainability issues across the industry. Although the production processes between different types of packaging vary, all are relatively resource and energy intensive, resulting in comparable environmental

Bloomberg Industry Classification System (BICS). A list of representative companies appears in Appendix I.
externalities. Additionally, raw materials costs are typically the largest cost of manufacturing; material prices are thus a key driver of profitability in the industry. Companies operate primarily as business-to-business establishments, as packaging products are used to ship and store a wide variety of finished goods produced by other industries. Ultimately, though, the industry’s products are also often consumer facing, underscoring the importance of product safety.

Due to the substantial equipment and energy requirements necessary to transform raw materials into finished products, the industry is characterized by high barriers to entry and capital intensity. Raw material inputs represent a significant and volatile cost to manufacturers, particularly because those costs are tied to commodity prices, which can exhibit price volatility. Raw material costs as a percentage of revenue range from 44 percent for glass bottle manufacturers to 63 percent for metal container manufacturers. As a result of these high costs of inputs, profit margins are typically low for containers and packaging companies. Furthermore, industry margins are generally correlated with commodity prices; that correlation can lead to high levels of profit volatility if producers cannot pass on higher costs to customers. As of February 2015, the median gross and net income margins of the Containers & Packaging industry were 13.2 and 4.8 percent, respectively.

**Competition**

The Containers & Packaging industry is characterized by ongoing consolidation. Recent acquisitions and mergers have created larger, more competitive companies. For example, RockTenn, a major paper container manufacturer, acquired Smurfit-Stone, raising RockTenn’s market share from 2.8 percent in 2008 to more than 8.5 percent in 2013. In January 2015, RockTenn and MeadWestvaco announced that they would merge to form the second-largest U.S. packaging company.

The competitive landscape between glass, plastic, metal, and paper container and packaging companies largely depends on consumer preferences and raw material costs. Due to the nature of their products, domestic container and packaging manufacturers face little competition from imports, as it is not typically economical to ship inexpensive or empty containers. As a result, most operations are located relatively close to end markets.

**Industry Segments**

The Containers & Packaging industry’s largest segment, paper container manufacturing, transforms paper pulp from virgin and recycled sources into various packaging forms including paperboard, corrugated paper (cardboard), linerboard, and beverage containers. The paper segment’s revenue is driven in large part by the food and beverage industry, demand
from retail and industrial customers, and consumer spending. Paper packaging is one of the most widely used forms of containers for food and beverage products. The chief end-markets for corrugated paper packaging, a commonly used variant of paper packaging, include plastic and rubber products manufacturers, general retailers, shipping and logistics firms, and textile companies. Companies typically purchase paper pulp or unfinished paper from paper and pulp producers, then convert it into paper containers and packaging. U.S.-based International Paper, Inc. is the largest company in this segment.

The metal container-manufacturing segment converts raw materials like aluminum, tin, and steel into various forms of packaging, including lightweight aluminum beverage cans, shipping containers, steel drums, and other metal boxes. Demand for metal containers is driven mainly by beverage companies, makers of both non-alcoholic and alcoholic beverages, which represent 60 percent of the total market in the U.S. The segment’s drivers include demand from beverage and canned food companies. Aluminum and steel prices are key determinants of profitability, as materials costs are the single greatest manufacturing expense for the industry. Companies producing metal containers compete directly with other packaging segments, especially cheaper, more versatile paper and plastic alternatives.

In 2012, the global beverage can industry shipped 290 billion units, and shipments are expected to grow to 400 billion units by 2020, with growth largely driven by emerging markets. In 2014, the U.S.-based Can
Manufacturers Institute, a trade association whose members include many U.S. metal can manufacturing companies, reported that the segment shipped more than 126 billion metal containers of all types within the U.S. in 2013. U.S.-based Crown Holdings, Inc. is the largest company in this segment by revenue.

The plastic container-manufacturing segment includes companies that transform plastics and resins into a wide variety of plastic bottles and containers. These products are used in a broad variety of applications across industries, including beverage, food, and household products. In the U.S. market, this segment’s revenue comes primarily from the following sources: 55 percent from beverage bottles, 18 percent from household products, 12 percent from automotive and industrial products, 8 percent from food bottles, and 7 percent from other products. The versatility of plastic and its low manufacturing costs have made it desirable for application in multiple industries and the primary competitive alternative to glass and metal containers. Consolidated Container Company, a large private company, acquired Roffe Container and Madras Packaging in 2012, adding to the company’s capacity for milk, water and juice containers. U.S.-based Sealed Air Corp. is the largest company in this segment.

The U.S. domestic glass container segment represents a $5.5 billion market. Glass container manufacturers convert raw materials, sand and cullet (recycled glass), into glass containers and bottles. The largest company in this segment is Owens-Illinois, which had $6.9 billion in global sales in 2013. The glass container market is facing headwinds, as consumers increasingly demand substitute products, such as paper and plastic.

Trends and Valuation Factors

Innovation in the Containers & Packaging industry is driven by traditional operational efficiencies created by reduced material and energy consumption. Additionally, consumer and regulatory concern about the lifecycle environmental and human health impacts of products is of growing importance. Industry associations have launched comprehensive plans to increase industry competitiveness by driving down costs in manufacturing. The Agenda 2020 Technology Alliance partnered with the U.S. Department of Energy to reduce energy consumption in the paper and pulp industry, including paper container manufacturers, by 25 percent from a 2002 baseline by 2020. In the U.S., other corporate and industry association initiatives have been developed to increase the availability of recycling programs for all forms of containers. Some major beverage companies are developing new bio-plastic materials made from renewable resources, such as plants.

Financial analysis of containers and packaging companies focuses on prices of commodity inputs, including wood fiber, aluminum, steel,
and plastics. The drivers of product shipment volumes will help determine expected profitability, depending on the margins typically earned on each major product line. These drivers include consumer spending, the activity of major customers, and demand in major markets, factors that may not correlate with each other. Due to the industry’s global exposure, foreign exchange fluctuations will also impact profits. 42

LEGISLATIVE AND REGULATORY TRENDS IN THE CONTAINERS & PACKAGING 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. SASB also describes self-regulatory efforts on the part of the industry.

The Containers & Packaging industry is subject to regulation by various agencies at the federal, state, and local levels. Generally, regulations address the industry’s environmental externalities and product safety issues.

Furthermore, voluntary efforts by companies are driving shifts in production and product design.

The U.S. Environmental Protection Agency (EPA) regulates air and water pollution in the industry. Air emissions are regulated under the Clean Air Act (CAA) of 1970. The National Emission Standards for Hazardous Air Pollutants (NESHAP), issued under the CAA, established specific hazardous air emissions thresholds for industrial facilities, including specific thresholds for furnaces and boilers used to produce containers and packaging products. Key groups of regulated air pollutants include Criteria Air Pollutants (CAPS), Hazardous Air Pollutants (HAPS), and Volatile Organic Compounds (VOCs). Companies that emit pollutants above threshold levels must apply for state permits, and may be required to install Maximum Achievable Control Technology (MACT). 43

Additionally, under the EPA’s Greenhouse Gas Reporting Program (GHGRP), facilities emitting more than 25,000 metric tons of carbon dioxide equivalent (CO2e) must report total greenhouse gas (GHG) emissions. The GHGRP is designed to collect data to inform future policy decisions, including programs to reduce emissions. 44 Although there are currently no federal carbon emissions reduction regulations in the U.S., certain states and regions have implemented carbon cap-and-trade programs to reduce emissions. The most prominent example is California’s GHG reduction law, commonly known as AB 32, which took effect
in January 2012. The program introduced an emissions cap for industrial and other major emitters, which will be reduced by approximately three percent annually. Facilities must reduce emissions or offset them by obtaining emissions credits.\textsuperscript{45} International GHG regulation may also affect the industry. In Canada, Quebec Province maintains a cap-and-trade program for industrial entities that emit 25,000 metric tons or more of CO\textsubscript{2}e annually.\textsuperscript{46}

The Clean Water Act (CWA) of 1972 set water discharge quality requirements for industrial sources, including paper, plastic, metal, and glass container manufacturing facilities. The Resource Conservation and Recovery Act (RCRA) directs the EPA to track hazardous wastes from “cradle to grave,” and included solid waste in its definition of hazardous wastes. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or “Superfund”) established regulations for funding the remediation of current and past discharges of CERCLA-listed hazardous wastes, as well as measures to mitigate hazardous waste disposal. The EPA has the authority to levy fines against entities that do not comply with the above regulations, and the agency may also require violators to make necessary adjustments to processes or equipment in order to achieve compliance.\textsuperscript{47}

Regulations directed at product safety are designed to protect human health. The U.S Food and Drug Administration (FDA) regulates and sets standards for food packaging and labeling.\textsuperscript{48} The FDA monitors the health impact of chemicals used in containers, and can set limitations or ban chemicals with demonstrated negative health impacts. Bisphenol-A (BPA) is one substance that has been banned at high levels in some, but not all, forms of beverage containers.\textsuperscript{49, 50} In the European Union (E.U.), legislation has established migration limits for materials that come into contact with food; for example, that the material cannot transfer its components into the food in unacceptable quantities. For plastic materials, rules set specific migration limits for individual substances, which are determined through a toxicological evaluation.\textsuperscript{51}

Post-consumer containers and packaging contribute a significant portion of waste to landfills every year. Companies that operate in many E.U. countries are regulated by recycling directives related to Extended Producer Responsibility (EPR).\textsuperscript{52} These directives make container and packaging companies financially responsible for ensuring that their products are properly recycled and disposed of at the end of life. These directives are credited with improving the recycling rates of various forms of post-consumer packaging, although they have been found to lead to higher costs for the producing companies, as EPR shifts a portion of the financial burden of recycling from municipalities to packaging producers.\textsuperscript{53}

While no direct EPR laws for containers and packaging currently exist in the U.S., there has been proposed legislation around the topic,
and container deposit laws in eight of the ten states that have them are similar to EPR programs. Furthermore, there have been multiple voluntary industry-led initiatives to improve the recycling rates of various materials. The American Forest & Paper Association launched its Better Practices, Better Planet 2020 initiative in part to increase the recycling rate of paper products, which may lower raw materials costs for producers.

