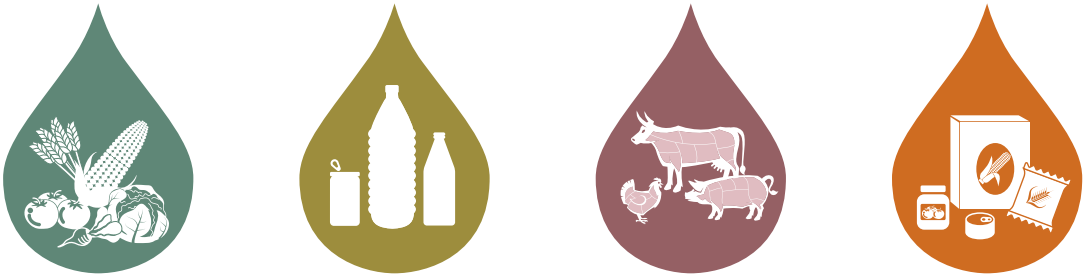
Ceres

Feeding Ourselves Thirsty:

How the Food Sector is Managing Global Water Risks

A Benchmarking Report for Investors



A Ceres Report

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About Ceres

Ceres is a nonprofit organization mobilizing business and investor leadership on climate change, water scarcity and other sustainability challenges. Ceres directs the Investor Network on Climate Risk (INCR), a network of over 100 institutional investors with collective assets totaling more than $13 trillion. For more information, visit www.ceres.org or follow Ceres on Twitter @CeresNews and @ValueEveryDrop.

The opinions expressed in this report are those of Ceres and do not necessarily reflect the views of reviewers.

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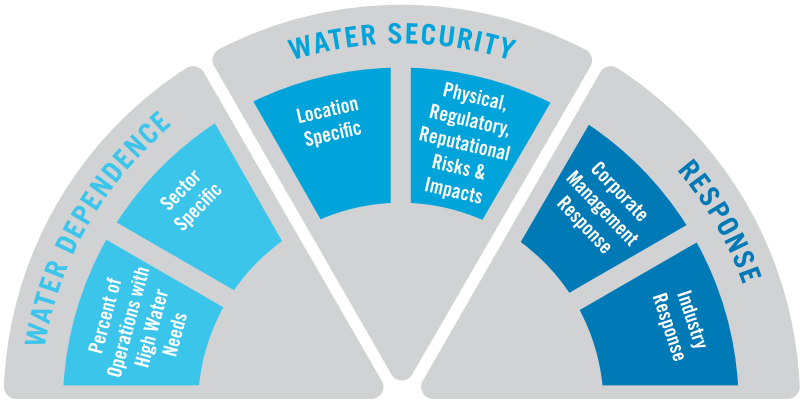
How to Use This Report

This report provides investors with guidance and relevant data for evaluating the water risk exposure of public equities in the packaged food, beverage, meat and agricultural products industries. This report is structured to guide investors through the key water risks facing these industries and features a unique dataset ranking 37 major food companies on the quality of their corporate water management.

Because the attributes of water are both industry- and location-specific, any risk analysis must take into account how much water a given company uses and pollutes, as well as the security of the local water resources on which a company relies. Given the significant amount of water use and pollution associated with agricultural production, supply chain water risk can be as financially material as water risks facing a food company's owned operations. Overall, corporate water risk exposure can be thought of as a function of three variables (**Exhibit 1**):

1. **Water dependence:** The relative amount of water needed for a company's direct operations or supply chain, as well as the volumes and intensity of associated wastewater that must be assimilated by a receiving body of water.
2. **Water security:** The degree to which conditions in specific operating or supply chain geographies—and related physical, regulatory and reputational risks—threaten the underlying security of a company's access to water and ability to discharge wastewater. Water security can be undermined by a company's own impacts, or by cumulative impacts from others within or across sectors. It can weaken a company's ability to operate profitably, especially when combined with high corporate water dependence.
3. **Strength of corporate management response:** Companies have a host of options available to mitigate water risks—ranging from operational water efficiency improvements to setting water efficiency expectations for suppliers to undertaking watershed-level actions that help support overall improvements in water resource sustainability.

Exhibit 1: Key Elements of Corporate Water Risk: Water Dependence, Water Security & Response



Corporate Water Risk Dashboard

Chapter Guide

Chapter 1, "Water Risks Facing the Food Sector," provides investors an overview of the relative water dependence of companies in the packaged food, beverage, meat and agricultural products industries. This chapter outlines the key risk drivers that threaten water security for the sector, and recommends a set of indicators that can be used to evaluate company risk exposure.

Chapter 2, "A Primer on Analyzing Agricultural Water Risk," lays out a framework for evaluating water risks specific to the agricultural supply chain. The framework takes into account crop-specific and region-specific water impacts and risks, the nature of a company's sourcing model, and relevant tactics for mitigating agricultural water risks, from corporate procurement policies down to specific farming practices.

Chapter 3, "Benchmark Results: Key Findings," provides data on the corporate water risk management performance of 37 companies in the packaged food, beverage, meat and agricultural products industries. The companies evaluated are largely public, U.S.-headquartered firms listed on the S&P 500 and Russell 1000 indices.

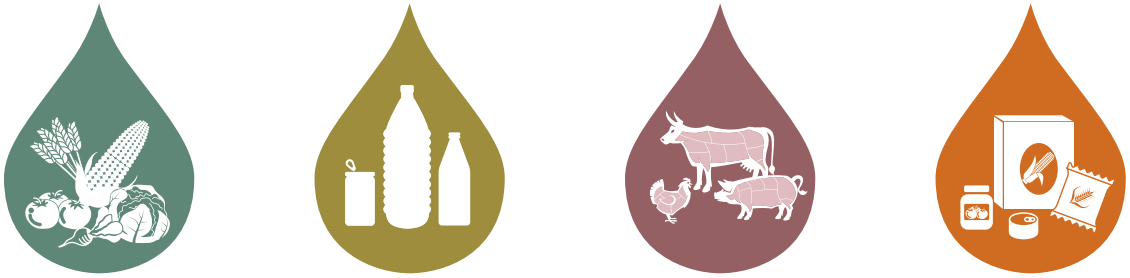
Chapter 4, "Benchmark Results: Findings by Water Management Category," provides a more in-depth discussion of the benchmarking results within each water management category and includes examples of leading corporate practices.

Chapter 5, "Recommendations for Companies and Investors," provides investors and food sector companies with recommendations for improving water risk analysis and management.

Appendix A details the company benchmarking methodology and **Appendix B** provides company-specific scores for each indicator evaluated. Appendix B is also available online as a downloadable spreadsheet at: www.ceres.org/foodwaterrisk.

Appendix C provides data on the relative water risks of the top agricultural commodities purchased by companies in this report and **Appendix D** provides a list of third-party databases and resources relevant to water issues in the food sector.

For further guidance on corporate water risk analysis, see Ceres' *Investor Handbook for Water Risk Integration*, available at www.ceres.org/investorwaterhandbook



Executive Summary

The global food sector faces extraordinary risks from the twin challenges of water scarcity and water pollution. Growing competition for water, combined with weak regulations, failing infrastructure, pollution and climate change impacts threaten the sector's water security and contribute to a water availability emergency that was recently ranked the world's "top global risk" by the World Economic Forum.[1]

This report examines how water risks affect the profitability and competitive positioning of 37 major food sector companies in four industries: packaged food, beverage, meat and agricultural products. It evaluates and ranks these companies—the majority of which are U.S. domiciled and publicly-traded—on how well they are positioned to anticipate and mitigate these risks, as well as contribute to improved water resource management.

The report provides recommendations for how analysts and investors can effectively evaluate food sector companies on their water risk exposure and management practices. It also provides recommendations for how food companies can improve water efficiency and water quality across their operations and supply chains to reduce risks and protect water resources.

Water Risks Facing the Food Sector

From farm to factory, producing food is the most water-intensive business on earth. Abundant clean water is essential to food processing—as an ingredient, for cleaning and moving raw materials, and as the principal agent used in sanitizing plant machinery. However, the vast majority of the food sector's water use and water pollution footprint is associated with the agricultural supply chain. Seventy percent of the world's freshwater is used to irrigate crops and raise animals. Currently, one-third of total food production is in areas of high or extremely high water stress, or competition.[2] The run-off of fertilizers from farm fields is one of the most common causes of water pollution worldwide, causing dead zones, harming fisheries, affecting human health and raising water treatment costs.

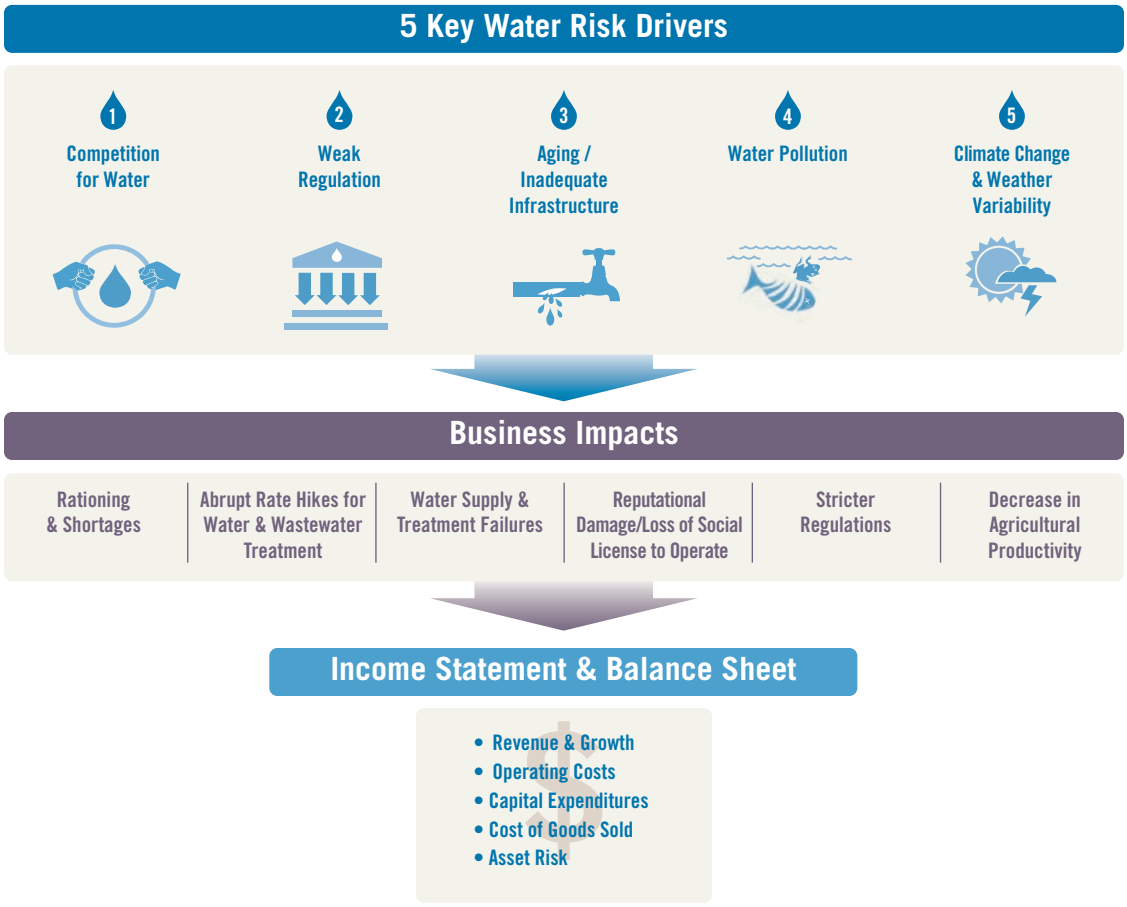
This report identifies five important water risk drivers that affect the water security of the food sector: 1) growing competition for water, 2) weak regulation, 3) aging and inadequate water infrastructure, 4) water pollution and 5) climate change. These water risks are already affecting corporate income statements and balance sheets due to: disrupted operations and limits on growth driven by water shortages and loss of social license to operate; increased operating costs due to abrupt water rate hikes and stricter regulations; and reduced margins due to higher commodity costs linked to decreases in agricultural productivity (**Exhibit ES.1**).

Many food sector companies are acknowledging these risks: 82 percent of food sector respondents to the CDP's 2014 water information request indicate that water risks could have a substantive impact on business operations and 90 percent of the 31 publicly-traded U.S. companies evaluated in this report cite water as a material risk in their 10-K financial filings.

Recent examples of financial impacts include:

- **Cargill** reported a 12 percent drop in 2014 fourth-quarter profits as a four-year drought in the U.S. Southwest damaged pastures used to raise beef.[3]
- **The Campbell Soup Company** saw a 28 percent drop in its California-based carrot division profits in early 2015 due in part to drought followed by intense rains.[4]
- **The Coca-Cola Company** decided not to move forward on the development of an $81 million bottling plant in southern India in April 2015 due to resistance from local farmers who cited concerns about strains on local groundwater supplies.[5]
- **GrainCorp**, Australia's largest agribusiness, reported a 64 percent drop in 2014 profits due to a prolonged drought that cut grain deliveries by 23 percent and nearly halved grain exports.[6]
- **J.M. Smucker** introduced an eight percent price increase on Folger's K-Cup coffee packs in early 2015 to offset the worst drought in Brazil in decades.[7]
- **Unilever** estimated that natural disasters linked to a changing climate—in particular, food price increases, water scarcity and reduced productivity in many parts of the agricultural supply chain—cost the company around $400 million annually.[8]

Exhibit ES.1: Business & Financial Impacts of Key Water Risk Drivers



Benchmark Results

The report analyzes food sector companies against actions taken in four categories of water risk management, using indicators and scoring drawn largely from the *Ceres Aqua Gauge*:[9] 1) overall corporate governance and management of water risk; and actions to reduce water risks and impacts in their 2) direct operations, 3) manufacturing supply chain, and 4) agricultural supply chain. Companies were scored on a 0-100 point scale, using publicly available information from company financial statements, corporate sustainability reports and 2014 CDP water survey responses.

Exhibit ES.2: Water Risk Management Scores by Company

Agricultural Products	
Bunge (BG)	29
Chiquita Brands (Private)	20
Cargill (Private)	17
Archer-Daniels-Midland Co (ADM)	10
Fresh Del Monte (FDP)	7
Ingredion (INGR)	5

Beverage	
The Coca-Cola Company (KO)	67
Molson Coors Brewing Company (TAP)	44
Brown-Forman Corporation (BF/B)	29
Constellation Brands (STZ)	24
Dr Pepper Snapple Group (DPS)	15
Monster Beverage (MNST)	1

Meat	
Smithfield Foods (SFD)	33
JBS (JBSS3)	12
Hormel Foods Corp. (HRL)	11
Perdue Farms Inc. (Private)	9
Tyson Foods (TSN)	8
Pilgrim's Pride (PPC)	3

Packaged Food	
Unilever (UN)	70
Nestlé (NSRGY)	64
General Mills (GIS)	57
PepsiCo Inc. (PEP)	55
Kellogg Co. (K)	54
Campbell Soup (CPB)	45
Mondelēz International (MDLZ)	43
ConAgra Foods Inc. (CAG)	31
Keurig Green Mountain (GMCR)	31
J.M. Smucker (SJM)	27
Hershey (HSY)	26
Mead Johnson (MJN)	23
McCormick & Co. (MKC)	14
Dean Foods (DF)	13
WhiteWave Foods (WWAV)	11
Hain Celestial (HAIN)	8
Kraft Foods Group (KRFT)	6
Flowers Foods (FLO)	5
Pinnacle Foods (PF)	1

Companies scored on a 0-100 point basis.

Overall Performance

While a small number of companies are taking wide-ranging actions to manage water risks across their operations and supply chains, most have a long way to go (Exhibit ES.2). Top performers by industry were **Unilever** (Packaged Food: 70 points), **The Coca-Cola Company** (Beverage: 67), **Bunge** (Agricultural Products: 29) and **Smithfield Foods** (Meat: 33).

Companies in the packaged food and beverage industries had the highest overall scores, with median scores of 27 and 26.5 points, respectively. Agricultural products and meat companies had median scores of 13.5 and 10.5, respectively.

Corporate Governance & Management

Although water risk was identified as a corporate governance priority by many of the companies, board oversight of water did not consistently translate into strong absolute performance. Of the 16 companies with board oversight of water risk, most performed relatively poorly, with more than

60 percent receiving fewer than 35 total points. In addition, for nearly half (19) of the companies evaluated, management-level oversight for water was relegated to executives at least two levels below the CEO. Most CEOs are not directly incentivized to address water risk: **Campbell Soup, Dean Foods, Molson Coors** and **Unilever** are the only companies that offer explicit financial incentives to the CEO and executive officers for water-related performance.

Only 30 percent (11) of companies indicated that water risks were considered as part of major business planning activities and investment decision-making. Although water is notoriously underpriced in most markets, **Nestlé** and **Unilever** are the only companies in this assessment that disclose using a "true cost" or shadow price for water to analyze the return on investment of water-efficiency investments.

Direct Operations

A majority of companies (23) have begun to evaluate water risks in their direct operations, but two-thirds (22) are still not evaluating water issues in their agricultural supply chains. Basic water accounting data on direct operations performance is common, with 70 percent (26) of companies disclosing basic data on water use. In addition, 70 percent (26) have targets to reduce water use in their direct operations, although the aggressiveness of these targets varies.

Water quality issues get less priority. Most companies assessed do not disclose the percentage of their facilities that are in compliance with local wastewater discharge regulations. Only two companies—**Coca-Cola** and **Nestlé**—reported goals to reduce wastewater discharges and improve water quality beyond compliance requirements.

Most companies are limiting their investments in water risk mitigation to improving facility-level water use efficiencies. Because many water risks stem from the impacts of other water users and poor regulations, such a narrow operational focus may overlook lower-cost, higher impact opportunities to help address critical watershed-level challenges. Only four companies—**Coca-Cola, General Mills, Molson Coors** and **PepsiCo**—have developed collaborative watershed protection plans that are linked to regions of high water risk.

Manufacturing Supply Chains

Nearly one-quarter of companies (9) ask their manufacturing suppliers to report on water use, wastewater discharge and management practices. **General Mills** and **Campbell Soup** ask suppliers to complete supplier scorecards that include water use sections. Only five companies require their manufacturing suppliers to establish their own water management programs.

Agricultural Supply Chains

Only six companies have sustainable agriculture policies that address water, with **PepsiCo's** and **Unilever's** being the most robust. Unilever has an Agricultural Code of Conduct that includes an entire section focused on water use and pollution and defines practices with which agricultural producers are expected to comply.

Despite the lack of policies, 41 percent (15) of companies have set time-bound goals to source agricultural commodities more sustainably. For many companies, these commitments were limited to just one or two commodities. **Coca-Cola, General Mills, Kellogg,** and **Unilever** have all set time-bound goals to source the majority of their agricultural inputs from farmers using sustainable water management practices.

Forty-three percent (16) of companies gather data from agricultural producers on the water impacts of their farming practices. For most companies, the data collected is often from a very narrow subset of their overall production base, and in many cases it is unclear how this data is being used to inform sourcing decisions or to help farmers improve their practices.

Recommendations for Companies & Investors

Company Recommendations

1. **Increase board oversight and understanding of material water risks.** Corporate board members have a fiduciary duty for risk management oversight. While 43 percent (19) of the companies evaluated in this report have board committees charged with environmental oversight, this oversight did not consistently translate into strong water management performance. Board charters should be strengthened to explicitly mention water. Additionally, board members should be regularly briefed by management on water-related risks, and provided with opportunities to engage with external water experts.
2. **Conduct robust water risk analysis.** Many of the companies assessed in this report have relatively weak systems—if any at all—for collecting and interpreting data on the severity of their exposure to water risks. Companies should accelerate risk assessments, including analysis of their manufacturing and agricultural supply chains. When conducting water risk analysis, companies should bear in mind the various kinds of water risks to which they may be exposed (e.g. physical scarcity risks and quality risks, regulatory risks, social license to operate risks), use forward-looking models or scenarios to identify the likelihood and severity of future risks, and use robust datasets to support this analysis (see **Appendix D**).
3. **Address watershed-level risks.** Most food sector companies are limiting their investments in water risk mitigation to improving facility- or field-level water use efficiencies and meeting regulatory compliance standards. While these efforts are critically important, even achieving best-in-class water use efficiency may not be sufficient to mitigate the physical, regulatory or reputational risks resulting from the broader mismanagement of local water resources. A narrow operational focus may also overlook lower-cost, higher-return opportunities to work collaboratively to reduce risks through activities that protect and restore watersheds. Companies should develop water risk mitigation plans that incorporate targeted investments to improve the conditions of the most at-risk watersheds on which their facilities and supply chains depend. Companies should also consider opportunities to align public policy positions and lobbying activities in ways that encourage government officials to implement more sustainable water management policies.
4. **Tackle water risks and impacts in agricultural supply chains.** As water supplies are increasingly depleted and polluted in major agricultural regions across the world, traditional risk management approaches such as hedging and geographic diversification are becoming less effective. Companies can achieve more by engaging directly with their supply chain to strengthen farmer practices and protect watersheds. Key strategies include setting sustainable agriculture policies and time-bound sourcing goals, purchasing certified sustainable commodities where relevant, and collecting data from farmers on their practices while providing assistance and incentives for improvement.
5. **Improve disclosure.** Companies need to disclose to investors their exposure to water risk, as well as strategies and progress made in mitigating such risks. As much as possible, data should be reported at the facility or regional level. Companies publicly-listed in the United States are required by the Securities and Exchange Commission (SEC) to disclose to shareholders financially material risks related to climate change and water in their operations and supply chains.[10] Additionally, investors expect companies to provide more detailed disclosure of risks and mitigation strategies through their corporate sustainability reports and in responses to CDP's annual water information request.