Companies in the industry may have to navigate municipal packaging bans that could have a substantial impact on operations. Bans have arisen due to consumer concerns over chemical leaching, environmental pollution by plastic packaging, and use of fossil hydrocarbon feedstocks. Cities including San Francisco and Portland have entirely banned the use and sale of plastic bags. San Francisco also banned the sale of plastic disposable water bottles on city-owned property. If more cities follow, these bans may have detrimental effects for plastic packaging and present opportunities for other materials.

Voluntary third-party raw materials sourcing certification standards for materials used to manufacture containers and packaging have gained acceptance in recent years, as demand for environmentally and socially sustainable products has grown. The most common certifications address wood and wood fiber sourcing, while aluminum certification has also gained acceptance at major companies. Certification is undertaken throughout the entire paper supply chain, from timber harvesting to paper product manufacturing.

The Programme for the Endorsement of Forest Certification (PEFC) is the world’s largest timber certification organization by total certified forest area. Other standards of note include the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (FSI).

The Aluminum Stewardship Initiative (ASI) is a voluntary standard that promotes responsible and transparent practices throughout the aluminum supply chain, including addressing environmental externalities such as biodiversity loss.

Lastly, companies in this industry are subject to the conflict minerals disclosure rule of the Dodd-Frank Act of 2010 and subsequent rules adopted by the U.S. Securities and Exchange Commission (SEC). Companies are required to publicly disclose their use of “conflict minerals” if they are “necessary to the functionality or production of a product” that the company manufactures or contracts to be manufactured. These minerals include tantalum, tin, gold, or tungsten originating in the Democratic Republic of the Congo (DRC) or adjoining countries.
SUSTAINABILITY-RELATED RISKS AND OPPORTUNITIES

Industry trends 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 a 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 Containers & Packaging industry:

- **Use of common capitals**: Containers and packaging companies use natural capital inputs including energy and raw materials. Raw material extraction and energy production generate environmental and social externalities, while environmental pressures such as climate change and corresponding increased regulatory pressure could lead to higher costs or an unstable supply of these resources.

- **Negative environmental externalities**: Externalities of containers and packaging manufacturing include GHG emissions, air and water pollution, and waste generation. Increasingly stringent environmental regulation could increase operating costs.

- **Social license to operate**: Increasing consumer awareness of potential adverse long-term health effects from chemicals in containers and packaging can affect the industry’s social license to operate.

As described above, the regulatory and legislative environment surrounding the Containers & Packaging industry emphasizes the importance of sustainability management and performance. Specifically, recent trends suggest a regulatory emphasis on environmental protection, product safety, and product lifecycle management, 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 implications for companies in the Containers & Packaging 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 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. These impacts could stem from 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.

Containers and packaging manufacturing generates environmental externalities through energy consumption and materials processing. These processes generate GHG and other air emissions, which contribute to global climate change and can be harmful to human health and the environment. Furthermore, the industry faces water management issues related to the quantity used and quality of effluents. Lastly, companies in this industry produce wastes that are potentially harmful to the environment and can result in pollution abatement costs or regulatory penalties. Overall, these environmental externalities can cause concern among local communities and regulators, possibly leading to more stringent regulations or reputational harm.

**Greenhouse Gas Emissions**

The Containers & Packaging industry generates relatively high GHG emissions within its manufacturing sector. Fossil fuels comprise a significant share of energy use in the Containers & Packaging industry. Common fuel types include natural gas, coal, and fuel oil. Emissions intensity will vary based on the type of fuel used and the type of product produced.
Containers and packaging companies generate significant direct greenhouse gas emissions, which contribute to climate change. These emissions create regulatory compliance costs and risks for the industry, as large industrial emitters face greater likelihood of targeted emissions regulation. Greenhouse gas emissions stem from both materials transformation and direct process energy consumption.\(^8\) The emissions profile of a company will vary based upon product and fuel type. In general, the manufacture of paper, plastic, glass, and metal products from raw materials will be more emissions-intensive than assembly of pre-manufactured components. As GHG regulations become more stringent worldwide, the industry is likely to face increasing costs and risks related to regulatory compliance.

On the contrary, GHG reduction through improved energy efficiency, use of cleaner-burning fuels or alternative energy, and other process advances can lead to lower costs and reduced operating risks. Company performance in this area can be analyzed in a cost-beneficial way internally and externally 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 a regulatory program; and
- Description of long-term and short-term strategy or plan to manage Scope 1 emissions and emissions reduction targets, and an analysis of performance against those targets.

**Evidence**

According to the GHGRP’s emissions data by North American Industry Classification System (NAICS) code,\(^6\) the Containers & Packaging industry emitted more than 4.5 million tons of CO\(_2\)e in 2013. However, the industry’s emissions reported to the EPA GHGRP give an incomplete picture of total emissions, as facilities emitting less than 25,000 tons of GHGs are not required to report, and many of the paper container segment’s emissions are reported together with the vastly higher pulp and paper industry’s emissions, addressed in SASB’s Forestry & Paper industry.\(^6\)

The glass manufacturing segment is a significant emitter of GHGs, especially CO\(_2\).\(^6\) Glass container manufacturing requires volatilization of raw materials to produce glass, requiring intense energy, primarily in the form of natural gas. The volatilization of materials also produces non-energy process emissions in addition to energy-related emissions.\(^6\) By one estimate, the emissions from the production of one kilogram of glass in a natural gas-fired furnace produces nearly 0.6 kg of CO\(_2\). Approximately 0.45 kg of this figure comes...
from fuel combustion, while the remainder comes from the dissociation of carbonate raw material. Furthermore, the use of recycled glass, or cullet, and the type of glass can affect the quantity of GHGs emitted. For each percentage increase in cullet as a share of raw material, energy use may be lowered by between 0.15 and 0.3 percent. However, some products require high quality glass thus cullet cannot not be used.

In the U.S. and abroad, regulations directed at curbing GHG emissions from point sources may increase costs for container and packaging manufacturers. These include cap-and-trade or other carbon emissions reduction programs implemented in the E.U., Australia, New Zealand, Brazil, California, and Quebec, as well as proposals to implement similar federal programs in the U.S. Company financial disclosure alludes to the potential for material risks from these regulations: Owens-Illinois, a major glass container producer, states in reference to the E.U. ETS and proposed U.S. federal cap-and-trade programs that, “...should the regulators significantly restrict the number of emissions allowances available, it could have a material effect in the future...The EPA regulations, if preserved as proposed, could have a significant long-term impact on the Company's U.S. operations.” Further, RockTenn warns in its FY 2014 Form 10-K that “Enactment of the Quebec cap-and-trade program may require expenditures to meet required GHG emission reduction requirements in future years. Such requirements also may increase energy costs above the level of general inflation and result in direct compliance and other costs.”

Value Impact

Managing GHG emissions can directly affect the cost structure of companies in the industry. Specifically, mandated regulatory emissions reductions can increase operational costs and capital expenditures and may result in fines for non-compliance. At the same time, reducing emissions through improved energy efficiency, the use of renewable energy, or other process improvements can create operational efficiency, reduce costs, and protect companies from further regulations that limit or put a price on emissions. These measures can also reduce business uncertainty and, therefore, lower the cost of capital.

As international and national climate change mitigation efforts continue, the probability and magnitude of these impacts are likely to increase in the near to medium term.

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 significant impact high emitters in the form of taxes or cap-and-trade.
Air Quality

In addition to GHGs, container and packaging manufacturing facilities may release regulated air emissions, which are closely linked with local human health impacts. These emissions include SO\textsubscript{x}, NO\textsubscript{x}, carbon monoxide, PM\textsubscript{10} and PM\textsubscript{2.5}, chlorine dioxide, and others. Exposure to some of these substances has been linked to decreased pulmonary function and fatal diseases.\textsuperscript{74, 75} The sources of emissions from containers and packaging manufacturing facilities include, among others, cogeneration fuel boilers, raw material volatilization, and process engines.\textsuperscript{76} Glass container manufacturers are large producers of hazardous nitrogen oxides and sulfur dioxide emissions, which are emitted from glass furnaces.\textsuperscript{77} The manufacturing of paper products also releases air emissions, particularly if facilities are vertically integrated and include paper pulp processing.

Such air emissions generate regulatory risk, particularly for companies with intensive manufacturing operations, though that risk may vary depending on local air regulation. Companies must ensure that facility emissions at least comply with standards. Non-compliance can result in fines and may require the installation of emissions-reduction equipment. Additionally, the industry may face future risks from currently unregulated air emissions, or emissions below regulatory thresholds, as public and regulatory concern over air quality drive more stringent legislation or regulatory action.

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

- Air emissions for the following pollutants: NO\textsubscript{x} (excluding N\textsubscript{2}O), SO\textsubscript{x}, particulate matter (PM), and volatile organic compounds (VOCs).

Evidence

According to the EPA 2014 National Emissions Inventory, the Containers & Packaging industry accounts for relatively substantial emissions of certain compounds. According to EPA data, the industry in 2013 accounted for approximately four percent of all VOC emissions and two percent of total chromium emissions from all industrial processes.\textsuperscript{78} Emissions of other hazardous substances, although at lower quantities, present similar operational risks.

Air pollution mitigation measures require operating costs as well as capital expenditures. According to data from the EPA’s 2005 Pollution Abatement Costs and Expenditures (PACE) survey, the Containers & Packaging industry had air pollution abatement operating costs of $320 million, accounting for nearly 3.7 percent of the total for all manufacturing industries. The PACE data further shows that air pollution abatement capital expenditures hit
$55 million, approximately 1.4 percent of the manufacturing sector total.\textsuperscript{79, 80}

Air emissions regulations are becoming more stringent over time, increasing the industry’s air pollution mitigation costs. The EPA recently issued a new rule setting limits on emissions from industrial and commercial power boilers, traditionally used in industries that use cogeneration techniques to generate their own power. The new rule, labeled the Boiler MACT, is aimed at reducing the amount of hazardous air pollutants from industrial and commercial boilers and process heaters. The rule impacts all industrial manufacturers, including manufacturers of containers and packaging.\textsuperscript{81}

Pursuant to the new regulation, RockTenn anticipates that it will spend $55 million in total capital expenditures due to Boiler MACT compliance over several years.\textsuperscript{82}

Companies warn investors of potential financial impacts from pending air emissions regulation in financial disclosure. In its 2014 Form 10-K, International Paper states, “Regulations addressing specific implementation issues related to the SO\textsubscript{2} NAAQS are being developed by the EPA and are expected to be finalized during the next two years. Potentially material capital investment might be required in response to these emerging requirements.”\textsuperscript{83}

Companies can face regulatory penalties and required equipment upgrades as a result of violation of air pollution regulation. In 2010, the U.S. Department of Justice fined Saint-Gobain, a large French multinational glassware producer, $2.25 million and required the company to install $112 million worth of new air pollution control equipment that will reduce the company’s NO\textsubscript{x} and SO\textsubscript{2} emissions by 38 and 201 tons per year, respectively.\textsuperscript{84} Furthermore, in December 2012, a U.S. glass container manufacturer agreed to pay a $1.45 million fine and install $37.5 million of air pollution control equipment for violations of the CAA. The new equipment will target NO\textsubscript{x}, SO\textsubscript{2}, and PM emissions, reducing emissions by an estimated 2,500 tons per year.\textsuperscript{85}

Manufacturing methods that lower air emissions can mitigate regulatory risks. For example, in glass manufacturing, increased use of cullet, lower furnace temperatures, and use of low sulfur fuels can lower PM emissions. Similarly, sulfur dioxide emissions can be reduced by using low sulfur fuels, such as natural gas, and reducing sodium and calcium sulfate levels in raw material batches. Additionally, pollution control equipment including emissions scrubbers can likewise reduce emissions. Such equipment is commonly required at industrial facilities in order to comply with air emissions regulation.\textsuperscript{86}

**Value Impact**

Management of air emissions can have an ongoing impact on the operational efficiency and cost structure of companies, as well as one-time effects on cash flows from regulatory fines and litigation.
Harmful air emissions from operations may result in regulatory penalties, higher regulatory compliance costs, or new capital expenditures to install the best-in-class control technology. Companies may also face legal challenges from the local population or other businesses, resulting in one-time costs and increased contingent liabilities. Financial impacts of air pollution will vary depending on the specific location of companies’ operations and the prevailing air emissions regulations, which may be less developed in some regions and countries than others.

As concerns about the health effects of air emissions grow around the world, the probability and magnitude of impacts from this issue are likely to increase.

The quantity of key pollutants emitted is an indicator of a company’s operational efficiency and its success in mitigating regulatory risk and one-time costs associated with harmful emissions.

**Energy Management**

Containers and packaging companies are reliant on energy as a primary input for value creation, due to their energy intensive operations. Energy is derived primarily from the direct combustion of fossil fuels and the electrical grid. Purchased electricity is used to power manufacturing machinery in the industry. The paper and metal container segments are particularly reliant on electrical energy, while glass container manufacturing requires relatively more energy in the form of heat, but also consumes electrical power. This energy-intensive production has regulatory implications due to Scope 1 GHG emissions from direct fossil fuel use. These financial risks were discussed earlier under the topic of “Greenhouse Gas Emissions.” However, Scope 2 emissions from purchased electricity can result in indirect risks, as regulations limiting the emissions of electrical utilities may result in higher costs for electricity customers. The Containers & Packaging industry’s high electricity consumption thus creates possible impacts on company value through increased operating costs. The tradeoff between on-site versus grid-sourced electricity and the use of alternative energy can play an important role in influencing both the costs and reliability of the energy supply. The use of cogeneration to produce electrical energy onsite presents the industry with an additional tradeoff: Increased cogeneration will typically raise direct GHG emissions, but reduce indirect emissions through lowered grid electricity purchases.

The long-term prospects of increased demand from the developing world, as well as concerns about energy security, climate change, and the use of nuclear energy, suggest increasing upward pressure on price and availability of conventional sources of electricity. As a result, the way in which a containers and packaging company manages its overall energy efficiency, its reliance on different types of energy and associated sustainability risks, and its ability to
access alternative sources of energy, can have long-term financial implications that affect value creation.

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

- Total energy consumed, percentage grid electricity, percentage renewable.

**Evidence**

Overall energy costs are a key component of manufacturing costs for companies in the Containers & Packaging industry. According to data from the 2011 U.S. Census Bureau Annual Survey of Manufacturers (ASM), the facilities representing the Containers & Packaging industry accounted for approximately four percent of the manufacturing sector’s total purchased electricity consumption. The cost of purchased electricity accounted for three percent of the total cost of materials and value added for the industry.\(^\text{88}\) Purchased electricity accounted for approximately 2.6 percent of the total cost of materials and 3.6 percent of value added. The industry’s purchased electricity costs of nearly $2.3 billion are greater than its purchased fuel costs.\(^\text{89}\) As net income margins tend to be low in the industry, cost savings from effective energy management, particularly in terms of purchased electricity, can be a key competitive factor.

For many packaging companies, energy costs are addressed in financial disclosure as a key risk and a possible material financial concern. For example, Owens-Illinois, a major glassware manufacturer, reports that energy accounts for between 10 and 25 percent of its total manufacturing costs.\(^\text{90}\) Sonoco Products, a diversified manufacturer, states in its 2013 Form 10-K that “Some of our manufacturing operations require the use of substantial amounts of electricity and natural gas, which may be subject to significant price increases as the result of changes in overall supply and demand and the impacts of legislation and regulatory action,” and, “we could suffer adverse effects to net income and cash flow should we be unable to either offset or pass higher energy costs through to our customers in a timely manner or at all.”\(^\text{91}\) International Paper similarly discusses the link between regulatory action and energy prices, stating that “Other sites that we operate in the EU experience indirect impacts of the EU ETS through purchased power pricing…”\(^\text{92}\) This disclosure highlights the importance of effective energy management and explains why some companies are implementing strategies to improve their energy efficiency.

Companies can implement energy-efficient technologies in order to reduce electricity-related energy expenses. Companies in the containers and packaging industry are implementing various techniques to improve their overall energy efficiency, including cogeneration. It is important to note that
cogeneration can increase emissions of GHGs and other air pollutants; thus there are tradeoffs between energy management and other important environmental issues. In 2013, RockTenn invested more than $68 million in a new biomass boiler at an Alabama plant that will use facility waste to generate electricity and steam. The project will allow the plant to produce as much as 87 percent of its own energy and comply with the new EPA Boiler MACT rule.93 Additionally, MeadWestvaco invested $285 million in a biomass boiler upgrade at its Virginia plant, allowing the plant to become self-sufficient in electrical and steam power, lowering operating and maintenance costs.94 A capital investment of $44,000 to modify a fan system at a Louisiana-Pacific board mill resulted in annual savings of roughly 2.5 million kWh, or $85,000 in electricity costs.95 Companies are also lowering energy costs by using waste process materials as a source of energy, a concept which is discussed in further detail below.

**Value Impact**

Management of energy efficiency, energy independence and energy-mix (including renewable energy) is key to the profitability and risk profile of containers and packaging companies.

Cost savings can be achieved through energy efficiency as well as energy source optimization. At the same time, efforts to improve energy efficiency or reduce dependence on specific types of energy can require additional capital expenditures. While the cost of energy consumption is already captured in financial results, overall energy consumption levels provide a sense of firms’ exposure to possible future increases in energy prices, resulting from energy providers internalizing the growing environmental and social impacts of energy generation and consumption.

As a portion of operating costs for containers and packaging companies come from purchased electricity, decisions about on-site versus sourced electricity and diversification of energy sources can also influence the volatility and price of energy costs. This can have an impact on long-term profitability and ultimately the risk profile and cost of capital.

Increasingly stringent environmental regulation is likely to increase the probability and magnitude of these impacts in the medium term.

The more purchased fuels and electricity a company uses from traditional sources of energy, the more vulnerable it is to rising prices of specific energy sources and the indirect impact of costs from internalization of carbon prices by utilities. The use of independent energy sources (non-grid) also indicates a degree of control and a company’s ability to provide continuous energy for its facilities. The percentage energy from renewables indicates a firm’s ability to mitigate its environmental
footprint, its exposure to energy costs increase, as well as its energy independence.

**Water Management**

Containers and packaging production is water-intensive. Water is consumed during raw materials preparation, cooling, and product cleaning. As a result, companies both require ample stable water supplies and produce wastewater, which is reused, treated and discharged into the environment, or lost through evaporation. Process water may accumulate contaminants. Contaminated water effluent can result in oxygen depletion of receiving waters, aquatic pH fluctuations, accumulation of persistent organic chemicals in the ecosystem, eutrophication from nutrient loading, and contamination with suspended solids, including heavy metals. Water contamination can generate regulatory risk, including penalties for violations, higher treatment and permitting costs, capital requirement for alternative water supplies, and tension with other local water users.

In addition to water contamination, the industry faces possible issues surrounding water availability. Water is becoming a scarce resource around the world, due to increasing consumption from population growth and rapid urbanization, as well as climate change. Furthermore, water pollution in developing countries makes available water supplies unusable or expensive to treat. Based on recent trends, it is estimated that by 2025 important river basins in the U.S., Mexico, Western Europe, China, India, and Africa will face severe water problems as demand overtakes renewable supplies. Many important river basins can already be considered “stressed.” Water scarcity can result in higher supply costs, supply disruptions, and social tensions, which companies across different industries, particularly water-intensive ones, will need to contend with.