Investor Recommendations

1. **Analyze corporate water risk in terms of water dependence, security and response.** When evaluating a company's overall risk, use the information and data resources suggested in this report to capture corporate water dependence (the amount of water needed for a company's direct operations and supply chain, as well as the volumes and intensity of associated wastewater that must be assimilated by a receiving water body); the security of the water resources they rely on; and the quality of management response to those risks.

2. **Go beyond direct operations to consider supply chain water risks.** While most companies in the food sector are not directly involved in agricultural production, many are significantly exposed to agricultural water risks through their suppliers. When analyzing water risks embedded in agricultural supply chains, consider that risk exposure is shaped by several factors, including the primary agricultural commodities the company buys, the level of water dependence and security associated with those commodities, as well as the sourcing model used by the company to procure agricultural inputs.
3. **Engage underperforming companies.** Investors should engage portfolio companies on how they manage water risks. As a result of poor disclosure by many companies in the sector, investors need to engage directly with corporate management to gather relevant information and encourage future disclosure. In addition to direct engagement, consider leveraging existing collaborative investor efforts that engage companies on water, such as Ceres' Investor Network, the United Nations-supported Principles for Responsible Investment's (UNPRI) "Water Risks in Agricultural Supply Chains" group, and the Interfaith Center for Corporate Responsibility's (ICCR) Water & Food group.[11]
4. **Integrate information from water risk analysis and corporate engagement into buy/sell decisions and beyond.** Taking into account unique investor objectives, possible approaches include embedding water analysis into overall environmental, social and governance scores; altering the size of the investment universe to either avoid high water risk industries or companies, or include companies with a strong management response; and embedding water risk analysis in scenario analysis in financial models. Investors can conduct portfolio-level analysis of exposure to high water risk regions, companies or agricultural activities. It is also beneficial to analyze cross-asset class exposure, from equities and fixed income to commodities and farmland funds. For other approaches and more details, see Ceres' *Investor Handbook for Water Risk Integration*.[12]
5. **Support efforts to increase and standardize food sector reporting on water.** While some food sector companies had robust disclosure, most did not, with some companies failing to report basic information on their water use and only 43 percent providing data to CDP's 2014 water information request. Investors should encourage company reporting to CDP, and also support improvements to the survey to ensure that more comparable, industry-relevant data is requested from food sector companies. Investors may also wish to engage the Sustainability Accounting Standards Board (SASB) on food sector water metrics.[13]

CHAPTER 1

Water Risks Facing the Food Sector

Chapter Overview

- The global food sector faces extraordinary risks from the twin challenges of water scarcity and water pollution. Water is crucial to the sector as a direct ingredient in food and beverage processing, and more significantly, as an input to agricultural commodity production.
- Growing competition for water, alongside weak regulation, failing infrastructure, pollution and climate change impacts threaten the sector's water security. Near-term business impacts include: disruption to operations and supply chains, increased capital expenditures and operating costs, and constraints on revenue growth.
- The food sector is beginning to recognize these risks. Eighty-two percent of food sector respondents to the 2014 CDP water information request indicate that water risks could have a substantive impact on business operations. Of the 31 publicly-traded U.S. companies evaluated in this report, 90 percent cite water as a risk in their 10-K filings.
- Investors will need to elevate their attention to the materiality of food sector exposure to water issues, integrating individual company's water dependence, security and water management response into company risk analysis and valuation.

Water & the Food Sector

Clean water is already in short supply. The amount of water on the planet is for all practical purposes fixed. Only 2.5 percent of the world's water is freshwater. With 68 percent of that total locked up in glaciers, humans rely on the remaining 30 percent found in surface and groundwater.[1] However, much of this freshwater is polluted and water quality is deteriorating in many parts of the world.[2]

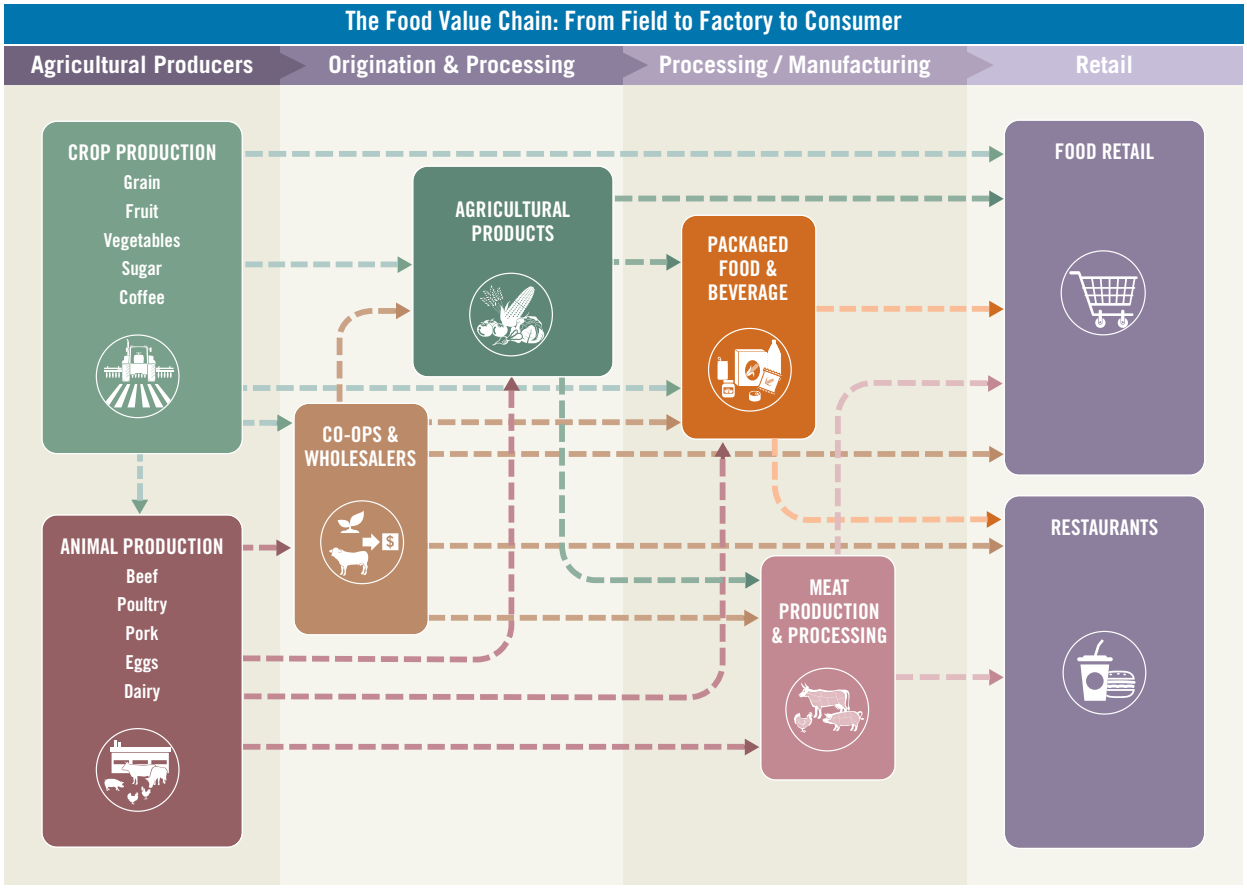
Constrained water supplies face growing demand. The trends of population growth, urban migration, rising incomes and climate change are slated to lead to a 50 percent increase in water withdrawals in developing countries and an 18 percent increase in developed countries by 2025.[3] By that time, two-thirds of the world's population will be living in areas of high water competition or "water stress,"[5] and subject to periodic shortages of water.[4] Meanwhile, at least 20 percent of the water used to irrigate crops (equivalent to roughly eight percent of total global food production) is non-renewable, coming from groundwater basins that are being rapidly depleted.[6]

The Food Sector: Industries Analyzed

This report analyzes the water risk exposure and management response of four industries within the food sector: agricultural products, beverage, meat and packaged food. These industries vary in their levels of vertical integration, operational water intensity, water risk exposure and in the adequacy of their responses to these risks.

Industry	Description	Companies Analyzed	Average Operational Water Intensity (gal./$1 revenue)*	Median Water Risk Management Score (0-100)
Agricultural Products	Companies that produce and process foods, but do not package and market them, as well as companies that grow crops or are owners of plantations (includes constituents of GICS 302020, Food Products, Agricultural Products). These companies are typically suppliers to the industries listed below.	· Archer-Daniels-Midland Co (ADM) · Bunge (BG) · Cargill · Chiquita Brands · Fresh Del Monte (FDP) · Ingredion (INGR)	0.28	13.5
Beverage	Producers of non-alcoholic beverages, beer and malt beverages, and wine and distilled beverages (includes constituents of GICS 302010, Beverages).	· Brown-Forman Corporation (BF/B) · Coca-Cola Company (KO) · Constellation Brands (STZ) · Dr Pepper Snapple Group, Inc. (DPS) · Molson Coors Brewing Company (TAP) · Monster Beverage (MNST)	1.56	26.5
Meat	Companies that raise and process livestock or poultry (includes constituents of GICS 302020, Food Products, Packaged Foods & Meats).	· Hormel Foods Corp. (HRL) · JBS (JBSS3) · Perdue Farms Inc. · Pilgrim's Pride (PPC) · Smithfield Foods (SFD) · Tyson Foods (TSN)	0.72	10
Packaged Food	Producers of packaged foods including sweet and salty snacks, dairy products, cereal, bread products, soups, frozen entrees, etc. (includes constituents of GICS 302020, Food Products, Packaged Foods & Meats).	· Campbell Soup (CPB) · ConAgra Foods Inc. (CAG) · Dean Foods (DF) · Flowers Foods (FLO) · General Mills (GIS) · Hain Celestial (HAIN) · Hershey (HSY) · Kellogg Co. (K) · Keurig Green Mountain (GMCR) · Kraft Foods Group (KRFT) · McCormick & Co. (MKC) · Mead Johnson (MJN) · Mondelēz International (MDLZ) · Nestlé (NSRGY) · PepsiCo Inc. (PEP) · Pinnacle Foods (PF) · J.M. Smucker (SJM) · Unilever (UN) · WhiteWave Foods (WWAV)	0.36	27

*Average annual water withdrawal intensities (gallons/ $1 revenue) based on self-reported information by companies analyzed in this report.



This simplified value chain traces the flow of agricultural ingredients from the farm field to intermediaries such as co-operatives and wholesalers, then onto agricultural products and meat companies, which in turn supply packaged food and beverage companies, and eventually downstream food retailers and restaurants.

The food sector is a heavy user and polluter of water. From the field to the factory, producing food is the most water-intensive business on earth. The majority of the food sector's water use and water pollution footprint is associated with the agricultural supply chain. Irrigating crops and raising animals consumes roughly 70 percent of the world's freshwater.[7] For instance, beef uses more water than anything else humans eat. Raising a kilogram of beef requires 15,415 liters of water (primarily to grow the feed for the animals). A kilo of pasta requires 1,850 liters of water, most of it for growing the wheat.[8] In addition, many agricultural practices contribute to water pollution. In China, a 2010 government study found that the manure and chemical fertilizer run-off from farms causes more pollution nationwide than industry.[9, 10]

Abundant clean water is also essential to food processing—as an ingredient, an initial and intermediate cleaning source, an efficient conveyor of raw materials, and the principal agent used in sanitizing plant machinery (**Exhibit 1.1**). Some food processing activities, particularly in the meat sector, are also associated with high levels of contaminated wastewater discharge that must be treated before being returned to the water supply.

Exhibit 1.1: Water Dependence: Key Water Use & Pollution Issues in the Food Sector

Food Sector Supply Chain	Direct Operations			
Agricultural Producers (Farmers, ranchers, dairies, etc.)	**Agricultural Products Industry**	**Beverage Industry**	**Meat Processors Industry**	**Packaged Food Industry**
USES OF FRESH WATER				
• Crop irrigation • Drinking & cooling water for livestock • Cleaning & disinfecting • Air conditioning of livestock facilities	• Product washing & moving • Cooling water • Boiler water • Air conditioning	• Freshwater as an ingredient • Product washing & moving • Cooling water • Boiler water • Cleaning & disinfecting • Air conditioning	• Drinking & cooling water for livestock • Cleaning & disinfection • Boiler water • Cleaning processing equipment • Air conditioning	• Freshwater as an ingredient • Product washing & moving • Cooling water • Boiler water • Cleaning & disinfection • Air conditioning
POTENTIAL SOURCES OF WASTEWATER / POLLUTION				
• Run-off of water from farm fields that is polluted with fertilizer, pesticides & herbicides • Animal manure management/lagoons • Pathogenic organisms from livestock spread diseases	• Run-off of water from farm fields that is polluted with fertilizer, pesticides & herbicides • Wastewater from processing is high in suspended solids, organic sugars, starches & residual pesticides	• Fermentation processes produce wastewater that is high in biochemical oxygen demand	• Animal manure, which can sometimes contain antibiotics and arsenic • Blood by-products which are high in biochemical oxygen demand (an indicator of the level of organic matter in wastewater) • Wastewater discharge containing high levels of nitrogen & phosphorus • Pathogenic organisms in wastewater • Chlorine residue from disinfecting pathogenic organisms	• Biochemical oxygen demand (an indicator of the level of organic matter in wastewater), total suspended solids, residual chlorine & pesticides

Source: United National Industrial Development Organization (UNIDO), *Pollution from food processing factories and environmental protection,* http://www.unido.org/fileadmin/import/32129_25PollutionfromFoodProcessing.7.pdf

The majority of the food sector's water use and water pollution footprint is associated with the activities of the agricultural supply chain—namely irrigation and agricultural run-off. Companies in some industries—such as agricultural products and meat—tend to be more vertically integrated with ownership of agricultural production activities, in addition to food processing. Regardless, all industries in the food sector also have significant water requirements for both their processing activities, as well as associated wastewater discharge.

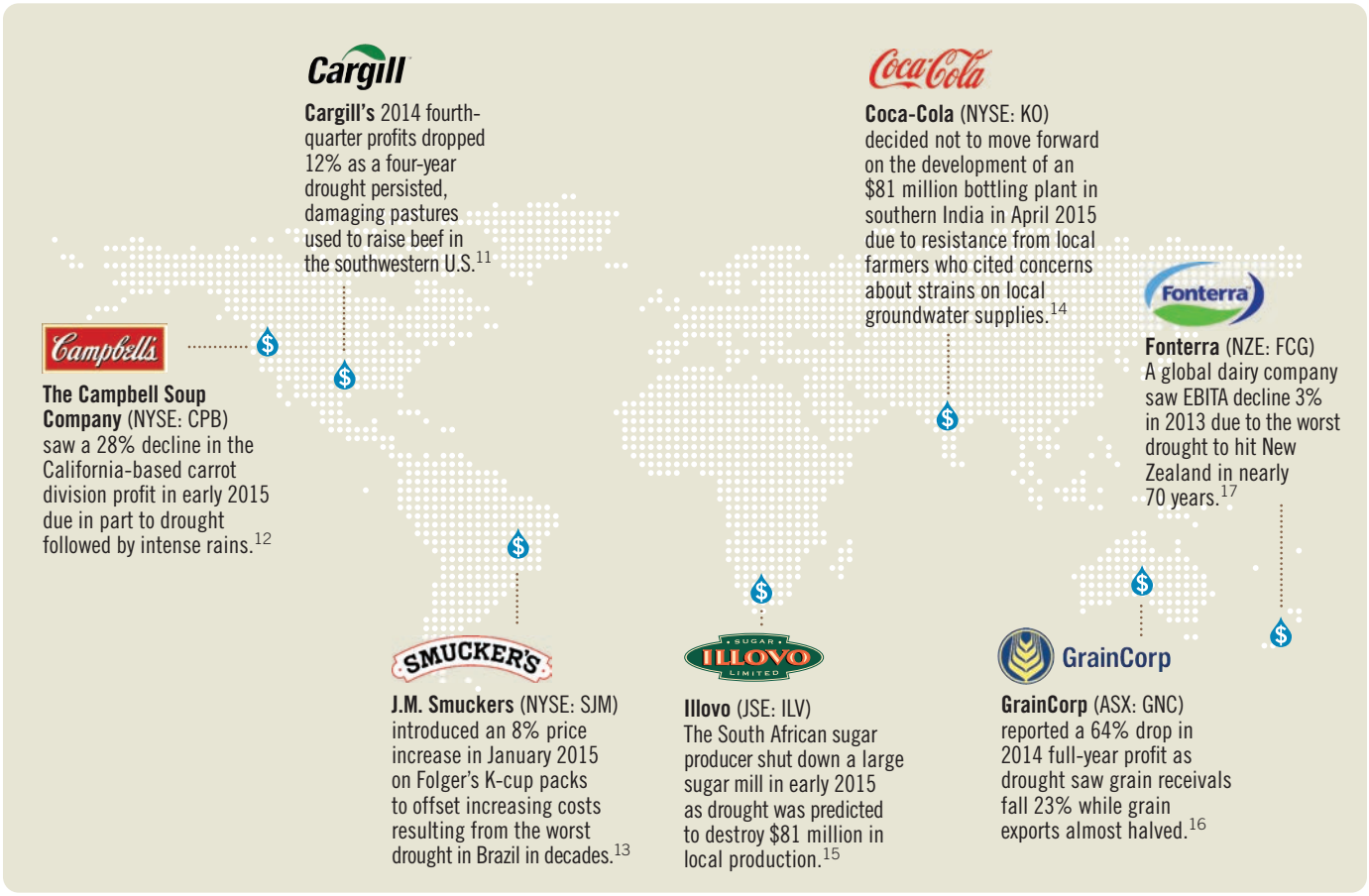
Water Security: 5 Key Risk Drivers

Ceres has identified five water risk drivers that affect the water security of the food sector and have increasingly material impacts on company performance (**Exhibit 1.2**). These drivers are already negatively impacting the earnings of food sector companies across the globe (**Exhibit 1.3**).

Exhibit 1.2: Top 5 Water Risk Drivers for the Food Sector

Risk Driver	Potential Business Impact
1 Competition for Water	• Rationing & abrupt water rate hikes • Increased conflict with other water users/loss of social license to operate
2 Weak Regulation	• Shortages, rationing or reallocation of permits • Abrupt rate hikes for water and wastewater treatment
3 Aging / Inadequate Infrastructure	• Water supply and treatment failures • Harm to community relations/reputational damage • Loss of ecosystem services
4 Water Pollution	• Higher water treatment costs • Stricter regulation
5 Climate Change & Weather Variability	• Decreased agricultural productivity • Shifting agricultural production zones & stranded assets • Exacerbates all other risk drivers

Exhibit 1.3: Financial Impacts on Companies



1. COMPETITION FOR WATER

Competition for water within and between different sectors is on the rise in many regions of the globe. As the world's population increases by nearly three billion by 2050[18] and more people eat resource-intensive foods such as meat, food production could rise by 70 percent, pushing up agricultural water consumption by 20 percent.[19, 20] Agricultural water users are already coming into more frequent conflict with urban water demands, as is well illustrated by the current debate about the legitimacy of agricultural versus urban water needs in drought-stricken California.[21]

Business Impacts:

→ **Rationing and abrupt rate hikes.** Increased competition puts a premium on supply, leading in some cases to rationing or reduced allocations—or steep water rate increases. In areas of Mexico, water demand is far outstripping groundwater supplies, leading to significant price hikes for industrial users as well as new usage limits.[22] In 2013, water price increases in Mexico were as high as 300 percent and new regulations and fees for allotted water volumes at food manufacturing plants, including those of **Kellogg**, led to higher operating costs.[23] In Kenya, alcoholic beverage-maker **Diageo** anticipates its operations will face growth restrictions in the next five years as a growing population outpaces water supplies.[24]

Relevant Financial Indicators

Increased operating costs due to higher water rates or costs of acquiring alternative water sources

Revenues and projected revenues affected due to production interruptions or constraints on growth

Higher cost of goods sold due to water constraints on agricultural production

→ **Increased conflict with other water users & loss of social license to operate.** Water shortages amplify reputational issues for companies who are seen as competing with local communities for access to water supplies. This can lead to the loss of a company's social license to operate, business disruption and brand damage. **The Coca-Cola Company** decided not to move forward on the development of an $81 million bottling plant in southern India in April 2015 due to resistance from local farmers who cited concerns about strains on local groundwater supplies.[25] Even in water-rich regions, companies perceived as using water unfairly may be exposed to reputational risk or loss of community support.[26]

Relevant Financial Indicators

Revenues or projected revenues affected due to production interruptions or constraints on growth

2. WEAK REGULATION

Many local and national governments and ministries lack the policy frameworks, institutional capacity and political will to manage competing water demands, maintain acceptable water quality and enforce permits. Most governments around the world have historically chosen to charge less than the full cost for water service for a variety of reasons, typically leading to inefficient water use by both urban and agricultural users, despite scarcity. In many regions, water permits are free, and sometimes—particularly in the case of groundwater use—completely unregulated. In many markets, governments also tend to administer water sector activities separately, leaving urban, agricultural and industrial water use poorly measured and coordinated.