Companies can adopt various strategies to address water supply and treatment issues, such as recycling process water, improving production techniques to lower water intensity, and managing water effluent.

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

- Total water withdrawn, percentage in regions with High or Extremely High Baseline Water Stress and percentage recycled water usage; and
- Number of incidents of non-compliance with water quality permits, standards, and regulations.

**Evidence**

The Containers & Packaging industry is relatively water intensive. A 2013 ranking of 130 Global Industry Classification System sub-industries by water value-added, placed the
paper packaging industry in the top 15 industries, with nearly six cubic meters of water per dollar of output. Water value-added was measured by cubic meters of water consumption per dollar of output. Together, glass and metal container manufacturing are among the top 50 sub-industries, using approximately 4.5 cubic meters per dollar of output.100

The contamination of process water can require treatment-related operating costs and capital expenditures, as well as potentially cause tension with other local water users. According to data from the EPA’s 2005 Pollution Abatement and Capital Expenditures survey, the water pollution abatement operating cost of the Containers & Packaging industry was approximately $161 million.101 This represents approximately 2.4 percent of the U.S. manufacturing sector’s total water pollution abatement operating costs.102 Individual companies have achieved cost savings by implementing technologies to improve wastewater treatment. At one facility, RockTenn implemented a microorganism water treatment system that allowed the company to avoid municipal water treatment fees of $500,000 a year; the system also creates methane gas that is later resold, resulting in total savings in excess of $1 million a year for their Solvay, NY containerboard mill.103

Operations that rely heavily on water and are located in water scarce regions are at particular risk as concerns over water scarcity mount. For example, operations located in California may face hurdles associated with water consumption due to drought concerns.104 California alone accounts for 10.2 percent of paper and cardboard box production in the U.S.105 Much of the state’s water supply is considered to be at very high risk, and cities like Los Angeles and San Francisco are concerned about sustaining long-term water demand.106, 107

Companies have implemented water efficiency and reduction goals to reduce their total exposure to water risks. Companies have also started to disclose operations located in water scarce regions to contextualize this issue in their sustainability reports. Amcor Australia, a producer of rigid plastic and paper products, used the World Business Council for Sustainable Development Global Water Tool to determine that the company operated 34 sites in water stressed and water scarce regions around the world. Eleven of the sites were covered under the company’s water consumption targets, and the remaining 23 were under further evaluation to determine appropriate consumption targets.108 Ball Corp. recognizes that some facilities are located in water scarce regions in China, South America, the United States, and Europe. The company has committed to improving water use efficiency throughout its can operations by 7.2 percent a year.109 Similarly, RockTenn has set a goal of reducing its water discharge by 12 percent from 2009 levels by 2020.110
**Value Impact**

Managing water consumption and wastewater can influence companies’ operational risks, with potentially acute impacts on value from disruptions to production. Water use and contamination can also affect ongoing operating costs and impact cash flows through one-time capital expenditures or regulatory penalties.

More efficient use of water over time could generate cost savings and lower operating expenses. Large water withdrawals create operational risks related to price and availability. Water shortages could create additional permitting requirements, thereby increasing operating costs. In water-stressed regions, water-intensive production could have an impact on the long-term revenue growth and risk profile of a company, and therefore its cost of capital.

Water treatment may require capital expenditures on treatment equipment or facilities, as well as increased operating costs to run and maintain them. Third-party water treatment costs could rise if it is outsourced. Community tension arising from water contamination or excessive use of local water resources could adversely affect a company’s reputation or license to operate, potentially affecting revenues or operating costs.

As regulations become more stringent over time, and water resources become increasingly stressed due to climate change and other pressures, the probability and magnitude of future financial impacts due to water effluents and withdrawals are likely to increase.

Total water withdrawn in water-stressed regions shows a company’s exposure to cost and supply risks. Fines and instances of non-compliance with water standards and regulations indicate a company’s management of water quality, which is suggestive of regulatory risk over the medium term.

**Waste Management**

Containers and packaging companies face regulatory and operational challenges in managing processing waste. These substances can be hazardous to human health and the environment, leading to carcinogenic effects and adverse environmental impacts like harm to animal species through accumulation of substances in tissues. Containers and packaging production can generate a variety of wastes, including those categorized as hazardous. The majority of wastes are by-products from raw material conversion and processing. Hazardous wastes include acetaldehyde, lead, glycol ethers, formaldehyde, and chromium. If not properly managed, waste generation can increase the risk of accidental release to the environment, which may result in regulatory penalties. In addition, wastes can cause long-term liability in the form of environmental cleanup and mitigation expenses, including those required under the U.S. EPA’s RCRA and
CERCLA programs. Although many of these current liabilities stem from a decades long legacy of poor waste management practices, continued waste production results in ongoing costs and the possibility of future mitigation requirements.

Companies in the industry can also benefit from recycling best practices and using byproduct materials in production. Companies are implementing retreatment techniques to reduce costs and reuse raw materials, as well as using byproducts to generate their own power. By addressing or exceeding regulatory requirements and implementing waste management best practices and recycling throughout their operations, companies can reduce regulatory and operational expenses and mitigate potential risk of community tension due to localized pollution.

Evidence

The Containers & Packaging industry generates processing waste, including waste classified as hazardous under U.S. environmental regulations. The 2011 Biennial RCRA Hazardous Waste Report shows that together, the converted paper manufacturing (NAICS 3222) and plastic products (NAICS 3261) industries generated more than 61,000 tons of hazardous waste in 2011. These industries were both ranked in the top 50 industries for hazardous solid waste generated.113

Waste disposal, especially for hazardous materials, can represent significant operating costs. According to data from the 2005 PACE survey, the paper, glass, and metal container manufacturing segments of the industry had combined solid waste pollution abatement operating costs of $175 million; that figure accounts for nearly 3.3 percent of the total for all manufacturing industries. Solid waste pollution abatement capital expenditures were $16.4 million.114, 115

On the contrary, waste can be used as raw materials or for energy production, improving operational efficiency. For example, materials including wood fiber and other byproducts from the paper making process may be used as a source of biomass energy.116 Other internally generated byproducts or postindustrial materials like glass cullet and plastic resins can be reused in the manufacturing process to reduce costs and energy needs of the packaging company.117

Company financial disclosure discusses the risks presented by waste generation. For example, Sealed Air Corp mentions, “We generate, use and dispose of hazardous materials in our
manufacturing processes. In the event our operations result in the release of hazardous materials into the environment, we may become responsible for the costs associated with the investigation and remediation of sites at which we have released pollutants, or sites where we have disposed or arranged for the disposal of hazardous wastes, even if we fully complied with environmental laws at the time of disposal.”  

**Value Impact**

The generation of waste impacts operational efficiency and regulatory risks for containers and packaging companies. Waste treatment or disposal results in ongoing operating expenses related to waste handling. Mishandling of highly-regulated hazardous wastes can lead to fines and contingent liabilities from legal actions, while regulatory agencies may require additional capital expenditures to reach compliance.

Conversely, waste management can create operational efficiencies for companies, improving long-term cost structure and profitability.

The quantity of waste generated, including hazardous, and the percent recycled gives insight into a company’s operational efficiency and the potential for regulatory fines and remedial action, and capital expenditures related to solid waste pollution abatement.

Past performance on waste management can be a proxy for future risk, looking at the number and aggregate quantity of releases and spills and percent recovered.

**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 Containers & Packaging industry is dependent on a social license to operate, given the frequent contact between its products and consumers, either directly or through consumables. Increasing government and consumer concerns surrounding the potential human health impacts of substances in containers and packaging can have financial implications for the industry. Harmful substances in containers and packaging products, as well as the quality of products, can have acute and chronic impacts on human health. These factors can result in product recalls, litigation, and adverse reputational impacts for containers and packaging companies.
Product Safety

Product safety is likely a material financial concern for the Containers & Packaging industry due to potential impacts on revenue, regulatory risks, and product recalls and related litigation. Consumer and regulatory concerns over human health impacts from substances in containers and packaging can affect product demand, as well as result in product recalls and litigation. Many of the industry’s products come into frequent contact with consumers, primarily through food, beverage, and pharmaceutical packaging. Some packaging and containers have been found to leach trace amounts of chemicals into their contents.\textsuperscript{119} Products made of or containing plastics have garnered particular attention from consumers and regulators due to concerns over chemical leaching.\textsuperscript{120} These concerns have led to a shift in consumer preferences and increased regulatory scrutiny, resulting in shifting product demand and regulatory bans on certain chemical substances in regions like the U.S. and the E.U.\textsuperscript{121, 122} Furthermore, product safety is not limited to concerns over chemical substances – functionality is also a factor; for example, faulty packaging can allow contents to spoil. Such instances can result in lost revenues or litigation brought by the industry’s customers.

As the Containers & Packaging industry is primarily a business-to-business industry, consumer and regulatory concerns over product safety are manifested indirectly through demand for the industry’s products and recalls and litigation. Company performance in this area can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Number of recalls and total units recalled; and
- Discussion of process to identify and manage emerging materials and chemicals of concern.

Evidence

Potentially hazardous chemicals can leach from the packaging into consumables, although scientific evidence about health impacts in many cases has been conflicting. Low levels of formaldehyde, bisphenol-A (BPA), tributyltin, triclosan, and phthalates and have been found in food containers and packaging.\textsuperscript{123} One study found more than 24,000 chemicals in bottled water that are considered harmful to human health, including known carcinogens and human endocrine disruptors.\textsuperscript{124} BPA, a plasticizer used in a number of containers, including plastic and metal containers, has garnered much attention due its potential effects on health. At high levels, BPA has been shown to cause a number of human health issues later on in life, including cancer. However, U.S. regulators have deemed BPA safe for adults at the current low levels found in consumables.\textsuperscript{125}
In many cases, the health impacts of substances used in containers and packaging products are unclear, however consumer safety concerns can be sufficient to shift demand. For example, due to consumer pressure, the infant formula industry had already ceased using BPA in its packaging in 2013, when the FDA officially banned it. The FDA implemented the ban due to the industry’s “abandonment” of BPA packaging. The decision was not based on safety.\textsuperscript{126} This case illustrates the power of consumer preferences as a determinant of product demand and regulatory action.