Business impacts:

➔ **Shortages, rationing or reallocation of water permits.** Inappropriate water permit allocation and a lack of effective pricing, water markets, or incentives to moderate demand increase the likelihood of shortages. In India, the world's biggest user of groundwater in the world, the water table is falling precipitously in many areas because of a lack of regulation of well-drilling and the adoption of motorized pumps, which run on subsidized energy and number 27 million, up from tens of thousands in the 1960s.[27, 28] **Nestlé** reports that in 2013 the company temporarily reduced water consumption or halted operations at facilities in both India and Ghana due to shortages.

Relevant financial indicators

Revenues and projected revenues affected due to production interruptions or constraints on growth

Higher operating costs if alternative water sources must be found

Higher cost of goods sold due to water constraints on agricultural production

➔ **Abrupt rate hikes for water and wastewater treatment.** Delays in introducing effective water pricing or water allocation management systems increase the likelihood of steep or abrupt water and wastewater rates hikes for industry, especially when drought or shortages increase political pressure on regulators to take action. In many regions, there is a negative correlation between the cost of water and its relative scarcity (**Exhibit 1.4**). If introduced quickly, water rate hikes have the potential to significantly affect the market capitalization of companies. A recent analysis showed that an increase in industrial water rates across Brazil to a level equivalent to the highest rates already charged in some regions of the country could decrease the market cap of the Brazilian packaged food sector by more than five percent.[29]

The rate of water price increases is accelerating in many parts of the world. Between 2011 and 2014, water and wastewater prices in the BRIC countries jumped 22 percent and 25.9 percent, respectively, while U.S. water and wastewater prices grew by 17.6 percent and 20.6 percent, respectively.[30] China is expected in the next three years to increase water tariffs by 30 percent nationally.[31]

Relevant financial indicators

Higher operating costs due to increased water rates

Increased capital expenditures in technologies that reduce water and wastewater intensity of operations

Exhibit 1.4: Global Water Prices Relative to Water Stress ($/m³)

Sources: 2014 GWI Water Tariff Survey, Global Water Intelligence, http://www.globalwaterintel.com/tariff-survey/
& 2013 Aqueduct Data, World Resources Institute, http://www.wri.org/resources/data-sets/aqueduct-country-and-river-basin-rankings

In many countries facing high water stress, water prices are subsidized and fail to reflect the scarcity value of water.

3. AGING OR INADEQUATE INFRASTRUCTURE & ACCESS TO DRINKING WATER

Developed and developing countries share a common problem of water infrastructure systems being substantially under-funded. In developed countries, massive investment is needed to repair deteriorating, aging systems. A 2012 study by the American Water Works Association (AWWA) estimates that the U.S. needs to spend $1 trillion over the next 25 years on the most urgent investments.[32] The developing world, even within BRIC countries, is marked by a lack of consistent access to potable water and sanitation for millions of households.

Business Impacts:

→ **Risk of water supply and treatment failures.** Lack of reinvestment in aging infrastructure by water and wastewater utilities increases the risk of failures (water mains breaking, treatment failures) that could impact business or bring production to a halt. As a result, companies may have to invest more in their own supplies and treatment to ensure supply reliability and quality. In the U.S., where most systems are over 50 years old, 240,000 water mains break annually.[33] Mexico currently treats only 48 percent of its municipal wastewater.[34] Faced with declining water quality from municipal sources, **Nestlé** installed sophisticated technology in its Lagos de Moreno, Mexico ice cream plant that extracts excess water from incoming milk, and then recycles it, dramatically cutting water use.[35, 36]

Relevant financial indicators

Revenues and projected revenues affected due to production interruptions or inability to expand existing operations

Increased capital expenditures in water storage, wastewater treatment and recycling technologies

→ **Harm to corporate-community relations.** Inadequate delivery of water and sanitation by government to local communities enhances perceptions of inequity of access and harms corporate-community relationships, potentially restricting a company's ability to operate or grow. This is becoming a bigger issue as access to water becomes more widely recognized as a human right.[37]

Relevant financial indicators

Revenues and projected revenues affected due to production interruptions or constraints on growth

→ **Loss of ecosystems services.** A lack of integrated water management and sound public land use planning (destruction of watersheds or forested areas) can lead to losses of natural systems for cleaning water and storing water, and managing variability in precipitation and water flows, increasing costs of water delivery, and wastewater treatment, as well as increasing risk of shortages. Some companies have recognized the value of protecting and restoring green infrastructure. For example, after its water prices rose in Colombia due to more intensive water treatment costs, brewer **SABMiller** helped fund a project in Bogota to protect a watershed used by eight million people and the company's breweries.[38]

Relevant Financial Indicators

Revenues and projected revenues affected due to production interruptions or inability to expand existing operations

Higher operating costs due to increased water or wastewater treatment rates

"We all enjoy the illusion of infinite supply and pay virtually nothing. We must acknowledge the true costs of protecting, treating and delivering water, and develop models that reflect that cost. We must begin to value water as the essential and precious resource it is."[39]

Coke CEO Muhtar Kent

"Three of the top 10 risks in terms of impact over the next 10 years are environmental risks: water crises, at the top of the table, and failure of climate-change adaptation as well as biodiversity loss."
– The World Economic Forum 2015[40]

"During the next 10 years the depletion of groundwater supplies in some agricultural areas—owing to poor management—will pose a risk to both national and global food markets."
– U.S. State Department Global Water Security Assessment (2012)[41]

"As water scarcity increases, competition for water between expanding households (due to expected growing urbanization) and industry will continue to reduce the share of water available for agriculture. Agriculture/farming will consequently sooner or later enter the 'water market' and will be required to pay for the volume of water used, meaning that water will no longer be a free commodity."[42]

Rabobank

4. WATER POLLUTION

The pollution of water supplies is widespread, affecting both developed and developing countries. Poor protection of water sources and inadequate treatment of wastewater creates risks, both to companies that depend on clean water for processing and manufacturing activities, as well as to employees and surrounding communities.

Business Impacts:

→ **Higher treatment costs.** The cost for water utilities to clean water to acceptable levels is expected to rise in many markets, a cost that will likely be passed on to industrial customers. And where regulations are weak, the risks of being associated with pollution incidents are driving increased investment by food and beverage companies in additional on-site wastewater treatment equipment. **The Coca-Cola Company** has invested more than $1 billion since 2001 in wastewater treatment, working with its local bottlers worldwide to reduce their polluted discharge.[43]

Relevant financial indicators

Higher operating costs due to increased water or wastewater rates

Increased capital expenditures on wastewater treatment and recycling technologies

→ **Stricter regulation.** Unacceptable levels of pollutants can spur governments to adopt stricter water quality standards or increase enforcement. In the wake of environmental protests, China introduced new regulations in 2015 that lifted a cap on fines for environmental violations, giving local agencies the ability to shut down or seize facilities illegally dumping or emitting pollutants, and expanding the ability of different groups to sue polluters.[44] A lawsuit filed by the water utility for Des Moines, Iowa is seeking to force local governments to regulate nitrogen run-off from farms, which the utility claims is polluting its drinking water source.[45]

Relevant financial indicators

Higher operating costs due to higher fines or penalties

Increased capital expenditures on wastewater treatment and recycling technologies to ensure compliance

Higher cost of goods sold due to stricter regulation of agricultural water pollution

5. CLIMATE CHANGE & WEATHER VARIABILITY

Higher temperatures due to greenhouse gas emissions are dramatically speeding up the global water cycle, unleashing more extreme rainfall events and intensifying droughts, according to the Intergovernmental Panel on Climate Change (IPCC). Climate change is predicted to fundamentally alter what can be grown where, and to negatively affect overall global agricultural productivity. This will increase the prices and price volatility of agricultural inputs that are used to feed livestock and as direct ingredients for the food sector.[46]

More intense droughts will also exacerbate many of the previous risk drivers discussed, as already strained water sources become even more challenging to manage. Higher rainfall could increase the amount of agricultural and industrial run-off, as well as animal and human waste flowing into rivers and lakes.

Business Impacts:

→ **Decreased agricultural productivity.** Studies modeling climate change impacts on agricultural productivity predict that the global agricultural system as a whole will have difficulty supplying adequate quantities of food at constant real prices.[47] Few companies grow their own inputs and margin risks rise as commodities are affected by weather-related shocks and water scarcity. Weather-related price shocks are not new, but coupled with increased competition for water in most major agricultural production regions, there often aren't enough commodity contracts available to offset a company's different exposures (**Exhibit 1.5**). **General Mills** states in its 2014 CDP water information request that it is a large buyer of U.S. wheat and notes that "if water becomes scarcer, it will likely cost more to obtain ingredients such as wheat grown in this region."

Some companies are already beginning to project the impacts of climate change on their own agricultural procurement costs. **Unilever** estimates that natural disasters linked to changing climate, in particular increases in food costs, water scarcity, and reduced productivity in many parts of the agricultural supply chain, cost the company around $400 million annually.[48, 49]

Relevant financial indicators

Higher cost of goods sold due to reduced production of key agricultural inputs

Revenues and projected revenues negatively affected by shortages of key ingredients

Exhibit 1.5: Impacts of Weather Shocks on Commodity Prices

Wheat. With just six to 18 percent of the annual global wheat crop trading across borders, weather shocks in major wheat producing countries are felt disproportionately throughout the market.[50] In 2010 and 2011, severe droughts in Russia and China, along with flooding and severe heat in key exporting nations, caused wheat prices to more than double to $348 a metric ton.[51]

Beef. Extreme weather globally is significantly affecting beef production, causing prices to spike in 2014 to all-time highs.[52] Although exports from Brazil and India offset declines in Australia and U.S., potential demand increases in the emerging markets, which are driving the long-term growth of the sector, are stymied because there simply aren't enough cattle to slaughter. In the U.S., the world's largest beef producer, the extended droughts in California and Texas sent the size of cattle herds tumbling to historic lows in late 2014.[53]

Corn. Corn prices have increased over the last 20 years, propelled by higher demand for food, grain feed for meat production and biofuel mandates. Extreme flooding in 2011, followed by the drought in the U.S. Midwest cut corn production by 11 percent in 2012, causing corn prices to hit a record high, $8 a bushel.[54]

→ **Shifting production zones & asset stranding.** Oxford University estimates that as much as $11.2 trillion in agricultural assets, including processing plants, transportation and distribution networks, could be stranded annually because of environmental risks including climate change and water scarcity.[55] As changes in precipitation patterns make water less plentiful in certain growing regions, farmers will adapt over the medium to long-run by shifting crops or adopting new agricultural practices. In the short-term, however, crop losses could force companies to pay higher transport costs to haul inputs from longer-distances and affect the value of certain logistical and processing assets. Prolonged droughts transformed the U.S. beef business in recent years, with Texas losing 24 percent of its herd between 2010 and 2014 and Nebraska replacing Texas as the biggest beef producing state.[56] This dislocation has forced companies, including **Cargill** and **National Beef,** to close massive feedlots and meatpacking plants.[57]

Relevant financial indicators

Revenues and projected revenue negatively affected by shifts in availability and location of agricultural inputs

Impaired assets values due to shifts in agricultural production zones

Implications for the Food Sector

Investors are increasingly aware of the relevance of water risks for the food sector. Analyst questions and discussions about the earnings impacts of droughts and floods are becoming more routine on food company quarterly earnings calls (**Exhibit 1.6**). Eighty-two percent of food sector companies responding to the 2014 CDP information request disclosed that they are exposed to water risks and that these risks could have a substantive impact on business operations.[58] Companies are also increasingly acknowledging these risks in their financial filings: of the 31 companies evaluated in this report that are U.S.-based and publicly held, 90 percent cite water as a risk in their 10-K filings, 65 percent citing physical risks (**Exhibit 1.7**).

Exhibit 1.6: "Drought" Mentions on Food Sector Earnings Calls

Using the Transcript Analysis function available via Bloomberg, transcripts of quarterly earnings calls for the 37 food and beverage firms addressed in this report were examined for discussion of water risks material to business performance. Relevant transcripts from each firm's most recent fiscal year were captured using "drought*" and "flood*" in keyword searches in February 2015.

Twelve companies discussed drought in their earnings calls during the course of their previous fiscal year. Six companies initiated the reference when reporting quarterly performance and six referenced drought in response to questions posed by analysts. The supply chain and pricing impacts of drought conditions in Brazil and the American West, particularly California, were discussed most often.

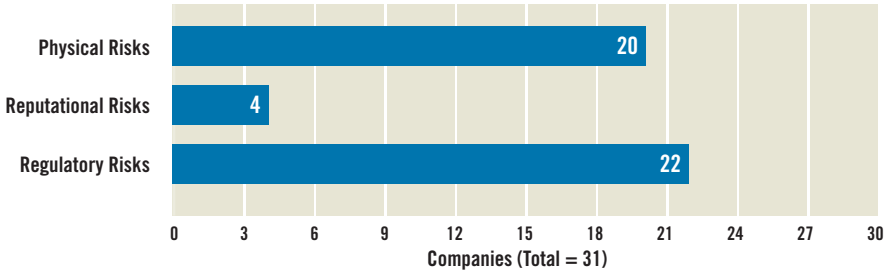
Three companies cited floods as factors in their forecasting and performance, and two of these mentioned events in Pakistan and select Eastern European countries.

* Transcript Analysis is currently available on the Bloomberg Terminal in beta phase only. All keyword searches were duplicated to ensure reproducibility of results.

"But the reality is, there is less rainfall in Panama and Costa Rica today and over the last five years than there has been traditionally. So certainly in our business, where we have a substantial presence in those countries, we are changing the way we farm. And that includes irrigating in places we haven't irrigated before."

– Ed Lonergan, President and CEO, Chiquita Brands, Q1 2014 earnings call, 5/9/14

Exhibit 1.7: Food Sector Companies Reporting Water Risk Exposure in 2013 10-K Filings



90 percent of the 31 publicly traded U.S. companies evaluated referenced water-related risks in their 2013 10-K filings. Data was analyzed by Sustainalytics and Ceres in November 2014.

Given these trends, investors should be taking into account the water dependencies and risks previously outlined when analyzing the food sector, especially in regard to scenario and sensitivity analysis or stress testing. Investors will need to model a variety of factors, including the magnitude of exposure, likelihood of risks within a given scenario and time frames. Company exposure to these financial risks will vary greatly based on geographic exposure, water use intensity, agricultural supply chain mix, and level of vertical integration. In light of the above, investors seeking to understand the potential impact of water issues to a particular company's financial performance should consider their water dependence, the security of the water resources they rely on and the quality of their management response (**Exhibit 1.8**).

Exhibit 1.8: Indicators to Assess Corporate Water Dependence, Security & Response

Business Risk	Relevance	Indicators		
		Water Dependence	Water Security	Water Management Response*
Shortages, rationing and/or water rate increases	Especially relevant for companies with a high water intensity of production.	• Water withdrawals/$ revenue for direct operations CDP GRI • Average annual water withdrawals of facilities in regions of high water risk CDP • % of water recycled/reused in direct operations CDP GRI	• % of facilities located in areas of high water stress CDP GRI WRI WWF • % of revenues derived from areas of high stress WRI WWF • Quality of public water management/governance in key operating geographies N M	• Has assessed water risks facing key operating geographies • Sets & demonstrates progress against water use reduction targets • Uses a higher shadow price of water to inform business planning and capex decisions • Has collaborative watershed protection plans that are linked to operating regions of high water risk CDP GRI M
Conflicts with communities & loss of social license to operate	Especially relevant for branded beverage, packaged food and meat companies.	• % of total watershed-level water use or pollution in high risk regions that are linked to company's operations M • Frequency of fines/violations GRI G N	• % of facilities in areas with populations lacking access to adequate water and sanitation CDP WRI WWF • % of projected revenues coming from regions with populations lacking access to adequate water and sanitation CDP WRI WWF	• Has assessed socioeconomic conditions and water access of communities in key operating geographies • Has a policy publicly acknowledging the human right to water & processes in place to assess and reduce impacts on communities • Collaborative watershed protection plan in place to improve water supply and access in key regions CDP GRI M
Stricter water quality regulation & increased pre-treatment & wastewater treatment costs	Especially relevant for the meat industry and companies with significant wastewater discharges.	• Wastewater discharge volumes and concentrations of key contaminants for major facilities CDP GRI G • Fines and penalties incurred over past three years for wastewater permit violations CDP GRI G	• % of facilities located in regions with poor water quality CDP WRI WWF • % of facilities in areas with populations lacking access to adequate water and sanitation CDP WRI WWF • % and # of confined animal feeding operations located adjacent to freshwater bodies (meat sector) M • % of agricultural procurement spend or volume associated with regions of severe impacts on water quality from agriculture (nitrogen & phosphorus pollution, pesticides, soil erosion, dead zones) M	• Has evaluated the impacts of its wastewater discharge on receiving watersheds • Sets goals to reduce wastewater discharge and improve water quality beyond compliance requirements • Has strict animal waste management practices in place such as proper maintenance of lagoons and nutrient management plans CDP GRI M
Decreased agricultural production & higher commodity prices	Especially relevant for companies that cannot pass on costs to customers.	• % of key agricultural inputs that are non-substitutable 10-K M • Water requirements of key agricultural inputs M WRI WWF WFN • % of producers in supply chain using farming practices more resilient to extreme weather GRI M • % of agricultural procurement spend or volume sourced directly from agricultural producers 10-K M • % of agricultural procurement spend or volume that is traceable down to the field level (i.e. specific geographic origins of the product are known) M GRI	• % of agricultural procurement spend or volume associated with crops grown in high water risk or highly water-stressed regions M A WWF • % of agricultural procurement spend or volume associated with crops that rely on precipitation (dryland or rainfed) versus irrigation M • % of agricultural procurement spend or volume coming from regions of unsustainable groundwater withdrawals M WRI	• Has assessed water-related risks and water footprint of key agricultural commodities • Has a sustainable agriculture policy & time-bound sourcing goals that address water use and quality • Gathers data from agricultural producers on the water impacts of their farming practices • Offers educational support, technology or financial incentives to agricultural producers in supply chain to improve water management • Has collaborative, watershed protection plans that are linked to sourcing regions of high water risk CDP GRI M

Data Source Key:

- A Appendix C
- CDP CDP Water Survey
- G Government Databases
- GRI GRI or Corporate Sustainability Report
- M Management
- N Newsflow
- WFN Water Footprint Network
- WWF WWF Water Risk Filter
- WRI WRI Aqueduct Water Risk Atlas
- 10-K 10-K Financial Filings

**For a full discussion of water management approaches and company results, see Chapter 3.*

CHAPTER 2

A Primer on Analyzing Agricultural Water Risk

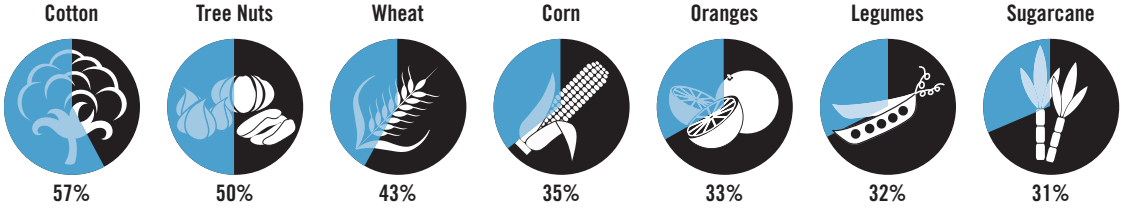
Chapter Overview

- High water demands, ever scarcer supplies and mounting pollution impacts in agricultural supply chains are the biggest challenges facing the food sector.
- One-third of the world's agricultural production is grown in areas of high or extremely high "water stress" or competition. More frequent and intense droughts are having devastating effects on harvests, while water regulations are tightening up in many growing regions.
- This chapter provides guidance to investors seeking to analyze corporate exposure to agricultural water risks. Risk exposure is shaped by several factors, including the primary agricultural commodities the company buys, the level of water dependence and security associated with those commodities, as well as the sourcing model used by the company to procure inputs.
- As water supplies are increasingly depleted in major agricultural regions across the planet, traditional risk management approaches such as hedging and geographic diversification are becoming less effective. Companies can achieve more by engaging directly with their supply chain to strengthen farmer practices and protect the watersheds from which they source. Relevant tactics include setting supplier policies and sourcing goals, purchasing certified sustainable commodities, collecting data from farmers on their practices while providing assistance and incentives for improvement, as well as supporting on-the-ground watershed protection projects and backing more sustainable water management regulations.

Agricultural Supply Chains Face Significant Water Pressures

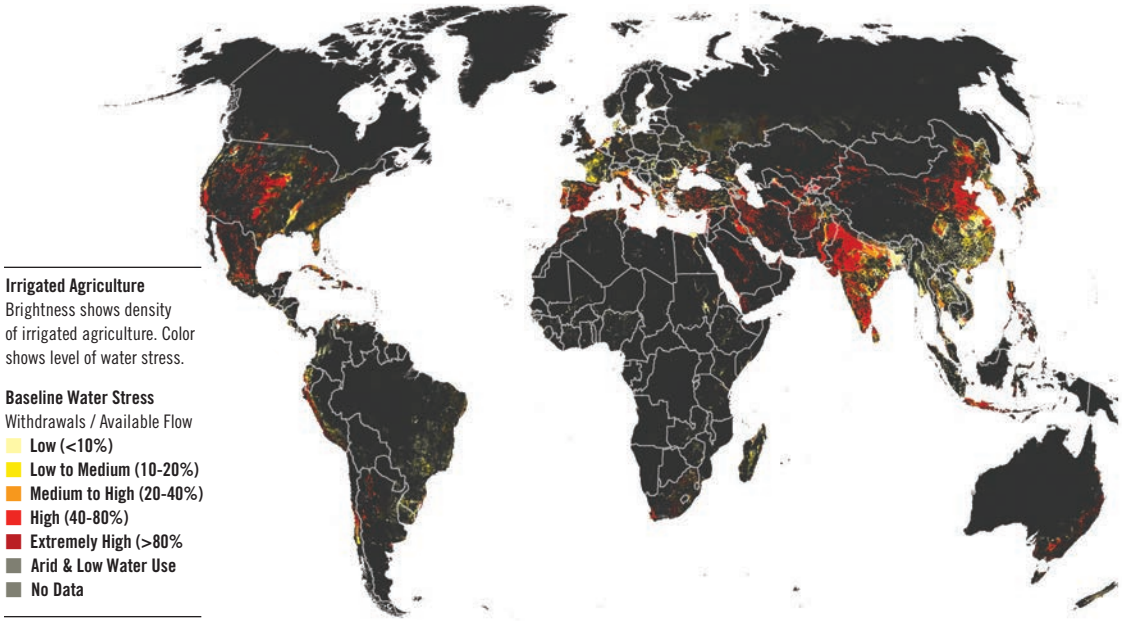
A recent analysis by the United Nations' Principles for Responsible Investment (UNPRI), a network of 1,300 investors with $45 trillion in assets under management, found that companies in the food sector are highly reliant on agricultural commodities from regions facing high levels of water stress (a measure of competition for water).[1] Currently, 56 percent of the world's irrigated crop production (**Exhibit 2.1**) and 21 percent of rainfed production (approximately one-third of total food production) are in areas of high or extremely high water stress.[2] Similarly, a large proportion of many high value global crops, including wheat, corn, nuts and fruits, are grown in regions exposed to high water stress (**Exhibit 2.2**).

Exhibit 2.1: Proportion of Global Crop Production Grown in Regions of High or Extremely High Water Stress



Source: World Resources Institute's Aqueduct with data from Gassert et al, 2013, Monfreda et al, 2008, Ramankutty et al 2008, Siebert et al 2013.

Exhibit 2.2: Irrigated Crop Production in Regions of High Water Competition



Fifty-six percent of all irrigated crop production takes place in regions of high or extremely high water competition, or "stress." Forty percent of global food production relies on irrigation.

Source: World Resources Institute Aqueduct, "Agricultural Exposure to Water Stress," available at: http://www.wri.org/applications/maps/agriculturemap/#x=0.00&y=-0.00&l=2&v=home&d=gmia

Droughts are increasingly affecting food production. Droughts have become more frequent and intense worldwide, affecting key production regions, including the U.S. Midwest and California, South America and Australia. In 2014, Brazil's worst drought in decades sent coffee prices spiking nine percent on average, forcing **Starbucks** and **J.M. Smucker** to pass price increases onto consumers.[3, 4] When New Zealand, the world's largest dairy products exporter, was impacted by drought in 2013 whole milk powder prices skyrocketed 64 percent.[5]

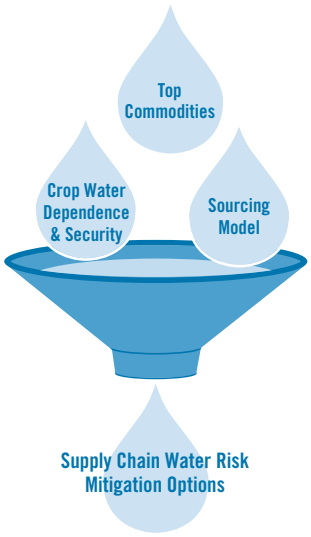
Water regulations are tightening up in many growing regions. Water authorities and regulators are enacting new laws to control water use, reallocate agricultural water to urban and energy needs and regulate the water quality impacts of agriculture. These regulations have obvious implications for production costs. The State of California approved a comprehensive groundwater law in 2014 that will have long-term impacts for agriculture, giving local authorities the right to set sustainability targets, restrict groundwater pumping, shut down wells and impose fines.[6] Even bigger changes are taking place in Australia, which has transformed its traditional water rights system after years of drought.[7] In the United States, more lawsuits are being filed over agricultural pollution. In a potentially precedent-setting case, a federal judge in Washington ruled in 2015 for the first time that animal waste could be regulated as solid waste and not as a beneficial farm product, after finding that a large industrial dairy's handling of manure had polluted drinking water.[8]

Investor Analysis of Water Risk in Agricultural Supply Chains

Analysis of water risks in corporate supply chains is complex, however the following questions and resources provide guidance for evaluating these risks, taking into consideration crop, geographic and sourcing model considerations (**Exhibit 2.3**).

Exhibit 2.3: A Framework for Analyzing Supply Chain Water Risk

1. What are the **primary agricultural commodities** the company relies on?
2. What is the level of **water dependence and security** (i.e. water risk) associated with those agricultural commodities?
3. What is the company's **sourcing model** for high-risk commodities? Are they purchased directly from farmers or through intermediaries?
4. Given the water risks associated with a company's top agricultural commodities and its sourcing model, **what strategic actions can the company and its agricultural suppliers take to mitigate risk?**



Analysis of Primary Agricultural Commodities

Information on the top agricultural commodities purchased by companies can be gleaned from financial filings, annual reports and in some cases corporate sustainability reports. For companies that raise and source livestock or dairy products, it is important to consider the crops that are used to feed animals—such as corn, soybeans and alfalfa—all of which have significant water demands. Of the 37 companies analyzed in this report, the top ten most commonly sourced crops are: almonds, cocoa, coffee, corn, grapes, palm oil, soybean, sugarcane, tomatoes and wheat. For company-specific information on top commodity purchases, see **Chapter 3**, and for information on the water risks associated with the top ten crops, see **Appendix C**.

Investors should also consider the degree to which certain ingredients can be easily substituted. For example, sugar from a drought-impacted sugarcane-growing region could be substituted in many products with corn syrup or sugar from sugar beets—although potentially not without additional logistics or processing costs. In addition, it is important to understand how diverse or limited a crop's growing regions may be. For example, nearly 80 percent of global almond production comes from California's drought-stricken Central Valley. In contrast, global soybean production is more evenly distributed across several countries and continents, providing more diversification of supply.

Key Indicators: Agricultural Commodity Exposure

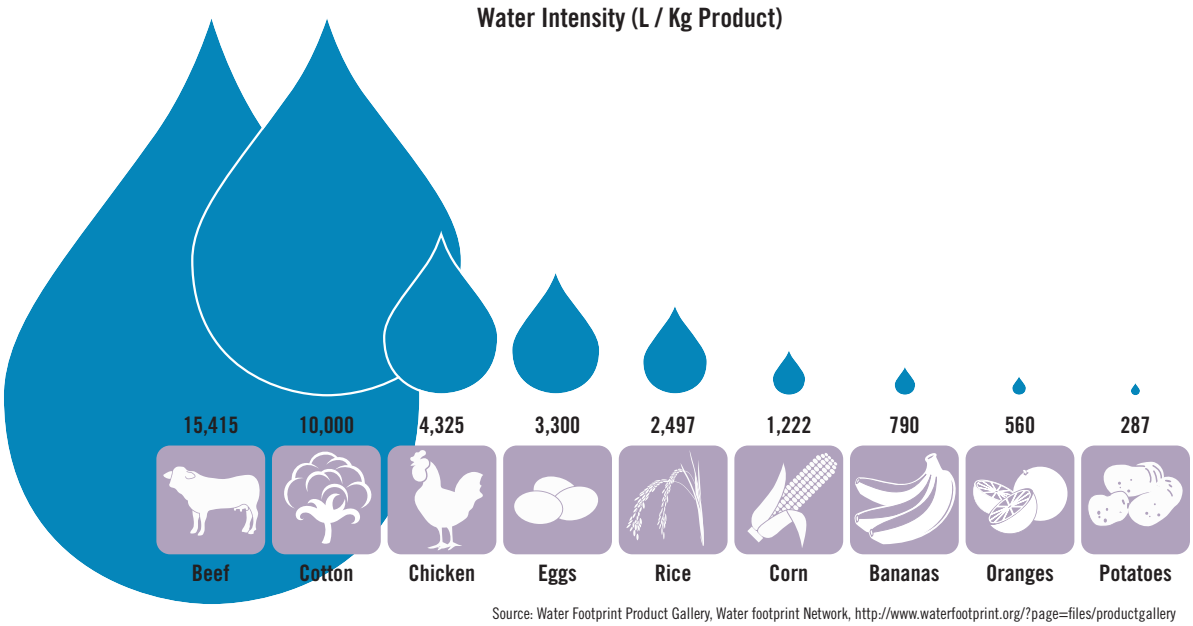
Indicator	Data Sources
Top agricultural inputs	10-K filings, annual reports, sustainability reports
% of key agricultural inputs that are non-substitutable due to distinctive attributes (flavor, texture, association with a branded product—e.g. "Fig Newtons")	Company product/ingredient analysis
# of geographies where key agricultural inputs are grown (i.e. whether there are many or few production regions globally from which the input can be procured)	FAO Global Production Stats[9]

Water Dependence & Security of Key Agricultural Commodities

To analyze commodity water risk, investors need information on the relative water dependence of a crop—i.e. how much water it requires to grow, as well as the associated water pollution footprint—coupled with information on the security and health of the water resources on which the crop relies.

Although growing crops and raising livestock are by their nature water-intensive activities, the water footprints of different commodities vary significantly. Animal products (meat, dairy, eggs) are among the most water-intensive forms of agricultural production when requirements for growing animal feed are factored in (**Exhibit 2.4**). On average, 10 liters of water are needed to produce one calorie of meat; only 1.2 liters are needed for one calorie of lentils or beans, and half a liter for one calorie of root vegetables such as carrots.[10]

Exhibit 2.4: Water Footprint of Major Commodities



Source: Water Footprint Product Gallery, Water footprint Network, http://www.waterfootprint.org/?page=files/productgallery

The type of agricultural system used to grow crops significantly affects the water risks and impacts associated with production of that crop. Agriculture relies on water in two forms: through direct precipitation (also known as "rainfed" agriculture) and irrigation systems (water delivered from surface water sources, such as streams, rivers and lakes, or groundwater from aquifers). While only 18 percent of cropped acres globally are irrigated, these acres represent 40 percent of total food production.[11]

Rainfed and irrigated agriculture have different vulnerabilities. The productivity of rainfed agriculture is subject to natural variability in precipitation such as drought and flooding, and increasingly to more extreme shifts in precipitation patterns due to climate change. The long-term productivity of irrigated agriculture requires healthy, functioning watersheds, including abundant stream flows and groundwater that ensure regular, dependable access to water supplies for agriculture as well as other uses.

Eighty percent of the world's cropland and more than 60 percent of the world's cereal grains rely on rainfed production.[12] In Africa, 95 percent of agricultural land is rainfed; in China 70 percent; and in India 60 percent.[13] The water productivity of rainfed agriculture overall tends to be low, while water losses from evaporation are high. This isn't because of the volume of rainfall, but because of soil degradation and poor methods for managing the rain when it falls, especially during floods and dry spells.[14]

Agriculture's Impacts on Water Quality

Water pollution from farming is rising, according to the Organization for Economic Co-operation and Development (OECD).[15] Erosion of topsoil and associated fertilizer run-off, both chemical and manure, is the most significant source of agricultural water pollution. Global chemical fertilizer use, which hit 180 million tons in 2012,[16] has increased 500 percent over the past 50 years, with nitrogen alone growing by 800 percent.[17] Because much of this fertilizer isn't completely absorbed by plants, tens of millions of tons of nitrogen and phosphorus run off into waterways, polluting rivers, groundwater and oceans annually. The number of hypoxic "dead zones" linked to fertilizer run-off has increased exponentially since the 1960s, affecting more than 400 aquatic ecosystems worldwide, including the Gulf of Mexico and South China Sea.[18] According to the EPA, nutrient pollution is the most significant water quality challenge facing the United States, which spends an estimated $4.8 billion annually treating nitrogen pollution.[19]

Animal manure resulting from industrial animal production is another significant source of water pollution. In the United States, it is estimated that livestock produce as much as 1.2 to 1.37 billion tons of waste a year and that concentrated feeding operations account for 16 percent of agricultural water pollution.[20,21] In the wake of a run-off induced toxic algae bloom in Lake Erie in summer 2014, which shut down water supplies to the city of Toledo, the Governor of Ohio recently signed legislation requiring dairies and livestock producers to change the way they handle manure.[22]

The use of pesticides, herbicides and fungicides to protect crops and boost yields is also increasing, with pesticide use alone reaching 5.2 billion tons worldwide in 2007.[23] Pesticides can leach into ground and surface waters and have been found in significant concentrations in many regions.[24] Syngenta, the world's largest pesticide manufacturer, paid $105 million in 2012 to settle a class action suit filed by U.S. Midwest water utilities that spent millions over the years filtering the herbicide atrazine from public water supplies. Atrazine is widely used by farmers in the Corn Belt, but banned in Europe.[25]

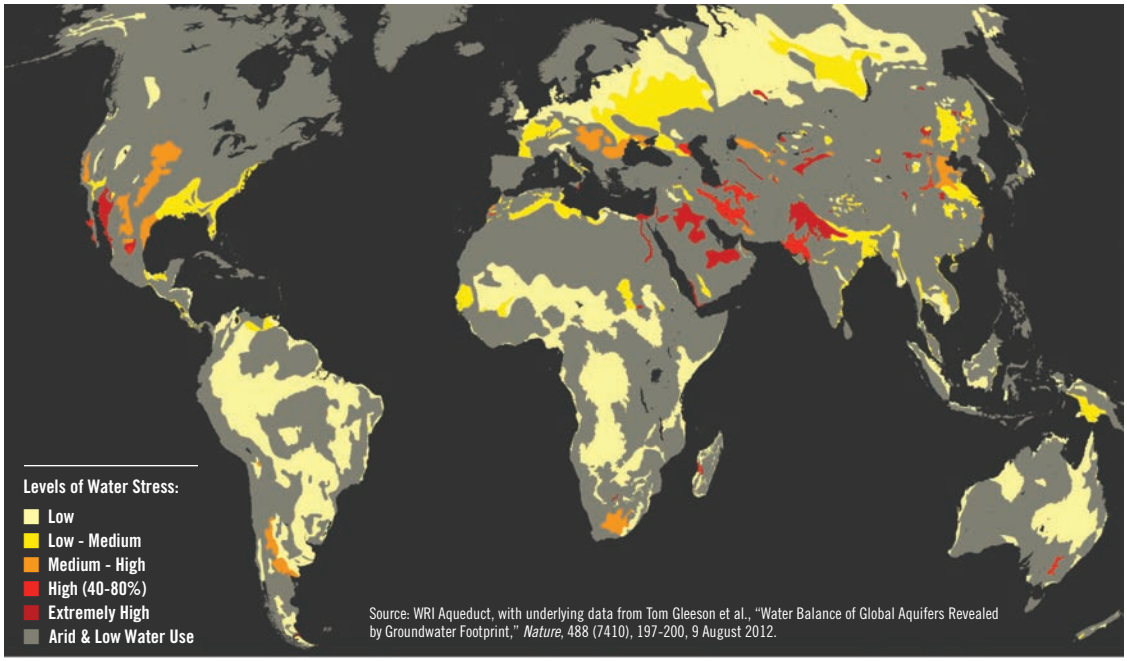
Rainfed agriculture is especially vulnerable to climate change. Modeling of expected climate change impacts show that precipitation variability is increasing along with more extreme weather, according to the UN's Intergovernmental Panel on Climate Change (IPCC).[26] Under most climate scenarios, precipitation is expected to increase in the tropics and higher latitudes, and drop further in semi-arid to arid mid-latitudes and the interior of large continents, affecting key growing regions.[27] Climate change could reduce yields of major rainfed cereal crops in Africa, including wheat yields falling as much as 35 percent south of the Sahara and corn yields dropping in excess of 30 percent in South Africa and Zimbabwe by 2050.[28] In Central America, the northeast of Brazil and parts of the Andes, increases in temperature and decreases in rainfall are expected to reduce crop productivity for rice, wheat and corn as well as high value commodities such as coffee.[29] Nicaragua could see an 80 percent decline in land suitable for coffee by 2050.[30]

The global trend is toward more irrigated production. Irrigated production is more than twice as productive on a per hectare basis than rainfed production.[31] However this water use contributes to significant shortages and environmental degradation in many regions: roughly 70 percent of all accessible water is used for irrigation globally, though that can reach as high as 90 percent in some countries.[32] As a response to climate change, the International Food Policy Research Institute (IFPRI)[33] foresees a 25 percent increase in irrigated areas in developing regions.

Irrigated production poses higher costs to ecosystems. Most irrigated production globally is in arid, dry regions threatened by drought. It also competes with other uses, is one of the most energy-intensive uses of water and increases the risk of soil salinization and waterlogging. In many regions, water supplies used for agriculture are highly stressed from excessive demand and unregulated use. Combined, these pressures are leading to the drying up of water supplies in key growing regions—from large-scale groundwater losses in California's Central Valley to the disappearance of Central Asia's Aral Sea due to massive water diversions for irrigating cotton fields.[34]

Groundwater is an essential and increasingly imperiled source of irrigation water. Its use in irrigation is increasing both in absolute terms and as a percentage of total irrigation.[35] Globally, about 43 percent of the water used for irrigation comes from groundwater.[36] Irrigation is the single largest user of groundwater in water scarce regions. An estimated 20 percent of the Earth's groundwater basins or aquifers are being over-exploited, many of them in regions of significant agricultural importance (**Exhibit 2.5**).[37] New satellite data in 2014 confirmed that the amount of water stored in seven of the world's major aquifers, including California's Central Valley, the northern Middle East, and the Guarani aquifer in central South America, have dropped significantly since the early 2000s.[38]

Exhibit 2.5: Unsustainable Groundwater Use in Areas Important to Agriculture



A significant number of groundwater basins important to agriculture face high to extremely high stress, meaning that unsustainable groundwater use could affect groundwater availability and groundwater-dependent surface water and ecosystems.

Key Indicators: Water Dependence & Security of Agricultural Commodities

Indicator	Data Sources
Relative water requirements of key commodities	Water Footprint Network's WaterStat,[39] FAO AQUASTAT, company lifecycle analysis (sustainability reports), USDA Farm and Ranch Irrigation Survey
% of agricultural spend or volume exposed to drought conditions	U.S. Drought Monitor, WRI Aqueduct (Drought Severity data layer)
% of agricultural procurement spend or volume associated with rainfed versus irrigated production	Management
% of agricultural procurement spend or volume associated with crops grown in high water risk or highly water-stressed regions	CDP water questionnaire; data on irrigated crops & water stress: WRI Aqueduct agriculture map; for a broader set of crops and water risk indicators, see WWF Water Risk Filter & Appendix C of this report
% of agricultural procurement spend or volume coming from regions of groundwater depletion	WRI Aqueduct (Groundwater Stress data layer), USGS report: *Groundwater Depletion in the United States*[40]
% of agricultural procurement spend or volume associated with crops that have high fertilizer or pesticide use	Management

Agricultural Sourcing Models

The way that companies source agricultural inputs—directly from farmers, through co-ops and wholesalers, or through multiple levels of intermediaries or commodities markets—shapes the level of influence and menu of opportunities available to them for improving the sustainability of farming practices.

Agricultural supply chains are highly complex and often lack traceability. Company influence over suppliers varies depending on the firm and the commodities. Some meat and agricultural products companies are vertically integrated, but many food sector companies are often four-plus links from the agricultural producer. Significant traceability challenges often exist in terms of understanding the geographic origin of a particular input and what intermediaries it passes through. Companies may have a wide variety of sourcing structures for different divisions, products and manufacturing facilities. This means that a box of tea on the shelves of a supermarket may include leaves bought from many different international commodity traders, while another brand of tea sold by the same company may contain leaves from a specific farm or co-op that is traceable at every stage of production.

Traceability challenges mean that many companies may be unaware of their exposure to water-related risks. In 2013, when horse meat was discovered in Europe in products labeled as beef, including meatballs from **Ikea** and **Nestlé** frozen pasta meals, and monthly frozen burger sales plunged by as much as 41 percent, the scramble to pinpoint the meat source highlighted traceability issues within the food supply chain.[41]

Key Indicators: Agricultural Sourcing Models

Indicator	Data Sources
% of agricultural procurement spend or volume sourced directly from agricultural producers	10-K, sustainability reports, management
% of agricultural procurement spend or volume that is traceable down to the field level (i.e. specific geographic origins of the product are known)	Sustainability reports, management

Approaches to Managing Agricultural Water Risk

Given the water risks associated with a company's top agricultural commodities and its sourcing model, companies have a range of risk management approaches available to them. However, as water supplies become overexploited in many major growing regions across the planet, traditional approaches to managing commodity price risk—such as hedging and geographic diversification—are becoming less effective. Companies may achieve more by working with agricultural producers to lower their water impacts, while also investing to support watershed resilience in key growing regions.