The regulatory environment is dynamic, introducing uncertainty into the Container & Packaging industry. In October 2014, the National Resources Defense Council, the Breast Cancer Fund, and a number of other consumer and environmental health groups petitioned the FDA for a ban on perfluorocarboxylates (PFCs) used in paper and paperboard food containers, including pizza boxes. According to the petition, these chemicals can affect fetal development, male reproductive systems, pre and post-natal brain development, as well as cause cancer.\textsuperscript{127}

Product innovation is an important factor for addressing uncertainty and staying abreast of regulatory change. Regarding the use of epoxy resins containing BPA, Ball Corp. states in its FY2013 Form 10-K that, “A significant change in these regulatory agency statements or other adverse information concerning BPA could have a material adverse effect on our business...Ball recognizes that significant interest exists in non epoxy-based coatings, and we have been proactively working with coatings suppliers and our customers to evaluate alternatives to current coatings.”\textsuperscript{128}

Internationally, regulations concerning BPA are more stringent. For example, in 2013, France banned BPA in all packaging and containers that come into contact with food. The ban is divided into two phases; the first, which banned the chemical in all materials coming into contact with food intended for use by children ages three years or younger, took effect on January 1, 2013; the second, for all food contact materials, took effect on January 1, 2015. The bans may have adversely affected U.S. exports of packaging products to France.\textsuperscript{129} While consumers and companies may demand new products that do not contain known hazardous chemicals, there is a risk that such new products introduced to the market could contain new, untested, chemicals that do not solve the underlying issue of potential harm to human health.\textsuperscript{130} Therefore, containers and packaging companies must consider the risks from the use of known hazardous substances, but also verify the safety of new chemicals and materials used in their products. The health impacts from long-term chronic exposure to chemicals is largely unknown. Trace amounts of substances known to be harmful are legal in low doses – for example, carcinogenic formaldehyde is widely used in plastic soda bottles and plastic tableware in low concentrations. More than 400 other chemicals
The use of chemical substances in packaging can result in product recalls—regardless of merit—due to concerns over impacts on human health. The costs of recalls by consumer-facing companies can be passed on to container and packaging manufacturers through lawsuits and lost revenue. Canadian packaging manufacturer Flexible Packaging Corp. (FPC), wax manufacturer The International Group, and the Kellogg Company have been engaged in a multi-year legal case stemming from a 2010 recall of thousands of cereal boxes. The recall, executed by Kellogg after customer complaints of offensive odors emanating from the packaging, as well as cases of nausea and diarrhea, allegedly cost the company millions. Kellogg filed suit against FPC, alleging that the plastic liners it provided contained high amounts of hydrocarbons that caused the health impacts. FPC in turn filed a suit against The International Group, claiming that the company’s wax used to manufacture cereal box liners was the source of the hydrocarbons. Kellogg is seeking more than $75 million in damages from FPC for recovery of lost inventory and sales, and reputational impacts.

Concern over chemical substances in packaging is not the only possible factor affecting safety. Functionally defective products that endanger human health can likewise result in recalls and financial impacts. For example, in 2008, Owens-Illinois produced faulty glass bottles that led to the recall of some Samuel Adams 12-ounce beer bottles. The glass bottles had a
defect that allowed for small pieces of sand and glass to break off and fall into the bottle, which could present a potential hazard for consumers. Boston Beer Co., the producer of Samuel Adams, eventually agreed to a $20.5 million settlement with Owens-Illinois over the recall and associated costs, which caused an estimated $12 million reduction in Boston Beer Co.’s profits.

Ultimately, recalls can have an effect on demand for products. As Sealed Air Corp. stated in its FY2013 Form 10-K, “We could also be required to recall possibly defective products, or voluntarily do so, which could result in adverse publicity and significant expenses.”

Value Impact

Product safety issues can affect containers and packaging companies financially through reduced demand for products, damage to reputation, regulatory action that bans the use of certain substances in products, and litigation brought by customers in the event of a product recall or safety incidents. Potentially harmful substances in products or product defects can impact human health and lead to lower revenues and market share. Legal actions by customers can result in one-time charges and contingent liabilities.

Companies may incur research and development in order to develop safer products, lowering operating income in the short term but reducing long term risks from recalls and potential bans on the use of certain substances in products. Additionally, companies that fail to obtain CoC or other certification could face a higher cost of capital due to the increased risk of acute adverse impacts from supply chain disruption or reputational issues.

As consumer safety regulations become more stringent over time, and awareness of possible health impacts from chemical substances grows, the probability and likelihood of financial impacts is likely to grow.

Past performance on product safety can be indicative of future performance, looking at the number of recalls and quantity products recalled.

A description of existing and emerging materials of concern contained within products is a forward-looking indicator of a company’s risk exposure to possible bans of certain chemical substances.

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.

Rising public awareness of the environmental externalities of packaging, including dangers to wildlife and marine pollution, is driving demand for more sustainable packaging materials. The industry’s customers are increasingly demanding products with improved lifecycle performance through recyclability, reduced material use, and the use of more durable or lighter materials.

**Product Lifecycle Management**

Containers and packaging material comprises a significant amount of post-consumer waste, which is recycled, sent to landfills, or disposed of into the environment. This waste, if sent to landfills, consumes landfill space and can generate GHG emissions, while some packaging materials that end up in the environment can persist for lengthy periods of time and cause harm to wildlife. These factors have resulted in bans on certain types of plastic packaging in the U.S. and abroad.

Additionally, rising global demand for packaging materials is placing increasing strain on limited global natural resources, and contributing to, biodiversity impacts and environmental pollution. Product end-of-life management is an important factor contributing to resource security and the long-term sustainability of the industry.

In the U.S., packaging manufacturers do not typically bear the financial costs of recycling or the environmental externalities that their products may create. However, regulatory and consumer trends suggest that the use of recycled materials and extended producer responsibility (EPR) may become more prevalent, as it is in other markets like the E.U. Future EPR laws may hold manufacturers financially liable for product take-back and recycling. Additionally, customers can garner financial and sustainability benefits from innovations such as packaging lightweighting, which can reduce transportation costs. These benefits can translate into increased demand. Furthermore, the design of a product can make it easier or harder to recycle. The addition of adhesives and metal foils to paperboard packaging, for example, can make recycling more difficult.

Innovation is an important business opportunity for containers and packaging manufacturers. Product design for improved recyclability and reduced environmental impact can have financial benefits, as recycled materials may be cheaper than virgin materials, and may also require less energy and fewer resources to convert to finished products. Additionally, increasing demand for environmentally friendly packaging may present growth opportunities for the industry.
Contrarily, companies may face diminished demand for products that do not meet customer needs or regulatory requirements for recyclability or reduced environmental impacts. Although containers and packaging companies may not bear direct financial responsibility for product waste in some markets, potential bans on products or shifting consumer preferences could jeopardize market share and lead to increased costs.

While the sustainability performance of products depends largely on the type, use, and ultimate disposal of materials, companies that effectively manage the end-of-life environmental impacts of their products through some of the innovations discussed above may be better positioned to capture shifting customer demand and meet regulatory trends.

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

- Percentage of raw materials from (1) recycled content (2) renewable resources;
- Revenue from products that are reusable, recyclable, and/or compostable; and
- Description of strategies to reduce the environmental impact of packaging throughout its lifecycle.

Evidence

Innovation in product design and access to recycled materials can help address customer demand for more environmentally sustainable products and drive growth in the industry. As concerns about generated waste and use of landfill space rise, recycling and recyclability of containers and packaging materials will play an important role in the industry’s long-term development. In 2012, containers and packaging materials represented 30 percent of total municipal solid waste, or more than 75 million tons of waste. In 2005, total municipal solid waste generation peaked at more than 250 million tons, while recycling rates have steadily risen since the 1960s. Recycling rates vary widely for different types of material. According to EPA figures, 91 percent of corrugated boxes, 70.8 percent of steel cans, 70 percent of newspaper and mechanical paper, 54.5 percent of aluminum cans, 34.1 percent of glass containers, 30.8 percent of polyethylene terephthalate plastic (PET) bottles and jars, and 28.2 percent of high density polyethylene plastic bottles were recycled in 2012. In the U.S., the amount of recoverable plastic, steel, glass, aluminum, and paper waste sent to landfills annually is estimated to be valued at more than $11 billion, representing a significant loss of potential feedstock for new containers and packaging.

A 2014 report estimated the size of the 2013 global packaging market was $797 billion, a figure that is expected to rise to $975 billion by
Of this total, the 2013 sustainable packaging market, comprised of recyclable, degradable, and reusable packaging, and packaging using recycled content and lightweighting, hit $190 billion in 2013, or nearly 24 percent of the total. The share of sustainable packaging is expected to rise to 26 percent by 2018. However, the size of the recycled, degradable, and reusable container and packaging market was estimated at just $27 billion in 2014, reflecting a narrower scope. This smaller market is also expected to grow four percent annually.