Farm-level Practices

While global agricultural production has become dramatically more efficient and productive in many regions over the past 50 years, many opportunities exist to improve soil health, further optimize resource efficiency, slow or halt groundwater depletion and minimize downstream water quality impacts. Below are some of the key practices that can be pursued—often at relatively low cost and with a demonstrated economic return. It should be noted that the applicability of specific practices will vary greatly depending on differences in crop water needs, farm size, soil types, local climates and watershed conditions.

→ **Enhanced soil management.** Soil health, defined as the continued capacity of soil to function as a living ecosystem that sustains plants, animals and humans, is arguably the most important indicator of agricultural resilience to drought and extremes in precipitation.[42] A variety of agricultural soil management practices can enable soil to increase water retention during dry spells, reduce the erosion impacts of flooding and provide more productive and reliable yields. No-till farming, which involves

seeding directly into crop residues rather than disturbing the soil to improve soil quality and increase water infiltration, has been shown in the case of corn production to yield 24 percent more bushels per acre and use 32 percent fewer gallons of water each year than conventional tilling.[43] Other practices, including cover cropping (planting non-commodity crops, such as legumes or plant grasses to protect and improve the soil), and crop rotation are important tools for preventing soil erosion and supporting relationships between plants and soil microbes that improve crop uptake of water and nutrients.[44]

→ **Water use productivity.** Researchers have identified that in many dry regions, 40 percent of total water used is being applied to fields that produce just 20 percent of total food calories.[45] In combination with existing rainfall, practices such as reducing soil erosion and improving soil nutrients could increase annual food production in rainfed croplands by enough to feed 110 million people.[46] In areas of irrigated cropland, raising the level of calories produced per drop could reduce water consumption enough to meet the annual domestic water demand of 1.4 billion people.[47]

Without regulations that encourage overall reductions in water use at the watershed level, individual field-level efficiency improvements may still contribute to depletion of water supplies & environmental degradation.

There are three key principles for improving water productivity at the farm and watershed level, which apply regardless of whether a crop is grown under rainfed or irrigated conditions: 1) increasing the marketable yield of the crop for each unit of water it consumes, 2) reducing non-beneficial water consumption, including water loss through evapotranspiration from soil or water surfaces, and 3) making more effective use of rainfall.[48] A range of practices and technologies can support these principles, from improved seeds to advanced drip irrigation to better practices for capturing and storing rainfall.[49]

It is important to recognize that a farm-level focus on increasing water efficiency—or increasing crop per drop—often results in the saved water being applied to additional agricultural uses, which can fail to reduce overall withdrawals from stressed water sources.[50] Without regulations that encourage overall reductions in water use at the watershed level, individual field-level efficiency improvements may still contribute to depletion of water supplies and environmental degradation.

→ **Improved fertilizer management.** Some regions use too much fertilizer, while others, particularly in parts of Africa, need to use more.[51] Just under a quarter of the world's cropland generates half of all fertilizer waste.[52] China, India and the U.S. are responsible for two-thirds of nitrogen and phosphorus waste, while three crops—rice, wheat and corn—generate 60 percent of all fertilizer waste.[53] Targeted cuts in fertilizer use in this small set of crops and countries could have a big impact on water pollution, without hurting yields. A recent study estimates that current crop yields for wheat, rice and corn in China, the U.S., and India, could be maintained while cutting nitrogen use by 14 to 29 percent and phosphorus by 13 to 22 percent.[54] Best management practices include matching the type and amount of nutrients to each crop's needs, careful timing of fertilization and injecting fertilizer directly into the soil.

Company Practices

There is much companies can do to incentivize and support farmers in adapting their practices, as well as investing more broadly in the health of the watersheds from which they are sourcing.

→ **Sustainable agriculture policies and goals.** Companies send an important signal to the agricultural supply chain by developing policies and setting goals that articulate an intention to source commodities that are grown with reduced water impacts. A number of food sector companies including **Coca-Cola, PepsiCo** and **Unilever** have released detailed agricultural policies while others, including **General Mills** and **Kellogg**, have set time-bound sustainable sourcing commitments.

→ **Data collection & benchmarking.** A broad range of tools and initiatives are being created to help track water use, fertilizer and pesticide management practices by farmers. Many companies including **Campbell Soup, PepsiCo, Sysco, Unilever** and **Wal-Mart** are using surveys to collect data on farm-level practices and environmental impacts. **Unilever**, which aims to have 100 percent sustainably sourced ingredients by 2020, is monitoring suppliers and farmers using a self-assessment software tool that collects data on compliance and tracks improvement against the goals of the Unilever Sustainable Agriculture Code.[55] Berry company **Driscoll's** collects water use data from its California Central Coast growers through an automated system which transmits data in real-time from water meters. The data is then aggregated to provide growers with benchmark data on their

water use versus that of other growers.[56] Industry-level efforts to develop consistent data collection approaches are also emerging. These include Field to Market, the Stewardship Index for Specialty Crops, the Sustainability Consortium and the Innovation Center for U.S. Dairy.

→ **Commodity certification.** Certification programs that provide assurance that certain aspects of agricultural production are undertaken in accordance with good environmental practices are one strategy available to companies. However, lack of traceability in certain commodity markets is a significant challenge to the broadening of certification systems beyond specialty crops. Additionally, the degree to which water quantity and water quality issues are reflected in different commodity certifications varies widely.

→ **Agronomic assistance.** Agronomic services that introduce and train farmers on practices that support more resilient water outcomes can be provided directly by companies, their suppliers or in partnership with third parties such as non-governmental organizations (NGOs), government agencies and universities. In 2014, **Unilever** partnered with the Dutch NGO Solidaridad to pool public and private grants, credits and investments to promote water efficiency techniques and education among sugarcane, cotton, soy and tea farmers in India with the goal of saving 400 billion to one trillion liters of water in three years.[57]

→ **Financial incentives.** Incentive payments, subsidies, and low-interest loan programs are economic instruments used to encourage adoption of approaches and technologies for reducing water use and fertilizer runoff. In the Irapuato region of Mexico, **General Mills** is providing interest-free loans to broccoli and cauliflower growers to speed up adoption of drip irrigation technology, helping save an estimated 1.1 billion gallons of water annually.[58] To mitigate fears that piloting new water or nutrient and pesticide management systems will lead to lower yields, companies and organizations can design programs that provide "performance guarantees." These guarantees offer farmers a set price regardless of yield or quality of their crops. Through the American Farmland Trust's risk-sharing programs, farmers have cut fertilizer use by 24 percent.[59]

Some companies are paying higher prices for products, particularly coffee and cocoa, grown using sustainable farming approaches such as watershed management, mulching and drip irrigation. Long-term or preferential contracting is another tool. **ADM**, in partnership with its customer **Unilever**, is paying Iowa farmers a 10-cent a bushel premium for soybeans from farms enrolled in the Field to Market program, which helps farmers evaluate ways to reduce the environmental impacts of their practices.[60]

→ **Watershed protection and public policy engagement.** Most agricultural water challenges are collective, and solving them requires shared action by all stakeholders, as well as government policies that support conservation, water quality improvements and integrated water management. Companies can play a role in collaborative efforts to protect and restore agricultural watersheds by providing direct investments in on-the ground projects that improve local conditions and ensure long-term continuity of agricultural production. Companies can also actively support government policies that achieve sustainable water use in the regions where they source. For example, **Coca-Cola, Driscoll's** and **General Mills** are members of the *Connect the Drops* campaign, a business advocacy initiative that supports sustainable water management policies in California.[61]

Key Indicators: Managing Agricultural Water Risk

Indicator	Data Sources
% of producers in supply chain showing continuous improvement on water-related outcomes (water use productivity, nutrient application, soil health, etc.)	Chapters 3 & 4 of this report, sustainability reports, CDP's water questionnaire, management
Company has a sustainable agriculture policy & time-bound sourcing goals that address water	
Company gathers data from agricultural producers on the water impacts of their farming practices	
Company offers educational support, technology or financial incentives to agricultural producers in supply chain to improve water management	
Company sources certified commodities, where relevant	
Company has collaborative, watershed protection plans that are linked to sourcing regions of high water risk	

CHAPTER 3

Benchmark Results: Key Findings

Chapter Overview

- This chapter provides results of an evaluation of the corporate water risk management of 37 companies in the packaged food, beverage, meat and agricultural products industries. Most of the companies are public, U.S.-headquartered firms listed on the S&P 500 and Russell 1000 indices.
- While the packaged food and beverage industries performed better overall, there was significant variation in performance within industries, with many companies scoring relatively poorly.
- Companies that had board-level oversight of water risk did not necessarily perform better overall. This weak correlation indicates that board engagement and education on the materiality of water issues could be strengthened.
- Companies showed more sophistication in managing water risks in their direct operations, with relatively few demonstrating comprehensive approaches to addressing supply chain risks.
- Most companies are limiting their investments in water risk mitigation to improving facility-level water use efficiencies. Because many water risks stem from the impacts of other water users and poor regulation, a narrow operational focus may overlook lower-cost, higher impact opportunities to help address critical watershed-level challenges.
- Although many packaged food and beverage industry firms have set goals for sourcing agricultural commodities with less water risk, many of their suppliers in the agricultural products and meat industries have not yet made parallel commitments.

Methodology

Thirty-seven major food companies in four industries were evaluated for their strength in managing water risks across their direct operations and supply chains. Most of the companies are U.S.-headquartered firms in the packaged food, beverage, meat and agricultural products industries, and the majority are public companies listed on the S&P 500 and Russell 1000 indices (**Exhibit 3.1**).

Exhibit 3.1: Overall Water Risk Management Scores by Company

Agricultural Products	
Bunge (BG)	29
Chiquita Brands (Private)	20
Cargill (Private)	17
Archer-Daniels-Midland Co (ADM)	10
Fresh Del Monte (FDP)	7
Ingredion (INGR)	5

Beverage	
The Coca-Cola Company (KO)	67
Molson Coors Brewing Company (TAP)	44
Brown-Forman Corporation (BF/B)	29
Constellation Brands (STZ)	24
Dr Pepper Snapple Group (DPS)	15
Monster Beverage (MNST)	1

Meat	
Smithfield Foods (SFD)	33
JBS (JBSS3)	12
Hormel Foods Corp. (HRL)	11
Perdue Farms Inc. (Private)	9
Tyson Foods (TSN)	8
Pilgrim's Pride (PPC)	3

Packaged Food	
Unilever (UN)	70
Nestlé (NSRGY)	64
General Mills (GIS)	57
PepsiCo Inc. (PEP)	55
Kellogg Co. (K)	54
Campbell Soup (CPB)	45
Mondelēz International (MDLZ)	43
ConAgra Foods Inc. (CAG)	31
Keurig Green Mountain (GMCR)	31
J.M. Smucker (SJM)	27
Hershey (HSY)	26
Mead Johnson (MJN)	23
McCormick & Co. (MKC)	14
Dean Foods (DF)	13
WhiteWave Foods (WWAV)	11
Hain Celestial (HAIN)	8
Kraft Foods Group (KRFT)	6
Flowers Foods (FLO)	5
Pinnacle Foods (PF)	1

Companies scored on a 0-100 point basis.

The companies were analyzed against indicators in four categories of water risk management: 1) corporate governance and management, and actions to reduce water risks and impacts in their 2) direct operations, 3) manufacturing supply chain and 4) agricultural supply chain (**Exhibit 3.2**). The indicators and scoring were drawn largely from the *Ceres Aqua Gauge*,[1] a tool developed by Ceres, WBCSD, Irbaris and IRRC for evaluating the maturity of corporate water risk management. Companies were scored on a 0-100 point basis, using publicly-available information disclosed in company financial statements, sustainability reports and CDP water information requests. Only information publicly disclosed through November 15, 2014 was considered. For the full indicator list and scoring methodology, see **Appendix A**.

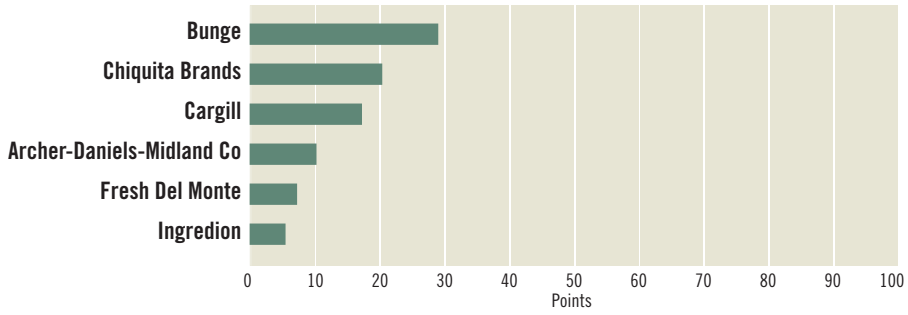
Exhibit 3.2: Evaluation Criteria

Water Management Category	Points by Category: Packaged Food & Beverage	Points by Category: Meat & Agricultural Products	Indicators
Governance & Management	25%	25%	1. Charges board members and senior executives with oversight of water-related issues 2. Considers water in strategy and operations
Direct Operations	30%	30%	3. Reports data on water use and wastewater discharge for direct operations 4. Assesses water risks facing direct operations 5. Sets standards and goals for direct operations on water use, wastewater discharge and impacts on watersheds
Manufacturing Supply Chain	20%	15%	6. Assesses water risks facing manufacturing suppliers 7. Has policies and programs to encourage manufacturing suppliers to improve water and wastewater measurement, management and reporting 8. Supports and incentivizes manufacturing suppliers to strengthen water management practices
Agricultural Supply Chain	25%	30%	9. Assesses water-related risks facing key agricultural inputs and sourcing regions 10. Has policies and programs to encourage agricultural producers to measure, manage and report their water use and pollution impacts 11. Supports and incentivizes agricultural producers in the supply chain to strengthen water management practices

FINDINGS BY INDUSTRY

Agricultural Products

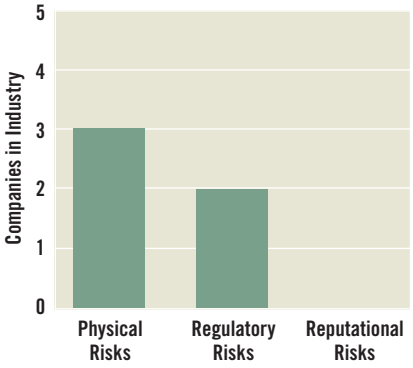
Total Water Risk Management Scores



Estimated 2013 Water Use	
Total Industry Water Use* =	84.8bn gallons
Average Water Use =	14.1bn gallons
Average Operational Water Efficiency (Gallons/ $ Revenue) =	0.28

*Total water use based on self-reported information by companies analyzed in this report. In cases where operational withdrawals were not reported, estimates were made using data disclosed by companies of comparable size and structure.

Disclosure of Water Risks in 10-K Filings (FY2013)



Companies Responding to CDP Water 2014 Information Request:

Bunge

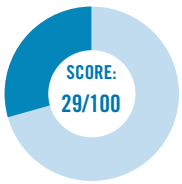
Top Crops by Company*

Archer-Daniels-Midland Co	soy · sunflower · canola/rapeseed · flaxseed · corn · sorghum · rice · wheat · barley · oats · cocoa · sugarcane
Bunge	canola/rapeseed · sunflower · soy · corn · wheat · sugarcane
Cargill	canola/rapeseed · wheat · corn · soy · cocoa · palm oil · tomato · sugarcane
Chiquita Brands	banana · lettuce · apple · pineapple
Fresh Del Monte	banana · pineapple · melon · tomato · grapes · apple · pear · peach · plum · nectarine · cherry · avocado · blueberry · kiwi
Ingredion	corn · tapioca · potato · rice · sugarcane

*Crops reflect those referenced by each company in their 2013 10-K filing and Corporate Social Responsibility (CSR) report. For privately held companies, data was pulled from annual reports and CSR reports.

Top Performer

BUNGE



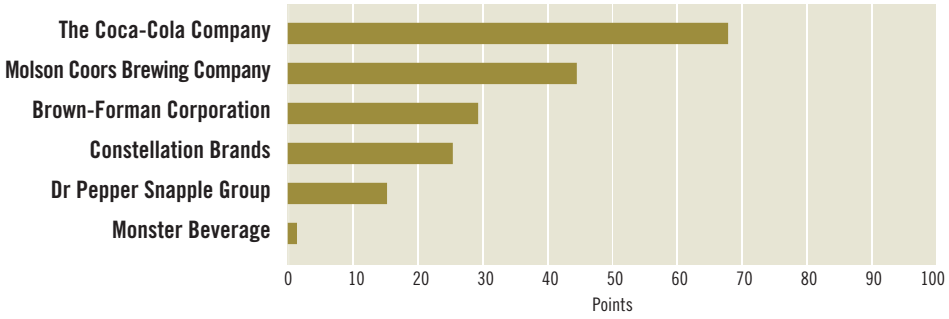
Leading Practices:

- Board of Directors' Sustainability and Corporate Responsibility Committee **has sustainability expertise** with representation from Carol Browner, former Administrator of the Environmental Protection Agency (EPA).
- **Collects water data** from corn growers in the midwest Corn Belt through Field to Market, in partnership with customer Kellogg and The Nature Conservancy.
- **Provides educational support** to growers via third-parties for on-farm sustainability practices, including irrigation through programs in Brazil and India.

FINDINGS BY INDUSTRY

Beverage

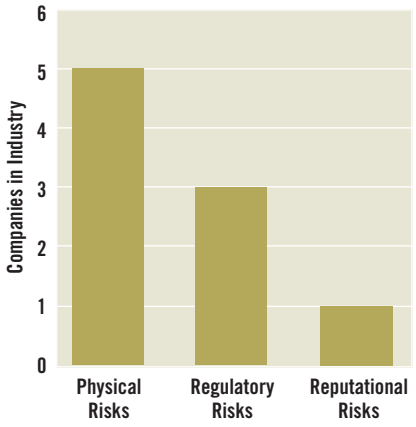
Total Water Risk Management Scores



Estimated 2013 Water Use	
Total Industry Water Use* =	104.8bn gallons
Average Water Use =	17.5bn gallons
Average Operational Water Efficiency (Gallons/ $ Revenue) =	1.56

** Total water use based on self-reported information by companies analyzed in this report. In cases where operational withdrawals were not reported, estimates were made using data disclosed by companies of comparable size and structure.*

Disclosure of Water Risks in 10-K Filings (FY2013)



Top Crops by Company*	
Brown-Forman Corporation	corn · rye · barley · agave · sugarcane · grapes
The Coca-Cola Company	sugarcane · corn · sugar beet · orange · coffee · tea
Constellation Brands	corn · barley · hops · grapes · rye
Dr Pepper Snapple Group	corn · sugarcane · apples
Molson Coors Brewing Company	barley · hops · corn
Monster Beverage	apples · sugarcane · dairy · soy

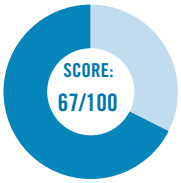
**Crops reflect those referenced by each company in their 2013 10-K filing and Corporate Social Responsibility (CSR) report. For privately held companies, data was pulled from annual reports and CSR reports.*

Companies Responding to CDP Water 2014 Information Request:

Brown-Forman, Coca-Cola, Constellation

Top Performer

Coca-Cola



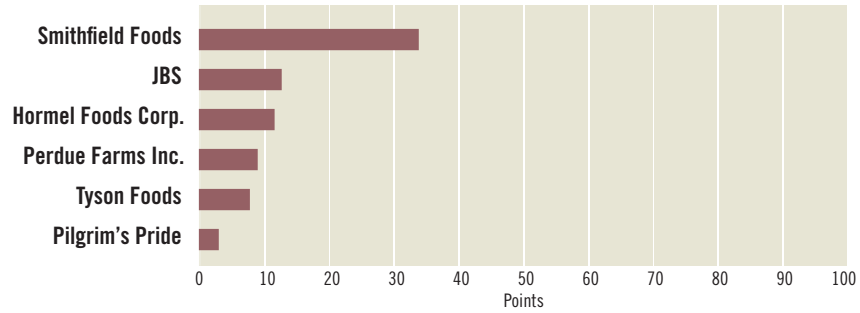
Leading Practices:

- Requires own facilities and manufacturing suppliers (bottlers) to complete a **source water vulnerability assessment** that evaluates risks to the company and surrounding communities, and to **develop and implement source water protection plans.**
- **Set time-bound goals** to source all major agricultural inputs sustainably.
- **Established a global wastewater standard** for its facilities that sets a limit for maximum loading values for major contaminants, unless more stringent regulatory standards apply.
- **Conducts comprehensive risk assessments** throughout its direct operations and supply chain.

FINDINGS BY INDUSTRY

Meat

Total Water Risk Management Scores



Estimated 2013 Water Use	
Total Industry Water Use* =	52.1bn gallons
Average Water Use =	8.7bn gallons
Average Operational Water Efficiency (Gallons/ $ Revenue) =	0.72

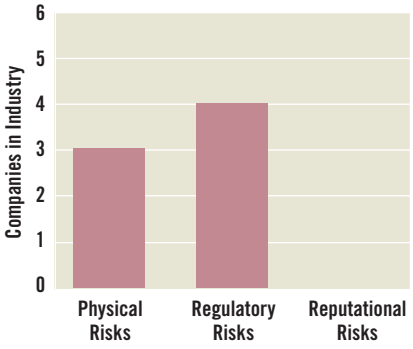
*Total water use based on self-reported information by companies analyzed in this report. In cases where operational withdrawals were not reported, estimates were made using data disclosed by companies of comparable size and structure.