As there are various hurdles for improving the recyclability of containers and packaging materials, including the use of various labels, inks, and coatings, there may be a disconnect between packaging designers and current recycling systems, preventing materials from being recovered and leading to their disposal in landfills. For example, aseptic cartons, which are recycled at a 6.5 percent rate, use layers of paper, plastic and aluminum that require specific processes to separate. Packaging designers play a critical role in how a package is ultimately recycled, which is essential for developing a closed-loop system for the packaging material, and can influence consumers’ understanding of a material’s sustainability. Motivated by potential financial benefits and a desire to improve the sustainability of their businesses, containers and packaging companies are partaking in voluntary efforts to improve the recycling rates of their products through integrated recycling efforts and stakeholder outreach. In several of its markets worldwide, Ball Corp. helps establish and financially supports recycling initiatives, including programs to educate consumers about the benefits of recycling and collaborate with industry partners to create collection systems. The American Forest and Paper Association, an industry association with several large paper container company members, launched its “Better Practices, Better Planet 2020” initiative to accelerate recycling rates of paper packaging by more than 70 percent by the year 2020. Container and packaging materials recycling can lead to financial and environmental benefits by reducing energy use and resource intensity. Using recycled materials to produce aluminum cans reduces the embodied energy of such cans by about 95 percent compared with products made of virgin materials. In theory, there is no limit to the number of times materials such as glass and aluminum can be recycled. Similarly, recycling of other materials such as plastic can reduce embodied energy by 84 percent, and subsequently reduce GHG emissions by about 72 percent, compared to products made with virgin materials. The use of recycled input materials can have significant benefits for producers. Because cullet melts at a lower temperature than virgin materials, manufacturers can use cullet in glass production to reduce the energy costs necessary to produce new bottles. Lower energy costs can translate into improved profitability. As Crown Holdings states in its...
FY2013 Form 10-K, “By reducing the per-unit amount of raw materials used in manufacturing its products, the Company can significantly reduce the amount of energy, water and other resources and associated emissions necessary to manufacture metal containers.”

In 1994, the European Union launched a packaging waste directive aimed at improving recycling rates. The directive called for an EPR process that makes producers of packaging materials financially responsible for the end-of-life management of their products. This legislation shifted some of the financial burden off of the taxpayers and internalized the costs with manufacturers. These EPR programs are largely credited with helping E.U. countries reduce the total packaging sent to landfills by 43 percent over an 11-year period. In the U.S., EPR programs would likely increase costs for manufacturers. A 2014 cost-benefit study of EPR in Minnesota found that total estimated costs to producers, including administrative, educational, and infrastructural costs, would hit nearly $75 million statewide. Companies may face uncertainty regarding the financial implications of EPR legislation. In its 2014 Form 10-K, Berry Plastics states that “there can be no assurance that future legislation or regulation would not have a material adverse effect on us. Furthermore, a decline in consumer preference for plastic products due to environmental considerations could have a negative effect on our business.”

One of the key barriers to improving recycling rates is a lack of recycling infrastructure for many forms of packaging. Some container and packaging companies have begun improving the amount of recycled content in their products, and have invested in new infrastructure to secure a steady supply of recycled materials. As some companies use up to 90 percent recycled content in new products, they have a vested interest in ensuring that raw materials can be recovered and are not sent to landfills.

RockTenn, the largest paper recycler in North America, currently uses 45 percent recycled fiber in its new paperboard packaging products. The company sources more than four out of the nine million tons of recycled fiber it uses in manufacturing paper products from its own recycling operations. The company also partners with municipalities to increase recycling efforts in communities that do not currently have curbside recycling. Owens-Illinois, the largest glass bottle producer, hopes to eventually increase its recycled content average to 60 percent, up from current levels of 37 percent. In 2013, the company launched a new “Glass to Glass” recycling joint-venture with eCullet to supply its Portland, Oregon bottle plant with recycled materials.

Beyond legislation, business customers of C&P companies are demanding that the products they purchase contain recycled content and packaging, due to their own customers
concerns and preferences. These factors put more pressure on container and packaging manufacturers to design recyclable products and products with higher recycled content. Colgate-Palmolive, a large consumer products company and customer of the packaging industry, recently announced that it would commit to 100 percent recyclable packaging and increase-recycled content from 40 percent to 50 percent by 2020. This initiative may put pressure on Colgate’s largest supplier of packaging, Nampak, which generates more than 8 percent of its revenue from Colgate alone. Companies further down the value stream are also demanding more recycled content in the products they sell. Walmart, Colgate’s largest customer, announced a goal of boosting post-consumer recycled content in plastic packaging by 3 billion pounds by 2020. While Walmart does not produce plastic packaging itself, it hopes to leverage its buying power to increase demand for more post-consumer recycled content in the products it sells to consumers, as well as mitigate affects from the cost and volatility of packaging materials.

Consumer perception of the recyclability and recycling of containers and packaging products can shape public perception of the environmental friendliness of such products, which can lead to shifts in consumer demand. For example, the environmental impacts of plastic water bottles have led to a negative perception about disposable plastic bottles. Such concerns have been a key driver of regulatory action. More than 100 U.S. cities have banned polystyrene foam food packaging, and 28 California municipalities have banned plastic take-out bags. Cities including Concord, Massachusetts and more than 24 national parks have enacted similar bans. These bans may have significant impacts on containers and packaging sales, especially if more cities and establishments follow suit. As Crown Holdings stated in its FY2013 Form 10-K, “A number of governmental authorities both in the U.S. and abroad also have enacted, or are considering, legal requirements relating to product stewardship, including mandating recycling, the use of recycled materials and/or limitations on certain kinds of packaging materials such as plastics. In addition, some companies with packaging needs have responded to such developments, and/or to perceived environmental concerns of consumers, by using containers made in whole or in part of recycled materials. Such developments may reduce the demand for some of the Company’s products, and/or increase its costs.”

New initiatives such as the Bioplastic Feedstock Alliance, backed by large corporations, are looking to make progress on creating plastics out of renewable sources like plants rather than traditional fossil fuels, helping to lower the potential negative environmental impact. Coca-Cola and PepsiCo have internally developed PET plastic bottles made from plant-based polymers as an alternative to plastics. Coca-Cola claims to have delivered more than
25 billion plant-based plastic bottles, saving more than 525,000 barrels of oil.\textsuperscript{182} Innovations such as these are expected to drive the sustainable packaging market to $244 billion by 2018.\textsuperscript{183} Innovative containers and packaging manufacturers have the opportunity to capture this growing market.

Innovations in packaging design and advances in types of materials used are enabling containers and packaging companies to address risks and opportunities related to product lifecycle environmental impacts. Processes such as light-weighting or making products more durable are helping customers save on transportation and disposal costs, with associated environmental benefits. Apple Inc. found that reducing iPhone packaging by 28 percent helped the company ship 60 percent more boxes in airline containers, reducing the number of necessary flights.\textsuperscript{184} By reducing the amount of material needed in its plastic, glass, and aluminum cans and bottles, Coca-Cola estimated cost savings of more than $180 million over a two year period.\textsuperscript{185} Such savings and environmental benefits for customers can make innovative containers and packaging attractive, increasing demand. Top containers and packaging companies have innovated in response to regulation and shifting consumer demand. In its FY2013 Form 10-K, Sealed Air states, “Our new venture activities...include the development of packaging products from renewable resources. We maintain programs designed to comply with these laws and regulations, to monitor their evolution, and to meet this customer demand.”\textsuperscript{186}

The value of different innovations varies. With limited resources, companies could benefit from assessing the types of innovation that would have the greatest positive environmental impacts and highest cost savings for their particular products. Product lifecycle evaluations can help with such determinations. For example, Greif Inc., a manufacturer of large reusable industrial drums and containers, conducted a lifecycle assessment and found that instead of lightweighting its containers to save on transportation and improve environmental impacts, it saved more money and improved the product’s environmental impact by making the containers more durable, prolonging their useful life.\textsuperscript{187}

**Value Impact**

Innovations and advances in business models that address the recyclability and environmental impacts of containers and packaging can affect demand for products, operating costs and increase risk profile.

Demand for recyclable or reusable products is likely to rise due to consumer preferences and regulatory requirements. This represents an opportunity for manufacturers to serve new markets, expand their share of existing markets, and charge a premium for their products.
The development of products with sustainable characteristics, such as lightweight materials or improved recyclability, will require research and development expenditures, with short-term impact on operating income. However, new products with reduced externalities can result in increased market share and revenues over the medium to long term.

At the same time, containers and packaging companies can benefit from increasing the use of recycled materials in production, which can lower their purchase and operating costs. This could also mitigate potential supply chain disruption of virgin materials.

Regulations that require manufacturers to finance the collection, recycling, or reuse of packaging materials could increase operating costs. Regulations could also include provisions for penalties against companies that do not adhere to EPR laws, resulting in reduced short term profitability. Additionally, regulations might require capital expenditures or other investments to support EPR programs.

As EPR laws and conservation efforts around recycling are likely to intensify, the probability and magnitude of financial impacts are likely to increase in the medium term.

The percentage of products that are recyclable or reusable indicates a company’s positioning to meet increased demand and potential future regulatory requirements. A description of products’ lifecycle environmental impacts can give insight into a company’s positioning to address increasing demand for more sustainable products. The percentage of recycled materials used in manufacturing is an indication of potential future cost savings and exposure to the risk of supply chain disruption.

**LEADERSHIP AND GOVERNANCE**

As applied to sustainability, governance involves the management of issues that are inherent to the business model or common practice in the industry and are in potential conflict with the interest of broader stakeholder groups (government, community, customers, and employees). They therefore create a potential liability, or worse, a limitation or removal of license to operate. This includes regulatory compliance, lobbying, and political contributions. It also includes risk management, safety management, supply chain and resource management, conflict of interest, anti-competitive behavior, and corruption and bribery.

Containers and packaging companies source vast amounts of materials, both virgin and recycled, from thousands of suppliers worldwide. Environmental or social externalities from raw material production can manifest themselves financially in the Containers & Packaging industry through reduced revenues, potential supply disruptions, and materials price increases. Conversely, the market for
sustainably-sourced packaging materials presents a growth opportunity for the industry.