Total Toxic Chemicals Discharged to U.S. Waterways in 2012 (lbs)		Rank*
Tyson Foods	18,556,479	1
Perdue Farms	7,472,092	5
Pilgrims Pride	6,558,172	7
Smithfield Foods	4,347,569	14

*Relative to all other U.S. companies.

Source: Environment America, "Wasting Our Waterways," June 2014, using data self-reported by companies to the EPA's Toxic Release Inventory (TRI)

Disclosure of Water Risks in 10-K Filings (FY2013)



None of the Meat Companies Completed CDP's Water 2014 Information Request

Top Crops by Company*

Hormel Foods Corp.	pork · turkey · corn · sugarcane · wheat
Tyson Foods	corn · soy · poultry · beef · pork · wheat
Perdue Farms	poultry · corn · soy
Pilgrim's Pride	corn · soy · sorghum · wheat · poultry
JBS	corn · soy · beef · pork · poultry
Smithfield Foods	pork · corn · sorghum

*Crops reflect those referenced by each company in their 2013 10-K filing and Corporate Social Responsibility (CSR) report. For privately held companies, data was pulled from annual reports and CSR reports.

Top Performer

Smithfield

Leading Practices:

- Board of Directors has a Sustainability, Community and Public Affairs Committee and the senior executive with oversight for water **reports directly to the CEO.**
- **Discloses a range of water accounting data**, including withdrawals by source, water recycling/reuse, total water discharge, as well as water discharge quality data by effluent parameters.
- **Established a time-bound goal** to have "75 percent of its Southeast [U.S.] grain-sourcing acres participate in a fertilizer optimization and soil health program,"[2] which will be expanded to include grain purchased in the U.S. Midwest in 2015.

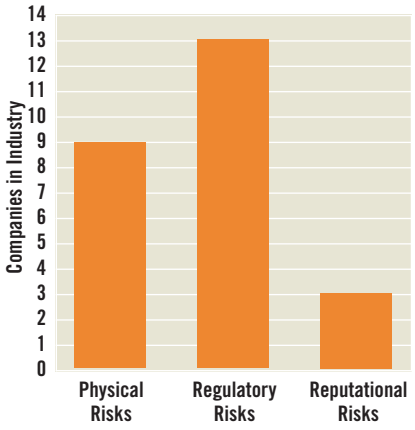
FINDINGS BY INDUSTRY

Packaged Food

Estimated 2013 Water Use	
Total Industry Water Use* =	135.5bn gallons
Average Water Use =	8.7bn gallons
Average Operational Water Efficiency (Gallons/ $ Revenue) =	0.36

*Total water use based on self-reported information by companies analyzed in this report. In cases where operational withdrawals were not reported, estimates were made using data disclosed by companies of comparable size and structure.

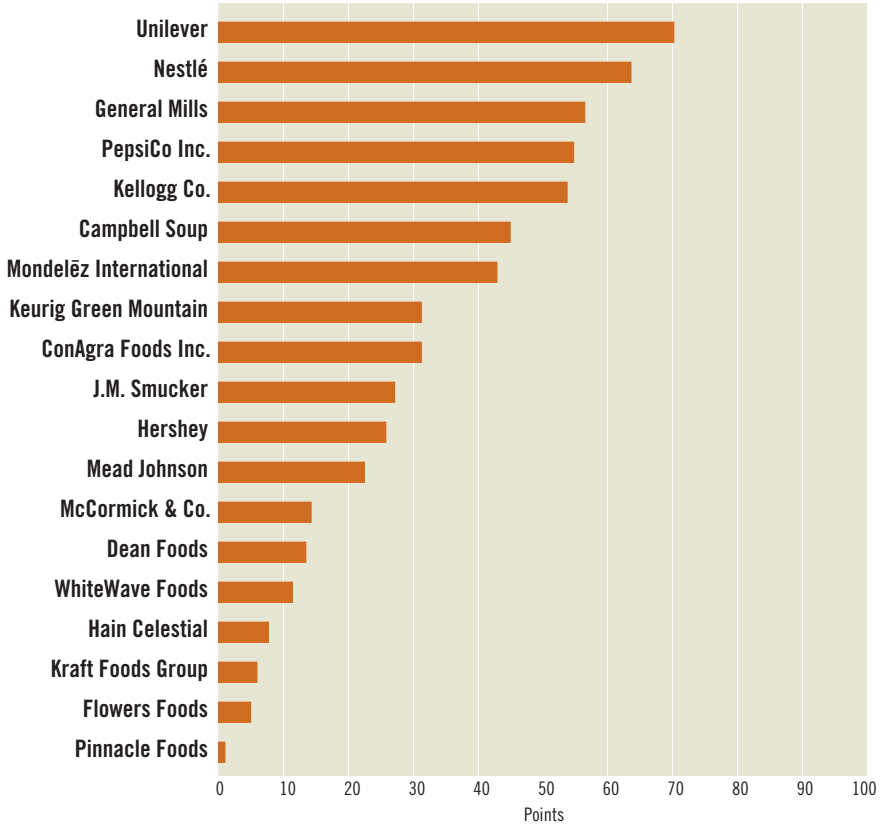
Disclosure of Water Risks in 10-K Filings (FY2013)



Top Performer:

Unilever

Total Water Risk Management Scores



Companies Responding to CDP Water 2014 Information Request:

Campbell Soup, ConAgra, General Mills, Hershey, Kellogg, McCormick, Mead Johnson, Mondelēz, Nestlé, PepsiCo, Smucker, Unilever

Leading Practices:

- CEO's personal **performance goals and bonus are linked to progress** against the company's goals in its Sustainable Living Plan.
- **Uses a shadow price for water to calculate the return of efficiency investments** while also meeting hurdle rates.
- **Prioritizes water efficiency investments** in factories located in water scarce locations when making investments through the "Small Actions Big Difference" investment fund.
- **Has a goal to source** 100 percent of its agricultural inputs sustainably by 2020.
- **Requires manufacturing suppliers to provide data on water** use by responding to the Sedex Supplier Self-Assessment Questionnaire and asks key suppliers to respond to the CDP supply chain information request.
- **Provides financial incentives** to growers and manufacturing suppliers through the Knorr Sustainability Partnership Fund, which invests in innovative projects that accelerate the adoption of sustainable agricultural practices.

Packaged Food

Top Crops by Company*	
Campbell Soup	tomato · beef · poultry · soy · wheat · cocoa · corn · carrots
ConAgra Foods Inc.	wheat · corn · oats · soy · beef · pork · poultry · dairy · sugarcane
Dean Foods	dairy · sugarcane · cocoa
Flowers Foods	wheat · soy
General Mills	oats · wheat · corn · soy · palm oil · dairy · vanilla · cocoa · sugarcane · sugar beet
Hain Celestial	wheat · rice · corn · soy · almonds · canola/rapeseed · dairy
Hershey	cocoa · dairy · peanuts · almonds · corn · palm oil · sugar beet
J.M. Smucker	coffee · peanut · dairy · wheat · corn · soy · palm oil
Kellogg Co.	palm oil · soy · sugarcane · cocoa · potato · corn · rice · wheat
Keurig Green Mountain	coffee · tea · cocoa · sugarcane · dairy
Kraft Foods Group	dairy · coffee · pork · beef · poultry · wheat · soy · sugarcane · corn
McCormick & Co.	pepper · dairy · rice · onion · garlic · soy · vanilla
Mead Johnson	dairy · cocoa · palm oil
Mondelēz International	sugarcane · coffee · cocoa · wheat · corn · soy · dairy
Nestlé	coffee · cocoa · palm oil · sugarcane · dairy · eggs · poultry · soy
PepsiCo Inc.	apple · orange · pineapple · corn · wheat · grapefruit · oats · dairy · rice · sugarcane
Pinnacle Foods	sugarcane · cucumbers · wheat · poultry · seafood · corn
Unilever	palm oil · tea · soy · sugarcane · tomato · dairy · sunflower · canola/rapeseed · cocoa
WhiteWave Foods	dairy · almonds · soy · hazelnuts · lettuce

**Crops reflect those referenced by each company in their 2013 10-K filing and Corporate Social Responsibility (CSR) report. For privately held companies, data was pulled from annual reports and CSR reports.*

CROSS-INDUSTRY FINDINGS

This section presents an overview of key findings across the four industries evaluated. For a more in-depth discussion of results within each water management category, see **Chapter 4**.

Overall Performance

Evidence of strong water management response by some companies, but relatively weak performance overall. Top performers by industry were:

Agricultural Products	Beverage	Meat	Packaged Food
— 29 points —	— 67 points —	— 33 points —	— 70 points —
Bunge	**The Coca-Cola Company**	**Smithfield Foods**	**Unilever**

Companies in the packaged food and beverage industries had stronger overall performance than meat and agricultural products companies. The packaged food and beverage industries had median scores of 27 and 26.5, respectively, while agricultural products and meat companies were 13.5 and 10, respectively.

Corporate Governance of Water Risk

- **Water risk is a corporate governance priority for many of the companies evaluated.** Forty-three percent (19) of companies across all four industries have oversight for water risk at the board level. Fifty-one percent of companies have senior level management oversight of water risk.
- **Despite this, strong board oversight did not consistently translate into strong overall performance.** Of the 16 companies with board oversight, most performed poorly overall, with more than 60 percent receiving fewer than 35 total points.
- **Few companies tie water performance to executive compensation.** **Molson Coors** and **Campbell's** are among four companies that offer explicit financial incentives to executive officers and the CEO for water-related performance.
- **Only two companies report using a shadow price of water to analyze the ROI of water-efficiency investments.** In most of the world, water is low-cost or free for industry, failing to reflect its true scarcity and value. Anticipating future price hikes, both **Unilever** and **Nestlé** use a shadow price for water to calculate the return of efficiency investments while also meeting hurdle rates. Nestlé places a theoretical price on water depending on the water stress of a factory location to help the company better prioritize investments in high water risk regions.
- **Only seven companies—all of them in the packaged food and beverage industries—acknowledged that access to drinking water and sanitation are fundamental human rights.**[3] Having provided formal recognition that water is a human right as voted upon by the United Nations (UN) General Assembly in 2010, some companies are following suit by evaluating the human rights impacts of their water management practices.
- **Few companies are actively supporting reform of public policies that would result in more sustainable water management.** Given generally weak water governance in high water stress regions throughout the world, there is a business interest in advocating for much needed water reforms. **Coca-Cola** and **General Mills** are members of the *Connect the Drops* campaign[4] a business advocacy initiative organized by Ceres that supports more sustainable water management policies in the state of California.

Direct Operations

- **A majority of companies (23) have begun to evaluate water risks in their direct operations, but two-thirds (22) are still not evaluating water issues in their agricultural supply chains.** Coca-Cola, PepsiCo and Unilever are among the few companies that conducted comprehensive water risks assessments throughout their operations and supply chains.
- **Nearly one-third of companies (11) fail to report basic water data.** While half the companies reported data on overall water use, few reported a full range of water accounting data. Brown-Forman, ConAgra and Kellogg are among the companies reporting the most data for their facilities.
- **70 percent (26) have set targets to reduce water use in their direct operations, but the aggressiveness of these targets varies.** Molson Coors has set risk-differentiated targets, requiring that all its breweries in high water risk regions achieve higher water efficiency levels than breweries in less stressed locations.
- **Water quality issues get less priority, with only two companies reporting goals to reduce wastewater discharges and improve water quality beyond compliance requirements.** Coca-Cola has a global wastewater standard for its facilities that sets a limit for maximum loading values for major contaminants, unless more stringent regulatory standards apply. Nestlé has a goal to implement new requirements for water quality and effluent discharge in its factories. The company has initiated a survey to identify gaps in existing wastewater treatment infrastructure and established targeted investments in the facilities that need it most.
- **Only a few companies—Coca-Cola, General Mills and Molson Coors—have developed collaborative watershed protection plans in high water risk regions.** Collaborative efforts that seek to restore watershed functions and invest in highest-return water conservation opportunities allow companies to help mitigate collective water risks, often at a lower cost than would be required to drive further operational efficiencies.

Manufacturing Supply Chain

- **Nearly one-quarter of companies (9) ask manufacturing suppliers to report on water use, wastewater discharge and management practices.** General Mills and Campbell Soup ask suppliers to complete supplier scorecards that include water use sections. Hershey and Unilever use Sedex (a platform for sharing supply chain data) to query suppliers on water management, use and risks.
- **Only five companies require their manufacturing suppliers to establish their own water management programs.** Coca-Cola requires its bottling suppliers to complete a source water vulnerability assessment that evaluates risks to the company and surrounding communities, and to develop and implement source water protection plans.

Agricultural Supply Chain

- **Only six companies have a sustainable agriculture policy that addresses water.** PepsiCo's policy includes the objective to "optimize the applied water footprint to crops and to reduce water waste during irrigation as well as responsibly manage runoff risks of pollution or contamination of ground or surface water with pesticides, nutrients or soil."[5] Unilever has an Agricultural Code of Conduct that includes an entire section focused on water use and pollution and defines practices with which agricultural producers are expected to comply.
- **Despite the lack of policies, 41 percent (15) of companies have set time-bound goals to source agricultural products more sustainably.** For many companies, however, these commitments were limited to only one or two commodities. Only two meat companies had goals. Coca-Cola, General Mills, Kellogg and Unilever are the only companies that have set time-bound goals to source the majority of their agricultural inputs sustainably.

- **43 percent (16) of companies gather data from agricultural producers on the water impacts of their farming practices.** **ADM, Bunge, Coca-Cola** and **Kellogg** are collecting data from some producers through their participation in Field to Market. Some **Brown-Forman** growers are reporting water data through self-assessments as members of the California Sustainable Winegrowing Alliance (CSWA) and the Wine Institute.
- **One-third (12) of companies provide educational support to growers through tools, advising and training programs.** **Molson Coors** has developed a tool to support UK barley growers in assessing their water use and finding ways to save money and manage water holistically. **JBS** offers consultations with technicians to support producers in implementing rainwater harvesting, biodigesting and composting initiatives. **ConAgra** provides support to potato growers through a program that allows them to self-evaluate their farming operations, compare themselves to other growers and identify practices they can implement to improve their performance.
- **Only four companies offer financial support to help growers farm more sustainably.** **WhiteWave's** Horizon Organic Producer Education (HOPE) program invests directly in growers looking to transition to organic farming. **General Mills** provides Mexican growers with interest-free loans to invest in more efficient drip irrigation.

CHAPTER 4

Benchmark Results: Findings by Water Management Category

Governance & Management

Total Points Available in Category: 25/100

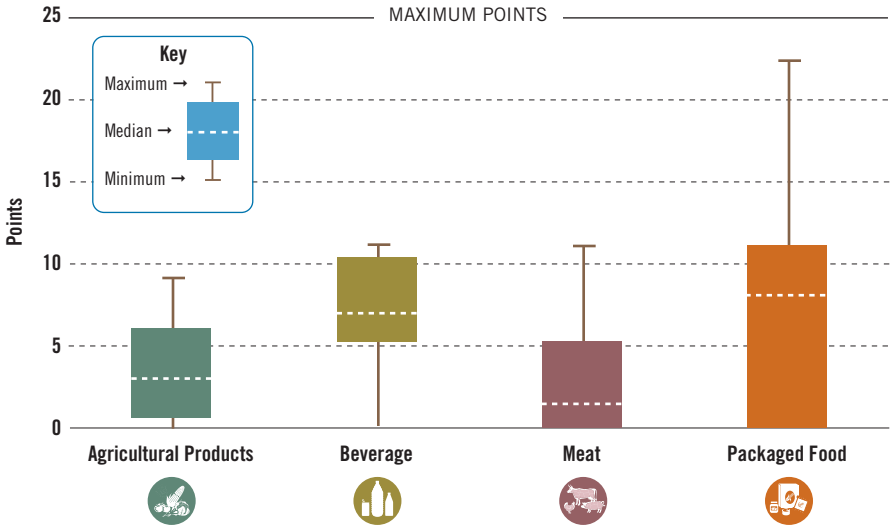
Top Performer

Unilever

Category: Governance & Management

This category assesses the level of board and senior management oversight of water-related issues, ties between executive compensation and water performance, and key business planning activities that take water into account. While there were some examples of strong performance—particularly within the packaged food industry—robust governance of water risk was lacking for most companies (**Exhibit 4.1**).

Exhibit 4.1: Governance & Management Performance



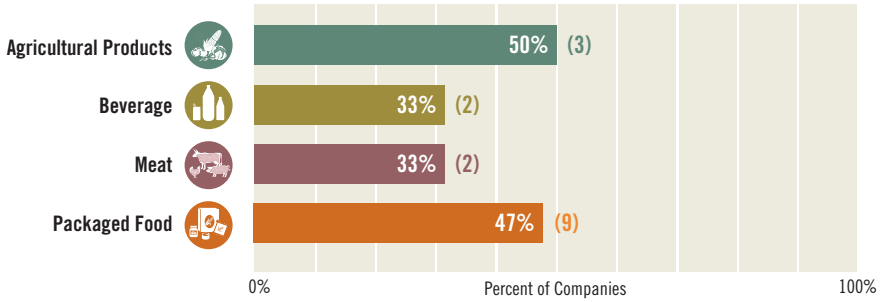
Board Oversight

Forty-three percent (16) of the food sector companies evaluated have boards of directors with explicit oversight for environmental or sustainability-related issues (as indicated by relevant board committee charters), with strongest performance from the packaged food and agricultural products industries (**Exhibit 4.2**). While many of these companies disclosed to CDP that their boards have oversight of water-related risks, none of their board committee charters made explicit reference to water.

Board Committee with Oversight for Environment or Sustainability:

- Bunge
- Chiquita Brands
- The Coca-Cola Company
- ConAgra Foods
- Dean Foods
- Dr. Pepper Snapple Group
- General Mills
- Ingredion
- JBS
- Kellogg
- Keurig Green Mountain
- Mead Johnson
- Mondelēz International
- PepsiCo
- Smithfield
- Unilever

Exhibit 4.2: Companies with Board Oversight

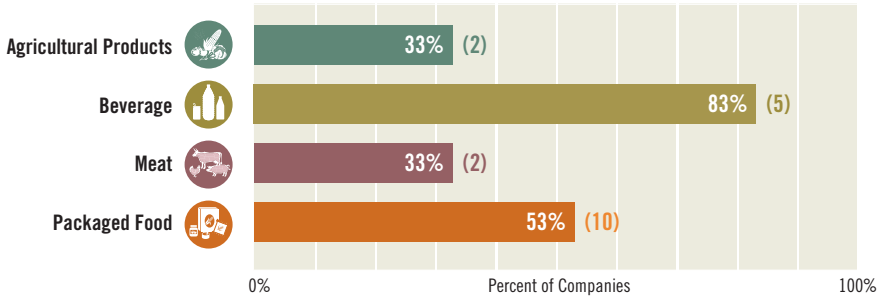


Only three of the companies disclosed that company executives regularly brief the board on water-related issues. Board briefings send a clear signal to investors that board oversight is more than a formality and directors are playing a more active role in overseeing water-related risks.

Senior Executive Oversight

For half (19) of the companies evaluated, management-level oversight for water was relegated to executives at least two levels below the CEO (**Exhibit 4.3**). Twelve of the 37 companies indicated that oversight for water management lay with an individual who reported directly to the CEO or Chairman. Oversight for water at **Smithfield** falls under the responsibility of the Chief Sustainability Officer, who reports directly to the CEO and sits on the leadership team. At **Keurig**, the company's Chief Strategy and Sustainability Officer has responsibility for social and environmental initiatives and reports directly to the President and CEO.

Exhibit 4.3: Companies with Senior Executive Oversight



Water Tied to Executive Compensation

Four of the 37 companies—all within the packaged food and beverage industries—incorporate water explicitly as part of their executive compensation structure, specifically with respect to variable compensation (**Exhibit 4.4**).

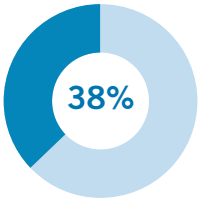
Exhibit 4.4: Water Tied to Executive Compensation	
Campbell Soup	Campbell's has "brought corporate social responsibility into our executive compensation system and included important metrics on energy, water, waste, safety and ethics."[1]
Dean Foods	At Dean Foods, CEO and executive officers receive a financial incentive for achieving sustainability goals, which include a "water per gallon" key performance indicator.
Molson Coors	Molson Coors offers monetary rewards to the CEO, the management group and business unit managers based on performance of "water consumption per hl [hectoliter] of production metric."
Unilever	CEO's personal performance goals and bonus are linked to progress on the company's CSR goals and its Sustainable Living Plan.

Considers Water in Strategy & Business Planning

Only 30 percent (11) of companies indicated that water risks were considered as part of major business planning activities and investment decision-making. Mead Johnson, for example, states that "we consider the availability of water when selecting new business locations, and we seek to achieve efficient use of water resources at all our facilities worldwide."[2] **Constellation** takes this a step further by disclosing that it conducts water risk assessments for all new acquisitions and expansions of existing facilities.

Although water is notoriously underpriced in most markets, Nestlé and Unilever are the only companies in this assessment that disclose using a "true" cost for water for key business planning decisions. Nestlé uses an internal "shadow price" of just over $1 per cubic meter for sites where there is abundant water and approximately $5 in drier regions.

Internal policies that guide procurement decisions with respect to water were disclosed by five companies: including Coca-Cola, Molson Coors, Nestlé, PepsiCo and Unilever. Coca-Cola, for example, has developed a sustainable sourcing "playbook" for its procurement leads to ensure alignment between sustainability policies and targets and internal sourcing decisions.



Of companies have not begun to evaluate water risks.

Analyzed water risks in their supply chains.

Evaluating Water Risks

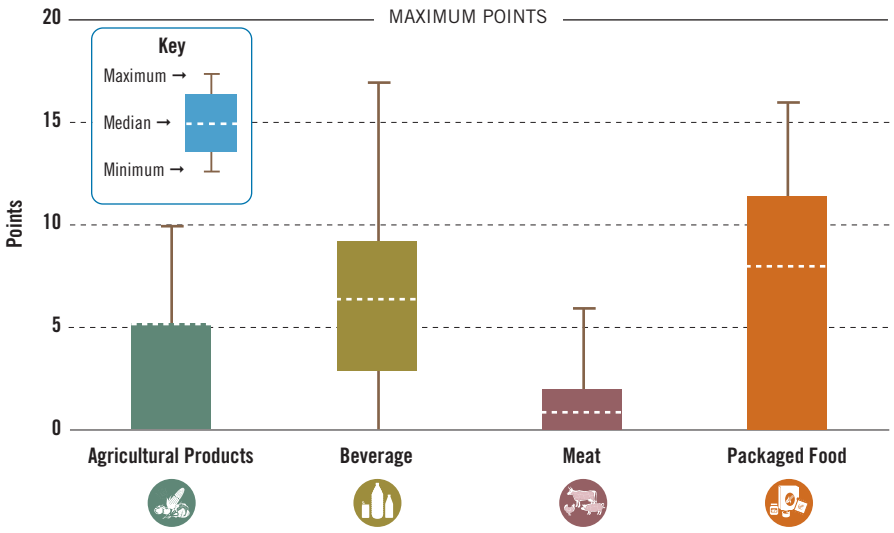
Across the companies evaluated, 38 percent (14) have not begun to evaluate water risks at all. The highest performers were found in the packaged food and beverage industries, which on average achieved 85 percent of the available points allotted to risk assessment indicators (**Exhibit 4.5**).

63 percent of packaged food companies, 50 percent of beverage companies and one-third of both meat and agricultural products companies analyzed water risks in their supply chains.

The robustness of corporate water risk assessments can be evaluated in various ways:

- Do the risk assessments extend beyond direct operations to include manufacturing and agricultural suppliers?
- Does the company analyze both external watershed conditions that may drive water risk, as well as the impacts of their own operations on ecosystems and communities?
- Does the company use more than one third-party tool or data set to analyze its water risks?
- Does the company use forward-looking models or scenarios to identify the likelihood and severity of future risks, such as the potential impacts of climate change and increased competition for water resources?

Exhibit 4.5: Water Risk Assessment



Direct Operations

Total Points Available in Category: 30/100

Top Performers

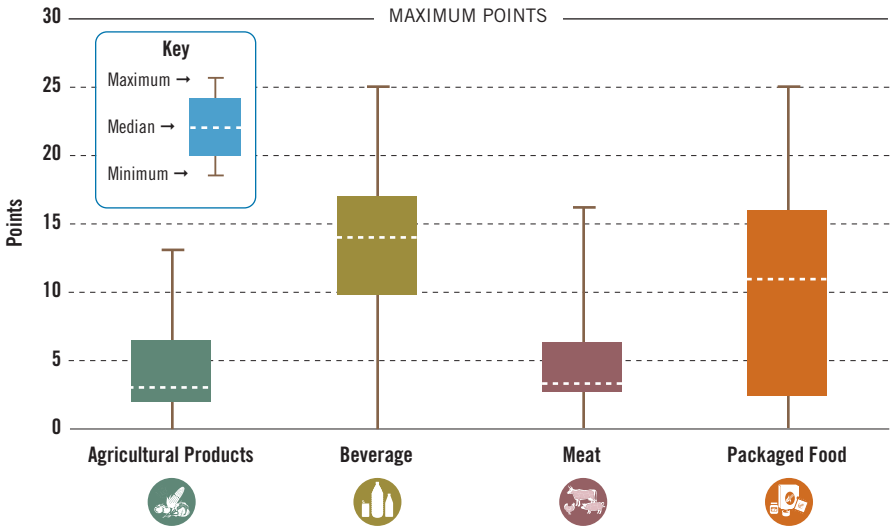
Coca-Cola

Nestlé

Category: Direct Operations

Managing water use and wastewater discharge in direct operations is a long-standing priority for many companies in the food sector, with particularly strong performance shown by the beverage and packaged food industries (**Exhibit 4.6**).

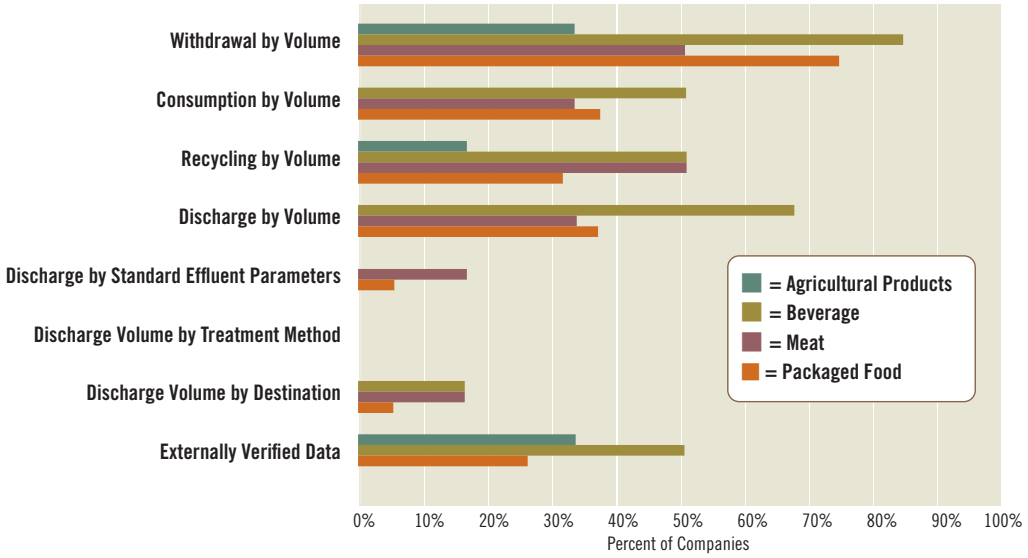
Exhibit 4.6: Direct Operations Performance



Water Accounting Data

Seventy percent (26) of all companies evaluated report basic data on overall corporate water use (withdrawals or consumption), 35 percent (13) report data on total wastewater discharge volumes, but only 27 percent (10) disclose both of these basic data points for all of their significant facilities (**Exhibit 4.7**). Few companies disclosed any of the four water-quality related metrics assessed.

Exhibit 4.7: Water Accounting Data Reported

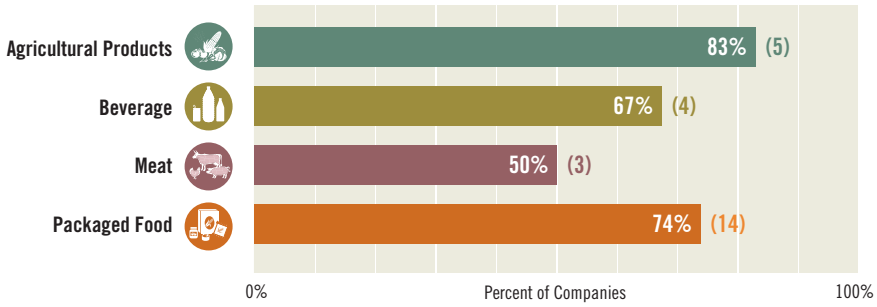


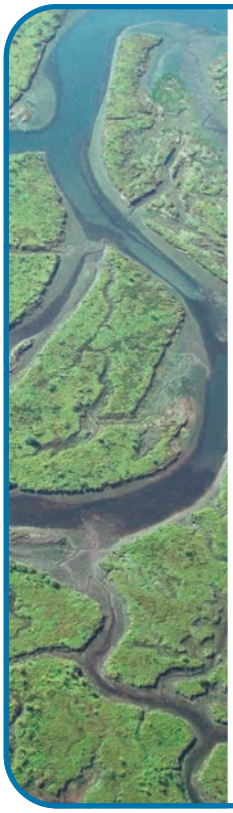
Smithfield is one of the few meat companies disclosing a range of data points and one of two companies, along with **Nestlé**, to report wastewater discharge data by standard effluent parameter. Wastewater discharge data is particularly important for meat companies, whose slaughtering and processing plants typically discharge significant amounts of phosphorus and other pollutants, and whose confined animal feeding operations must manage large quantities of animal waste.

Water Use Reduction Targets

Across the four industries evaluated, 70 percent (26) of companies have set a time-bound, quantitative water use reduction target (**Exhibit 4.8**). Four companies reported absolute reduction targets, while the rest reported normalized or eco-efficiency targets. Companies with the strongest targets used a risk-differentiated approach, which involved setting more aggressive targets for regions or facilities facing higher levels of water stress or risk. Two companies—**Molson Coors** and **Nestlé**—reported risk-differentiated targets. **Molson Coors** has an overall target to reduce water intensity by 15 percent by 2020 from a 2011 baseline, and requires that all its breweries in high water risk regions achieve "a world class water efficiency [ratio] of 3.0 to 3.5 hl/hl depending on the complexity of the brewery."[3]

Exhibit 4.8: Water Reduction Targets





Watershed Protection Plans

Water is a shared resource and presents a shared risk to the many users—industry, cities and farmers—that depend on it. For companies, even achieving best-in-class facility level water efficiency may not be sufficient to mitigate the physical, regulatory or reputational risks that result from the broader mismanagement of local water resources.

In many regions of the world, collaborative efforts to protect and restore watersheds are a critical approach for catalyzing the public and private investment needed to improve the conditions of rivers, lakes, groundwater and related ecosystems on which a company's facilities and supply chains depend. Some companies are developing watershed protection plans that focus targeted corporate resources on various activities—river restoration and aquifer replenishment projects, among others—typically in areas of high water risk and in partnership with local stakeholders. This approach allows various stakeholders to share the burden of what is often a complex, resource-intensive task.

Only four of the companies—**Coca-Cola, General Mills, Molson Coors** and **PepsiCo**—have developed watershed protection plans for their direct operations. Of these, two have plans that extend beyond watersheds associated with their direct operations to include those of key manufacturing suppliers or agricultural sourcing regions.

General Mills has established watershed stewardship plans for key at-risk regions, which the company identified in partnership with The Nature Conservancy. Priority watersheds include a growing region in Irapuato, Mexico, where vegetables are grown and packaged, as well as a growing region in the Snake River region of Idaho where agricultural producers grow wheat for the company. In addition to identifying current and future risks to these watersheds, General Mills seeks to identify stakeholders that are contributing to the depletion and pollution of the watersheds as well as opportunities for collaboration through education and advocacy efforts.

Manufacturing Supply Chain

Total Points Available in

Agricultural Products & Meat:
15/100

Packaged Food & Beverage:
20/100

Top Performer

Coca-Cola

Wastewater Reduction Targets

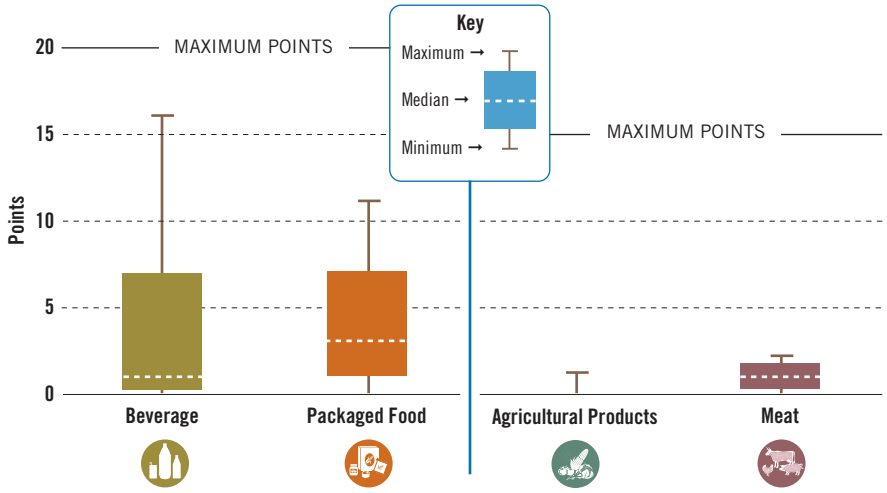
Most companies assessed do not disclose the percentage of their facilities that are in compliance with local wastewater discharge regulations. In addition, only two of the companies evaluated—**Coca-Cola** and **Nestlé**—have a goal or standard to achieve wastewater discharge performance at a level beyond that required for regulatory compliance. **Coca-Cola's** global wastewater standard for its facilities sets maximum concentrations for 20 contaminants (including biological oxygen demand, nitrogen and phosphorus) that must be met unless more stringent local regulatory standards apply.

Category: Manufacturing Supply Chain

Sustainable supply chain performance begins with establishing clear expectations for suppliers via policies and codes that are reinforced through vendor selection criteria, the RFP process and ongoing supplier engagement. In this water management category, companies were assessed on how they are evaluating, influencing and supporting their manufacturing suppliers—typically tier 1 suppliers that process agricultural and other inputs—to better manage water risk and improve water management practices.

Overall performance within this category was quite poor, with only 10 companies achieving more than five points for the category (**Exhibit 4.9**).

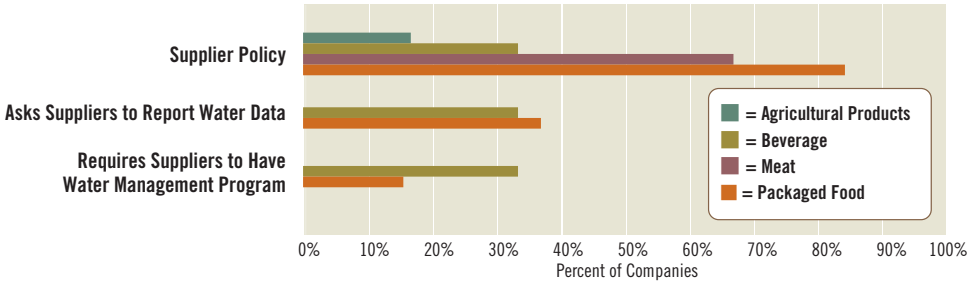
Exhibit 4.9: Manufacturing Supply Chain Performance



Supplier Codes & Policies

Nearly two-thirds (23) of the companies evaluated had a public supplier policy or code requiring manufacturing suppliers to be in environmental regulatory compliance (Exhibit 4.10). Of these, more than half (13) stipulated that their manufacturing suppliers go beyond regulatory compliance to address other environmental sustainability issues and demonstrate continuous improvement. **Kellogg's** supplier policy states that "[s]uppliers must strive to reduce or optimize their use of energy, water, and agricultural inputs, reduce greenhouse gas emissions, minimize water pollution and waste including food waste and landfill usage."[4] **Keurig** states that "[a]ll suppliers should conduct assessments of water usage and impacts in order to improve water management practices."[5]

Exhibit 4.10: Policies and Programs to Improve Manufacturing Suppliers' Water Performance



Supplier Reporting on Water

Nine companies disclosed expectations that their manufacturing suppliers provide them with data on water use, discharge and water management practices. Unilever requires manufacturing suppliers to provide data on water use by responding to the Sedex Supplier Self-Assessment Questionnaire and asks key suppliers to provide water data via the CDP supply chain information request.

Supplier Water Management Expectations

A handful of companies (five) in the packaged food and beverage industries—Coca-Cola, Campbell, Kellogg, Molson and Nestlé—have imposed water management expectations on their manufacturing suppliers. Molson Coors expects suppliers to quantify water consumption and demonstrate how they will seek to reduce this over time; conduct risk assessments that comply with Molson Coors's risk mitigation activities; and impose comparable standards on third-parties and sub-contractors where applicable. The company includes these standards in all contract templates and references them in all terms and conditions of purchase.

Manufacturing Supply Chain

Total Points Available in

Agricultural Products & Meat: 30/100

Packaged Food & Beverage: 25/100

Top Performers

Unilever

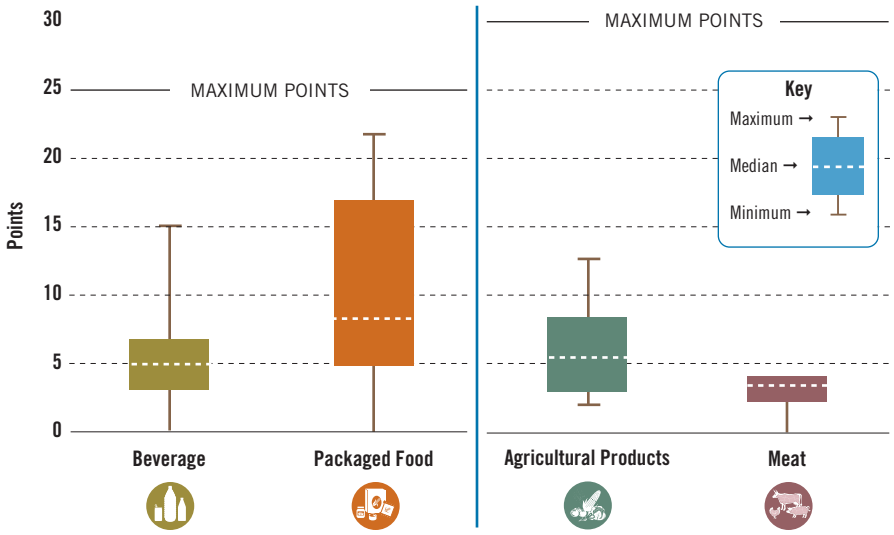
BUNGE

Category: Agricultural Supply Chain

As detailed in **Chapter 2**, 70 percent of global freshwater is used by farmers to grow crops and raise animals. This dependence on water—both in the form of irrigation and precipitation, as well as related water quality impacts—translates into potential risks for companies sourcing agricultural inputs. Understanding the agricultural water management practices of farmers is critical for influencing sustainable food production. Finding appropriate ways to invest in agricultural suppliers is essential: many agricultural producers do not have the financial resources or expertise to adequately address water and other sustainability risks without external support.

In this water management category, companies were assessed on how they are evaluating, influencing and supporting agricultural producers in their supply chains to better manage water risk and improve water-related practices. The packaged food industry outperformed all other industries in this category (**Exhibit 4.11**).

Exhibit 4.11: Agricultural Supply Chain Performance



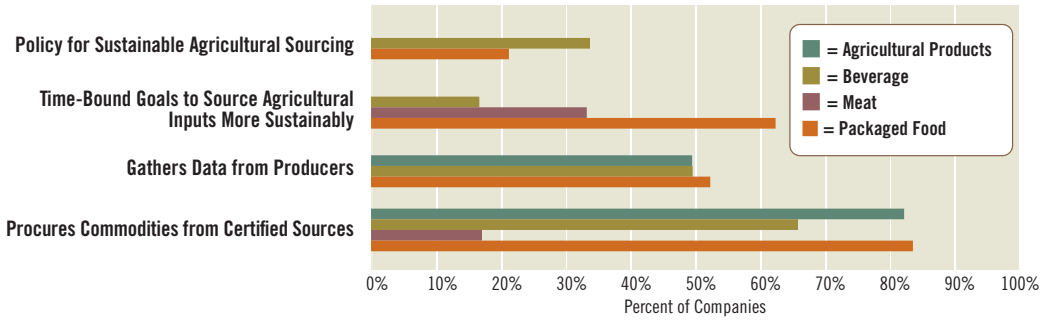
Companies with Sustainable Agriculture Policies

- Coca-Cola Company
- Kellogg
- Molson Coors
- Nestlé
- PepsiCo
- Unilever

Sustainable Agriculture Policies

Only six companies overall (all in the packaged food and beverage industries) had a publicly-available policy or a set of explicit principles outlining expectations and aspirations for the sustainability performance of agricultural producers (**Exhibit 4.12**). All of these policies reference the importance of improving water efficiency and reducing impacts on water quality. **PepsiCo's** Sustainable Agriculture Policy includes principles to "preserve and maintain soil fertility, water and air quality and biodiversity within the agricultural activities" and the objective to "optimize the applied water footprint to crops and to reduce water waste during irrigation as well as responsibly manage runoff risks of pollution or contamination of ground or surface water with pesticides, nutrients or soil."[6] **Unilever's** Agricultural Code of Conduct is the most detailed and prescriptive, defining specific agricultural practices related to water use and water pollution mitigation it expects from its suppliers, and outlining many practices as mandatory.[7]

Exhibit 4.12: Policies and Programs to Improve Agricultural Suppliers' Water Performance



Goals for Sustainable Sourcing

Forty-one percent (15) of companies evaluated have set a time-bound goal for sourcing at least one of their agricultural commodities more sustainably (Exhibit 4.12). These goals have varying levels of strength, with many focusing on only one commodity that makes up a relatively small percentage of a company's total procurement spend. **Smithfield**, for example, has a specific goal related to the sustainability of the grain it sources to feed its hogs. By 2018, it seeks to "have 75 percent of its Southeast [U.S.] grain-sourcing acres participate in a fertilizer optimization and soil health program."[8] In 2015, the company plans to expand this goal to grain purchased in the U.S. Midwest. **ConAgra** and **Hain Celestial** are among a growing number of companies with time-bound goals to source 100 percent of their palm oil from certified sustainable sources.