Materials Sourcing

The production of containers and packaging requires large quantities of raw materials, including wood fiber, metals, glass, and plastics. Wood fiber is derived from forests, metals and glass precursors are sourced from mines, and plastics are created largely from petroleum products. Natural resource extraction activities can result in environmental externalities such as habitat loss and water and land pollution, as well as negative social impacts including labor abuses and adverse community impacts. The industry also faces supply chain challenges in the use of conflict minerals. Companies can face pressure from legislation, actions by non-governmental organizations (NGOs), input price risks, and leadership from peers to track and eliminate the use of minerals responsible for conflict in the DRC. To the extent that a manufacturer uses these minerals in its production processes, the company is required to provide disclosures around the origin of the minerals in accordance with the Conflict Minerals provision of the Dodd-Frank Act (see the Regulatory Trends section above). This requires an active monitoring of the supply chain. Additionally, the use of tin that may originate from zones of conflict also exposes companies to regulatory risks associated with the Dodd-Frank Act.

Due to increasing consumer concern surrounding these issues, containers and packaging manufacturers’ customers may not wish to purchase products from suppliers that may be associated with negative supply chain externalities. These associations could reduce demand for a company’s packaging products. Furthermore, supply disruptions due to environmental or social issues in the supply chain could increase materials purchasing costs for containers and packaging companies.

In order to mitigate these risks, containers and packaging companies are implementing responsible sourcing practices internally and through the use of third-party supplier certification. Certification has been most common for wood fiber—and to a lesser extent aluminum—substrates that have garnered particular attention for externalities surrounding their extraction. Common certification programs include the Programme for the Endorsement of Forest Certification (PEFC)\textsuperscript{188}, the Sustainable Forestry Initiative (SFI)\textsuperscript{189}, the Forest Stewardship Council (FSC)\textsuperscript{190}, and the Aluminum Stewardship Initiative.\textsuperscript{191} All of these programs aim to verify that materials, both virgin and recycled, are from suppliers that consider and manage social and environmental issues and externalities during raw material production. Such third-party certifications are becoming increasingly important, as customers seek greater chain-of-custody (CoC) certification of a product. In addition to supply chain risk management, the certification of the raw material supply presents
revenue and market share opportunities, as companies can meet growing demand for sustainably-sourced packaging products.

Supplier engagement and verification of materials sourcing and chain of custody thus presents risks and opportunities to container and packaging manufacturers. Company performance in this area can be analyzed in a cost-beneficial way internally and externally through the following direct or indirect performance metrics (see Appendix III for metrics with their full detail):

- Total wood fiber purchased, percentage from certified sources; and
- Total aluminum purchased, percentage from certified sources.

Evidence

Raw materials extraction can result in adverse environmental and social externalities, leading to financial impacts for the Containers & Packaging industry.

Nearly 30 percent of forests are used for the production of forest products. The area of the world covered by forests is shrinking by an average of 15,000 hectares per day, due to conversion to agricultural lands, logging, and climate change. According to the United Nations Food and Agriculture Organization (FAO), approximately 57 percent of global forests are naturally regenerated, 36 percent are primary growth, and 7 percent are planted forest. Primary forests are especially important for biodiversity; about 66 percent of terrestrial species originate from primary forests. Thus, logging of such forests threatens the existence of thousands of species, many of which are endangered.

The Programme for Endorsement of Forest Certification (PEFC), one of the largest forest certification programs in the world, estimates that forests contribute to the livelihoods of about 1.6 billion people worldwide, and that 60 million indigenous peoples are fully dependent upon forests, and a further 350 million people depend on forests for income and food. Thus, wood harvesting can directly affect the lives of millions of people, underscoring the importance of community inclusion and social issues in all aspects of operations.

Through chain of custody certification, companies in the paper packaging segment can mitigate the risk for reputational harm while addressing customer concerns over the environmental and social impacts of their supply chains and products. This can lead to an expansion of revenues for containers and packaging companies. For wood fiber-based paper products, CoC certification includes third-party certifications like the FSC, the SFI,

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1 Primary forests are forests of native tree species that have previously not been disturbed by human activity or have attained significant age without significant disturbance.
and the Programme for the Endorsement of Forest Certification (PEFC). In order to achieve CoC certification, every organization in a company’s supply chain must independently obtain third party verification. Certification programs typically set standards for the protection of biodiversity and ecosystems, worker’s rights, indigenous peoples’ rights, local employment, and legal logging practices.

Rising consumer demand for sustainably-sourced packaging is an important industry driver. A 2012-2013 survey conducted by TetraPak, a major European paper packaging company, on a sample of more than 7,000 consumers across 13 countries, found that consumer demand for sustainably sourced packaging is on the rise. In the survey, more than half of consumers trusted environmental logos, up from 37 percent from the year before, while 37 percent of consumers reported searching for environmental certification logos on packaging. One in five people recognized the FSC logo.

McDonald’s notes in its 2013 Responsibility & Sustainability report that it has a target of sourcing 100 percent of its consumer-facing paper fiber-based packaging from third-party certified or recycled sources by 2020. The company grew this share from 9.3 percent in 2012 to 13.9 percent in 2013. The company uses FSC, PEFC, or verified post-industrial or post-consumer recycled fiber as the acceptable standards for its internal target.

International Paper is a major supplier to McDonald’s; the company accounted for 1.25 percent of International Paper’s revenues in 2014. According to the American Forest and Paper Association, in 2012 the association’s members, which include top containers and packaging companies, procured 29 percent of their fiber from certified forestlands, while they sourced 95 percent of their fiber through certified fiber sourcing programs. All AF&P members that source wood and fiber must comply with sustainable procurement principles, which support reforestation, control of invasive plants and animals, conservation of critical habitats, control of illegal logging, worker safety issues, fair labor practices, and indigenous people’s rights, or obtain SFI certification. Companies in the paper containers and packaging segment have goals and practices in place for responsible sourcing of virgin and recycled fiber. By 2020, RockTenn, a founding member of the FSI, is committed to having all of its wholly owned facilities CoC certified by third parties. The company holds that maintaining healthy, productive, and sustainable forests is beneficial to the environment, communities, and the company’s business. In addition to using certified suppliers, the company also directly encourages forest landowners to practice sustainable forestry. TetraPak aims to achieve similar goals of sourcing 100 percent of its fiber from certified sources.

Aluminum and tin mining can have particularly significant adverse social and environmental
impacts, with possible effects on the Container & Packaging industry’s reputation or supplies. The majority of aluminum ore is mined in tropical regions, which are areas with high biodiversity and ecological sensitivity. Aluminum mining in such regions can result in ecological harm due to land clearing, hazardous waste generation, and air emissions. Furthermore, many of the aluminum mining regions are located in developing nations, where socioeconomic development may be less advanced, and legal protection of indigenous and community rights can be weaker. Extractive metals mining can adversely impact local peoples’ culture, self-determination, and health. Due to the potential for large environmental and social impacts from aluminum extraction, voluntary standards such as the Aluminum Stewardship Initiative (ASI) have arisen to promote responsible and transparent practices throughout the aluminum supply chain. The ASI, which is under development, applies to all aluminum value chain stages, from bauxite ore mining to recycling. In 2013, Ball Corporation joined the ASI in order to help drive adoption of the standard and foster sustainability within its supply chain.

In certain regions of the world, such as the DRC, the mining and sale of conflict minerals like tin provide funding for armed conflicts and thus may result in human rights abuses. Companies are exposed not only to regulatory risk associated with the Conflict Minerals rule of the Dodd-Frank Act, but also to input price volatility and reputational risks. Tin is of particular concern for the Containers & Packaging industry. It is used to manufacture coated steel plating, called tinplate, and metal alloys commonly used to manufacture containers and can seals. Approximately 40 percent of the world’s tin is used to make tinplate. The DRC accounts for 6 to 8 percent of global tin production, and prices have shown high volatility, sometimes related to conflicts there. In 2008, a 31 percent increase in tin prices coincided with a rebel offensive against the DRC’s primary tin-trading center.

Company SEC filings describe possible impacts from materials sourcing. Ball Corp. states in its FY2013 Form 10-K that “regulatory developments regarding the reporting and use of “conflict minerals” mined from the Democratic Republic of the Congo and adjoining countries could affect the sourcing and availability of minerals used in the manufacture of certain of our products…Also, because our supply chain is complex, we may face reputational challenges with our customers and other stakeholders….” Supply chain engagement can be a risk mitigation tool; in Ball Corp.’s FY2014 Sustainability Report, it states that, “…our supply chain sustainability efforts help us to…Create shared value and reduce risk for our business and relevant stakeholders, including customers, suppliers and shareholders…”
Value Impact

The environmental and social performance of suppliers can have a substantial impact on containers and packaging companies, impacting demand or products and sourcing costs, and creating operational and reputational risks.

Product certifications may be demanded by downstream customers to prove the responsible forestry or mining credentials of suppliers. Increasing demand for certified products could allow companies that obtain such certifications for their products to improve market share, charge a price premium, and increase revenues over the long term.

As regulation and public awareness of negative externalities from raw material production grow, the probability and likelihood of financial impacts are likely to rise in the medium term.

The percentage of wood fiber and aluminum from certified sources is a proxy for the environmental and social performance of suppliers, and the risk of supply disruption and reputational damage faced by containers and packaging companies. The metrics are also suggestive of competitive positioning to capture the growing market opportunity for certified products.
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66 The NAICS codes, and the related industries activities, applicable to the Containers & Packaging industry are as follows:

32619 Other plastics product manufacturing
32622 Rubber and plastics hoses and belting manufacturing
32629 Other rubber product manufacturing
3321 Forging and stamping
3323 Architectural and structural metals manufacturing
3325 Hardware manufacturing
3326 Spring and wire product manufacturing
3327 Machine shops; turned product; and screw, nut, and bolt manufacturing
3328 Coating, engraving, heat treating, and allied activities
3329 Other fabricated metal product manufacturing
333 Machining manufacturing
33612 Heavy duty truck manufacturing
336212 Truck trailer manufacturing
3365 Railroad rolling stock manufacturing
3366 Ship and boat building
3369 Other transportation equipment manufacturing


77 Ibid.


80 Author’s calculation based on data from the U.S. Department of Commerce Economics and Statistics Administration, “Pollution Abatement Costs and Expenditures: 2005, Current Industrial Reports,” Tables 5 and 7, 2005, accessed March 27, 2014, based on the following NAICS codes:

321920 Wood Container and Pallet Manufacturing
3222 Converted paper product Manufacturing
327213 Glass Container Manufacturing
332431 Metal Can Manufacturing
332439 Other Metal Container Manufacturing

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326111 Plastics Bag and Pouch Manufacturing
326112 Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326160 Plastics Bottle Manufacturing
331315 Aluminum Sheet, Plate, and Foil Manufacturing
3324 Boiler, Tank, & Shipping Container Manufacturing
32615 & 32614 Polystyrene, urethane, other foam packaging
83 International Paper, Co., FY14 Form 10-K for the period ending December 31, 2014 (filed February 27, 2015), p. 4-5.
85 “Glass Container Manufacturer Agrees to Install Pollution Controls and Pay $1.45 Million to Settle Clean Air Act Violations / Settlement to reduce emissions at facilities in Georgia, Oklahoma, Pennsylvania, and Texas,” United States Environmental Protection Agency.
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101 Author's calculation based on “Pollution Abatement Costs and Expenditures: 2005, Current Industrial Reports,” U.S. Department of Commerce Economics and Statistics Administration, 2005, accessed March 27, 2014, tables 5 & 7, using the following NAICS codes:

321920 Wood Container and Pallet Manufacturing
3222 Converted paper product Manufacturing
327213 Glass Container Manufacturing
322431 Metal Can Manufacturing
322439 Other Metal Container Manufacturing
326111 Plastics Bag and Pouch Manufacturing
326112 Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326160 Plastics Bottle Manufacturing
331315 Aluminum Sheet, Plate, and Foil Manufacturing
3324 Boiler, Tank, & Shipping Container Manufacturing
32615 & 32614 Polystyrene, urethane, other foam packaging


105 Stephen Hoopes, “IBISWorld Industry Report 32221: Cardboard Box & Container Manufacturing in the US.”


109 Ball Corporation, FY10 and FY11 Sustainability Report, p. 12.


115 Author’s calculation based on the “Pollution Abatement Costs and Expenditures: 2005, Current Industrial Reports,” U.S. Department of Commerce Economics and Statistics Administration, 2005, accessed March 27, 2014, tables 5 and 7. The following NAICS codes were used to calculate waste pollution abatement costs per the PACE report:

321920 Wood Container and Pallet Manufacturing
3222 Converted paper product Manufacturing
327213 Glass Container Manufacturing
332431 Metal Can Manufacturing
332439 Other Metal Container Manufacturing
326111 Plastics Bag and Pouch Manufacturing
326112 Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326160 Plastics Bottle Manufacturing
331315 Aluminum Sheet, Plate, and Foil Manufacturing
32615 & 32614 Polystyrene, urethane, other foam packaging


146 Ibid.

147 Ibid.


152 Ibid pg. 6.


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sehewardship.org/about-asi/asi-overview/.

206 Ball Corporation, FY2014 Sustainability Report, p. 10-12.


210 Ball Corporation, FY2013 Sustainability Report, p. 10.
APPENDIX I:
Five Representative Containers & Packaging Companies

<table>
<thead>
<tr>
<th>COMPANY NAME (TICKER SYMBOL)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>International Paper Co. (IP)</td>
<td></td>
</tr>
<tr>
<td>RockTenn (RKT)</td>
<td></td>
</tr>
<tr>
<td>Crown Holdings Inc. (CCK)</td>
<td></td>
</tr>
<tr>
<td>Sealed Air Corp. (SEE)</td>
<td></td>
</tr>
<tr>
<td>Owens-Illinois (OI)</td>
<td></td>
</tr>
</tbody>
</table>

This list includes five companies representative of the Containers & Packaging industry and its activities. This includes only companies for which the Containers & Packaging 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 20, 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</td>
</tr>
<tr>
<td>Greenhouse Gas Emissions</td>
<td>67*</td>
<td>871</td>
<td>1t</td>
</tr>
<tr>
<td>Air Quality</td>
<td>67*</td>
<td>782</td>
<td>6t</td>
</tr>
<tr>
<td>Energy Management</td>
<td>58*</td>
<td>871</td>
<td>1t</td>
</tr>
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<td>Water Management</td>
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<td>83</td>
<td>5</td>
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<tr>
<td>Waste Management</td>
<td>75*</td>
<td>782</td>
<td>6t</td>
</tr>
<tr>
<td>Product Safety</td>
<td>89*</td>
<td>91</td>
<td>4</td>
</tr>
<tr>
<td>Product Lifecycle Management</td>
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<td>2</td>
</tr>
<tr>
<td>Materials Sourcing</td>
<td>33</td>
<td>83</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 to likely 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. One 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.

1/ : During the IWG phase, the topic was called “Waste Management” and its scope included both recycling of hazardous and non-hazardous waste.

2/ : During the IWG phase, the topic was called “Air Emissions & Waste Management” and its scope included angles from both disclosure topics.
## APPENDIX IIB:
Evidence of Financial Impact for Sustainability Disclosure Topics

<table>
<thead>
<tr>
<th>Evidence of Financial Impact</th>
<th>REVENUE &amp; EXPENSES</th>
<th>ASSETS &amp; LIABILITIES</th>
<th>RISK PROFILE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue</td>
<td>Operating Expenses</td>
<td>Non-operating Expenses</td>
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<td>Market Share</td>
<td>New Markets</td>
<td>Pricing Power</td>
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<td>Greenhouse Gas Emissions</td>
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<td>Water Management</td>
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</tr>
<tr>
<td>Waste Management</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Product Safety</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Product Lifecycle Management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Materials Sourcing</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- **MEDIUM IMPACT**
- **HIGH IMPACT**
# APPENDIX III:
Sustainability Accounting Metrics | Containers & Packaging

<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>Greenhouse Gas Emissions</td>
<td>Gross global Scope 1 emissions, percentage covered under a regulatory program</td>
<td>Quantitative</td>
<td>Metric tons CO2e, Percentage (%)</td>
<td>RT0204-01</td>
</tr>
<tr>
<td></td>
<td>Description of long-term and short-term strategy or plan to manage Scope 1 emissions, including emission-reduction targets and an analysis of performance against those targets</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>RT0204-02</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Air emissions for the following pollutants: NOx (excluding N2O), SOx, particulate matter (PM), and volatile organic compounds (VOCs)</td>
<td>Quantitative</td>
<td>Metric tons (t)</td>
<td>RT0204-03</td>
</tr>
<tr>
<td>Energy Management</td>
<td>Total energy consumed, percentage grid electricity, percentage renewable</td>
<td>Quantitative</td>
<td>Gigajoules (GJ), Percentage (%)</td>
<td>RT0204-04</td>
</tr>
<tr>
<td>Water Management</td>
<td>Total water withdrawn, percentage in regions with High or Extremely High Baseline Water Stress, (2) percentage recycled water usage.</td>
<td>Quantitative</td>
<td>Cubic Meters (m3), Percentage (%)</td>
<td>RT0204-05</td>
</tr>
<tr>
<td></td>
<td>Number of incidents of non-compliance with water quality permits, standards, and regulations</td>
<td>Quantitative</td>
<td>Number</td>
<td>RT0204-06</td>
</tr>
<tr>
<td>Waste Management</td>
<td>Amount of total waste from manufacturing, percentage hazardous, percentage recycled</td>
<td>Quantitative</td>
<td>Metric tons (t), Percentage (%)</td>
<td>RT0204-07</td>
</tr>
<tr>
<td>Product Safety</td>
<td>Number of recalls and total units recalled*</td>
<td>Quantitative</td>
<td>Number</td>
<td>RT0204-08</td>
</tr>
<tr>
<td></td>
<td>Discussion of process to identify and manage emerging materials and chemicals of concern</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>RT0204-09</td>
</tr>
<tr>
<td>Product Lifecycle</td>
<td>Percentage of raw materials from (1) recycled content (2) renewable resources</td>
<td>Quantitative</td>
<td>Percentage (%) by weight</td>
<td>RT0204-10</td>
</tr>
<tr>
<td>Management</td>
<td>Revenue from products that are reusable, recyclable, and/or compostable</td>
<td>Quantitative</td>
<td>U.S. Dollars ($)</td>
<td>RT0204-11</td>
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<tr>
<td></td>
<td>Description of strategies to reduce the environmental impact of packaging throughout its lifecycle</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>RT0204-12</td>
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<tr>
<td>Materials Sourcing</td>
<td>Total wood fiber purchased, percentage from certified sources</td>
<td>Quantitative</td>
<td>Metric tons (t), Percentage (%) by weight</td>
<td>RT0204-13</td>
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<tr>
<td></td>
<td>Total aluminum purchased, percentage from certified sources</td>
<td>Quantitative</td>
<td>Metric tons (t), Percentage (%) by weight</td>
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</tbody>
</table>

*Note to RT0204-08—The registrant shall discuss notable recalls, such as those that affected a significant number of products, a significant number of units of one product, or those related to serious injury or fatality.
APPENDIX IV: Analysis of SEC Disclosures | CONTAINERS & PACKAGING

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

**TYPE OF DISCLOSURE ON SUSTAINABILITY TOPICS**

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<tr>
<th>Containers &amp; Packaging</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
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</tr>
</tbody>
</table>

IWG Feedback*

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

\(^1\) During the IWG phase, the topic was called “GHG Emissions & Energy Management” and its scope included angles from both disclosure topics.

\(^2\) During the IWG phase, the topic was called “Air Emissions & Waste Management” and its scope included angles from both disclosure topics.