Of the 15 companies with time-bound sourcing goals, only four—Coca-Cola, General Mills, Kellogg, and Unilever—have goals that apply to the majority of their agricultural purchases. Kellogg and **General Mills** have committed to sourcing 100 percent of their 10 key agricultural inputs sustainably by 2020. In these cases, the companies' definition of "sustainably" varies significantly by commodity, but for most ingredients, water efficiency and water quality are among the metrics used to benchmark improvement in farming practices.

Collecting Data from Agricultural Producers

43 percent (16) of companies (most in the packaged food and beverage sectors) are collecting data on water management practices and performance from agricultural producers in their supply chains (Exhibit 4.12). For most companies, the data collected is often from a very narrow subset of their overall production base.

Some companies gather data from producers directly through audits. **Nestlé** conducts responsible sourcing audits for tier 1 suppliers (which includes some agricultural producers) and requires all other upstream suppliers to be in compliance with the company's Responsible Sourcing Guidelines, a 20-page document that lays out detailed environmental and social requirements on 12 key commodities.[9] Based on these audits, the company discloses that 17 percent of the volume of its key commodities are currently responsibly sourced in accordance with Nestlé's guidelines.

Numerous companies are members of Field to Market, a multi-stakeholder initiative that is creating environmental performance metrics for U.S. commodity crops. Growers participating in Field to Market are using the initiative's "Fieldprint Calculator" to collect data and monitor their water management practices. **Kellogg** and **Bunge**, together with the Nature Conservancy, are asking U.S. corn growers to use Field to Market metrics to monitor their on-farm practices. **ADM**, which supplies soybeans for **Unilever's** Hellmann's Mayonnaise, has enrolled soybean growers in Iowa to begin reporting key environmental metrics, which are anonymously aggregated and shared with Unilever.[10]

The Complexities of Farm-level Data Collection

As companies seek to better evaluate water risks and identify ways to catalyze improvements in water management at the farm level, data on the performance of agricultural producers is increasingly valuable. There can be significant challenges in gathering this data, however, due to traceability challenges in agricultural supply chains, as well as privacy concerns on the part of producers. Approaches to gathering this data vary—and include audits, surveys and anonymous reporting through third-party databases—often depending on a company's location in the value chain and the nature of its relationships with producers. One major point of differentiation in data collection relates to whether the information gathered is focused on farming practices (e.g. no-till agriculture, use of drip irrigation) or on the specific environmental outcomes that these practices can lead to (e.g. improvements in soil health, reductions in groundwater withdrawals). The latter sort of information can be more useful for driving investment decision-making and on-the-ground improvements, while the former can be easier to collect and validate.

Companies and investors should consider the potential reporting burden from new data collection processes, particularly on growers with limited resources. They should carefully weigh the pros and cons of their data collection approach and gauge whether there are ways to support growers in streamlining the data collection process through IT solutions, aligning with multi-stakeholder indicator efforts, and providing other forms of technical support. Additionally, data collection should not be viewed as a compliance or "tick-box" exercise, but should be used in ways that provide real value to producers, such as providing them with a benchmark of their performance against similar producers in their region.

Finally, farm-level data collection has limitations if indicators like water use are not considered in the context of local watershed conditions. Highly efficient producers may use their water savings in one field to expand production in another, potentially still depleting water sources. In addition, the water savings achieved by more efficient farmers can be easily overwhelmed by poor performance by neighboring farmers, thus failing to reduce overall water supply risk in a growing region.

Purchasing Certified Commodities

A majority of companies (70 percent) source at least one agricultural commodity from certified sources (**Exhibit 4.12**). Examples range from companies that are only sourcing certified sustainable palm oil, which may make up less than one percent of their company's procurement purchases, to companies that are sourcing a range of certified commodities such as coffee, tea and chocolate that make up a much larger percentage of their overall procurement spend. **Hain Celestial** was the only company that sources certified inputs for more than 50 percent of its procurement spend (60 percent of Hain Celestial's products are certified organic).

It is important to note that many agricultural certification programs do not comprehensively address relevant water risks and impacts. Some have much more in-depth requirements that take a range of social and environmental factors into account, while others are much more limited in their scope. Going forward, water-focused efforts such as the Alliance for Water Stewardship's new certification standard will likely be of growing relevance to agricultural certification.[11]

Incentivizing Agricultural Producers

Many producers lack information, training or financial incentives that may be needed to adjust their farming practices in ways that reduce water risks and impacts. Producers may view adopting new farming practices that contribute to higher water efficiency or reduced impacts on water quality as a financially risky endeavor, due to real or perceived uncertainty about a practice's effectiveness and return on investment. Corporate buyers can play an important role—both directly and in partnership with supply chain partners, government, NGOs and academia—to channel appropriate educational resources and financial incentives that help producers manage these risks and take on new practices.

Companies that Provide Financial Incentives to Growers for Better Water Management

- General Mills
- Keurig Green Mountain
- Unilever
- WhiteWave Foods

Nearly half (18) of the companies evaluated provide some form of support to growers through education and training or financial incentives. Twelve companies reported providing direct educational or agronomic resources to producers to encourage adoption of practices that reduce impacts on water.

Unilever directly engages with farmers in India, Turkey, China, Tanzania and Kenya to provide guidance on a range of issues, including efficient use of drip irrigation and prudent pesticide use. Unilever also "share(s) our expertise on soil and irrigation management, water reuse and rainwater harvesting techniques with our suppliers, so that they know what they can do to make improvements. For example, we know that applying irrigation only when crops need it and in the right amounts, enhancing soil structure to increase its holding capacity and collecting water from rooftops and run-off can help farmers use water efficiently and can also help improve crop yields."[12]

In 2010, **PepsiCo** established its Sustainable Farming Initiative, a global program to help the company measure the impacts of its agricultural supply chain against a range of environmental, social and economic indicators, including soil moisture, water, management practices and employment conditions. The program provides support to oat, citrus, potato, rice and corn growers. As a part of this program, PepsiCo partnered with the UK's Cambridge University to develop "i-crop," a web-based platform to help PepsiCo growers monitor and manage water and carbon emissions and improve crop yield and quality.[13]

Eleven companies reported funding external programs and projects to help advance water sustainability by farmers in their supply chains. **Mondelēz**, for example, is funding NGOs that provide tools and training to cocoa growers to strengthen agricultural management practices—including limiting fertilizer and pesticide use and protecting water resources.

Only a handful of companies—General Mills, Keurig, Unilever and WhiteWave—reported providing direct financial support to producers. Examples include premiums for more sustainably grown inputs; favorable financing terms or interest-free loans offered for equipment; and financial guarantees. **Unilever** has established the Knorr Sustainability Partnership Fund that invests 50 percent in innovative projects that accelerate the adoption of sustainable agricultural practices.[14]

CHAPTER 5

Recommendations for Companies & Investors

Given the growing materiality of water risks to the food sector, both investors and companies must act to mitigate short-term risks and foster long-term solutions that ensure sustainable food and water supplies.

Company Recommendations

1. **Increase board oversight and understanding of material water risks.** Corporate board members have a fiduciary duty for risk management oversight. While 43 percent (19) of the companies evaluated in this report have board committees charged with environmental oversight, this oversight did not consistently translate into strong water management performance. Board charters should be strengthened to explicitly mention water. Additionally, board members should be regularly briefed by management on water-related risks, and provided with opportunities to engage with external water experts.
2. **Conduct robust water risk analysis.** Many of the companies assessed in this report had relatively weak systems—if any at all—for collecting and interpreting data on the severity of their exposure to water risks. Companies should accelerate risk assessment, including analysis of their manufacturing and agricultural supply chains. When conducting water risk analysis, companies should bear in mind the various kinds of water risks to which they may be exposed (e.g. physical scarcity risks and quality risks, regulatory risks, social license to operate risks), use forward-looking models or scenarios to identify the likelihood and severity of future risks, and use robust datasets to support this analysis (see **Appendix D**).
3. **Address watershed-level risks.** Most food sector companies are limiting their investments in water risk mitigation to improving facility- or field-level water use efficiencies and meeting regulatory compliance standards. While these efforts are important, even achieving best-in-class water use efficiency may not be sufficient to mitigate the physical, regulatory or reputational risks resulting from the broader mismanagement of local water resources. A narrow operational focus may also overlook lower-cost, higher-return opportunities to work collaboratively to reduce risk through activities that protect and restore watersheds. Companies should develop water risk mitigation plans that incorporate targeted investments to improve the conditions of the most at-risk watersheds on which their facilities and supply chains depend. Companies should also consider opportunities to align public policy positions and lobbying activities in ways that encourage government officials to implement more sustainable water management policies.

4. **Tackle water risks and impacts in agricultural supply chains.** As water supplies are increasingly depleted and polluted in major agricultural regions across the world, traditional risk management approaches such as hedging and geographic diversification are becoming less effective. Companies can achieve more by engaging directly with their supply chain to strengthen farmer practices and protect the watersheds. Key strategies include setting sustainable agriculture policies and time-bound sourcing goals, purchasing certified sustainable commodities where relevant, and collecting data from farmers on their practices while providing assistance and incentives for improvement.
5. **Improve disclosure.** Companies need to disclose to investors their exposure to water risk, as well as strategies and progress made in mitigating such risks. As much as possible, data should be reported at the facility or regional level. Companies publicly-listed in the United States are required by the Securities and Exchange Commission (SEC) to disclose to shareholders financially material risks related to climate change and water in their operations and supply chains.[1] Additionally, investors expect companies to provide more detailed disclosure of risks and mitigation strategies through their corporate sustainability reports and in responses to CDP's annual water information request.

Investor Recommendations

1. **Analyze corporate water risk in terms of water dependence, security and response.** When evaluating a company's overall risk, use the information and data resources suggested in this report to capture corporate water dependence (the amount of water needed for a company's direct operations and supply chain, as well as the volumes and intensity of associated wastewater that must be assimilated by a receiving water body); the security of the water resources they rely on; and the quality of management response to those risks.
2. **Go beyond direct operations to consider supply chain water risks.** While most companies in the food sector are not directly involved in agricultural production, many are significantly exposed to agricultural water risks through their suppliers. When analyzing water risks embedded in agricultural supply chains, consider that risk exposure is shaped by several factors, including the primary agricultural commodities the company buys, the level of water dependence and security associated with those commodities, as well as the sourcing model used by the company to procure agricultural inputs.
3. **Engage underperforming companies.** Investors should engage portfolio companies on how they manage water risks. As a result of poor disclosure by many companies in the sector, investors need to engage directly with corporate management to gather relevant information and encourage future disclosure. In addition to direct engagement, consider leveraging existing collaborative investor efforts that engage companies on water, such as Ceres' Investor Network, the United Nations-supported Principles for Responsible Investment's (UNPRI) "Water Risks in Agricultural Supply Chains" group, and the Interfaith Center for Corporate Responsibility's (ICCR) Water & Food group.[2]
4. **Integrate information from water risk analysis and corporate engagement into buy/sell decisions and beyond.** Taking into account unique investor objectives, possible approaches include embedding water analysis into overall environmental, social and governance scores; altering the size of the investment universe to either avoid high water risk industries or companies, or include companies with a strong management response; and embedding water risk analysis in scenario analysis in financial models. Investors can conduct portfolio-level analysis of exposure to high water risk regions, companies or agricultural activities. It is also beneficial to analyze cross-asset class exposure, from equities and fixed income to commodities and farmland funds. For other approaches and more details, see Ceres' *Investor Handbook for Water Risk Integration*.[3]
5. **Support efforts to increase and standardize food sector reporting on water.** While some food sector companies had robust disclosure, most did not, with some companies failing to report basic information on their water use and only 43 percent providing data to CDP's 2014 water information request. Investors should encourage company reporting to CDP, and also support improvements to the survey to ensure that more comparable, industry-relevant data is requested from food sector companies. Investors may also wish to engage the Sustainability Accounting Standards Board (SASB) on food sector water metrics.[4]

APPENDIX A

Methodology

Ceres used a systematic method for evaluating and scoring the water risk management practices of each of the 37 companies assessed. This methodology uses publicly available information and is grounded in the *Ceres Aqua Gauge*,[1] a framework that was developed in 2011 by Ceres, WBCSD, IRRC and Irbaris in consultation with 50 investors, companies and NGOs. The *Aqua Gauge* was developed to aid investors in evaluating the water management activities of corporations in a range of sectors against detailed definitions of leading practice. For the purpose of this analysis, these definitions were modified to enhance their relevance to the unique water use characteristics of the food sector.

ESG investment research firm Sustainalytics supported the analysis by leading the data collection process, providing guidance on the methodology development, and synthesizing initial findings.

How Companies Were Selected

The 37 companies evaluated in this report fall within the food products and beverage industries, as defined by the Global Industry Classification System (GICS).

The companies evaluated represented the largest packaged food, beverage, meat and agricultural products firms listed in either the S&P 500 and/or the Russell 1000 indices as of July 2014. In addition, a few large companies that are either listed on different indices or are privately held were included in the analysis to provide a more comprehensive universe for benchmarking.

Data Sources

For each company, only publicly available information was used for the assessment. Any company disclosures made publicly available after November 15, 2014 were not included in this assessment.

The following documents were reviewed:

- Voluntary corporate disclosures such as sustainability or corporate social responsibility (CSR) reports, press releases, and company websites.
- Company responses to the CDP 2014 water information request.
- In instances where companies did not receive or did not respond to the CDP 2014 water information request, Sustainalytics also looked for relevant information reported to the CDP 2014 supply chain information request, the CDP 2014 climate change information request, and in some cases CDP 2013 water information request. Documents reviewed corresponded to the most recent year available, which was fiscal year 2013 for most companies. In cases where companies had issued water-specific reports or documents before 2013, these materials were also included in the review.
- Mandatory financial disclosures such as 10-K filings and proxy statements. For non-U.S. companies, the company's annual report was reviewed in place of the 10-K.

Data Collection Process & Quality Control

There were multiple rounds of data collection and review. The first level of the data collection, which included an internal review of all companies evaluated, was conducted by Sustainalytics between November 3-15, 2014. Ceres conducted a second round of review and data collection and made minor adjustments to the framework to ensure clarity and consistency in evaluation across industries. Sustainalytics incorporated this review into the assessment and completed another round of data collection for key indicators that had been adjusted.

In addition to conducting a final review of each company assessment, Ceres conducted a number of quality assurance checks of key indicators across companies evaluated. Through these checks, Ceres was able to ensure that companies were evaluated and scored consistently within different indicators and sub-indicators.

Indicators & Weights

Company scores are based on the findings of 11 indicators and 44 sub-indicators that fall within four water management categories: governance & management, direct operations, manufacturing supply chain and agricultural supply chain (**Exhibit A.2**). One hundred points were allocated at the sub-indicator level and roll up into total indicator scores, total water management category scores and total overall company scores.

Due to differences in the operational structure of different industries, point allotments for indicators and water management categories vary slightly by industry. Meat and agricultural products companies are more likely to have direct contractual arrangements with agricultural producers or co-ops, and thus have a different level of influence with respect to their water management practices. As a result, more points were allocated to the agricultural supply chain category for these industries. Packaged food and beverage companies are less likely to have direct relationships with agricultural producers, and have more ability to influence the water management practices of their manufacturing suppliers. For specific point allotments by industry, see **Exhibit A.1**.

Exhibit A.1: Point Allotments by Industry

Water Management Category	Industries	
	Packaged Food & Beverage	Meat & Agricultural Products
Governance & Management	25%	25%
Direct Operations	30%	30%
Manufacturing Supply Chain	20%	15%
Agricultural Supply Chain	25%	30%

Exhibit A.2: Indicator Descriptions

GOVERNANCE & MANAGEMENT		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
1: Charges board members and senior executives with oversight of water-related issues			
1.1 Board Oversight Board committee has oversight over water-related issues (3 points), AND/OR is regularly briefed by management on water-related issues (3 points)	Company's board committee has a charter that references "water," "sustainability" or "environment." "Regularly briefed" means that the board is briefed by management on water issues at least once a year.	6	6
1.2 Senior Executive Oversight The individual with the highest level of direct responsibility for water-related issues reports directly to a member of the Executive Management Committee (3 points), OR the individual with the highest level of direct responsibility for water-related issues reports to the CEO (6 points)		6	6
1.3 Executive Compensation Water is linked to pay or incentive compensation for senior executives	Water is linked to pay (typically, bonus compensation) for senior executives such as CEO, CFO, Chief Sustainability Officer, SVP of Supply Chain. Companies only received credit when water (rather than just "sustainability" or "environment") was explicitly referenced in discussions of executive compensation.	5	5
2: Considers water in strategy and operations			
2.1 Business Planning Company considers water in major business planning activities and investment decision-making	Business planning activities and investment decisions include, among others: acquisitions, capital investments, siting of facilities, contracts with major suppliers, and product development and design. Specific examples include: due diligence for key water performance indicators required for all acquisitions, contracts and capital investments over a certain amount, as well as scenarios where a company has decided to relocate a facility, source a new product, or switch suppliers because of water risks identified.	2	2
2.2 Uses a Well-Founded Value of Water Company uses a well-founded or "shadow" price of water to analyze the ROI of key investments	Company uses a well-founded value of water to make financial decisions. May also be referred to as a "shadow price," "true value," or "full value accounting."	3	3
2.3 Policy to Guide Procurement Function Company has a policy that guides procurement decisions with respect to water-related issues and risks which is integrated into the procurement process	The policy can be part of a larger procurement policy or supplier code, or can be a separate procurement code that focuses specifically on water and sustainable agriculture. It must be directed at the internal procurement team, guide procurement leads in implementing company water management practices, and seek to ensure that existing water policies and goals align with procurement sourcing strategies and practices.	3	3

DIRECT OPERATIONS		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
3: Reports data on water use and wastewater discharge for direct operations			
3.1 Water Withdrawals – total volumes		1	1
3.2 Water Withdrawals – withdrawals by source		1	1
3.3 Water Consumption – total volume		1	1
3.4 Water Recycling/Reuse – total volume	There is no differentiation between water recycling and reuse within this evaluation. Companies define these terms in different ways, making it difficult to measure and evaluate as separate data points.	1	1
3.5 Wastewater Discharge – total volumes		1	1
3.6 Wastewater Discharge – volume by destination		1	1
3.7 Wastewater Discharge – volume by treatment method		1	1
3.8 Wastewater Discharge – by effluent parameters		1	1
3.9 Data for All Significant Facilities	Company reports data on "3.1 water withdrawals" and "3.5 wastewater discharge for all significant facilities." "Significant facilities" are all facilities that use significant water volumes or have significant wastewater discharge.	2	2
3.10 Data is Externally Verified	Verification by an external third party is conducted for at least one of the water accounting data points.	2	2
4: Assesses water risks facing direct operations			
4.1 Analysis of Watershed Conditions As part of risk assessment, use of third-party tools or data sets (or equivalent internal tools) to identify facilities located in watersheds that are water scarce or stressed (2 points) AND to identify facilities in watersheds facing a broader set of risk factors such as impaired ecosystems or water quality, regulations, economic water scarcity, limited water access, etc. (2 points)	Third-party tools & methodologies that companies use to analyze watershed conditions could include: WBCSD's Global Water Tool, GEMI's Global/Local Water Tool, Integrated Biodiversity Assessment Tool (iBAT), WRI's Aqueduct, WWF/DEG's Water Risk Filter, Maplecroft water risk data. Many of the tools listed above have both a water stress/scarcity overlay and other data sets.	4	4
4.2 Analysis of Facility Impacts As part of risk assessment, use of data to evaluate the ecological and social/community impacts of facility water use and wastewater discharge	Companies can assess facility impacts in a variety of ways, including using data on watershed balances, ecosystems health, and the socioeconomic well-being and water access of surrounding communities.	2	2
4.3 Analysis of Future Conditions As part of risk assessment, takes into consideration potential future changes in water availability, quality, regulations, climate change, demand/competition, ecosystem, stakeholder concerns and impacts on local communities		2	2
5: Sets standards and goals for direct operations on water use, wastewater discharge and impacts on watersheds			
5.1 Targets to Reduce Water Use Has targets for reducing water withdrawals/consumption at a company-wide level (2 points), AND uses a risk-differentiated approach (2 points).	Targets should apply to all "significant" direct operations, which includes company facilities across all business units and geographies that use significant volumes of water. A "risk-differentiated" approach is one where more aggressive targets are set for higher risk facilities/regions. (e.g. 25% improvement in water use efficiency in facilities deemed "high risk" vs. 15% improvement target for all other facilities).	4	4
5.2 Wastewater Discharge Standard Company has a goal or standard to ensure wastewater discharge performance at a level beyond that required for regulatory compliance	Voluntary wastewater discharge standards should set a maximum concentration for key contaminants that must be met by all significant facilities, except in the case where more stringent regulatory standards apply.	3	3
5.3 Watershed Protection Plan Company has developed a watershed protection plan or strategy for key watersheds identified as high risk which includes plans to support projects that improve conditions for the watershed in collaboration with local stakeholders	"Plan" or "strategy" should include involvement in collaborative efforts to improve the conditions of rivers, lakes, and groundwater and related ecosystems that the facility depends on and are identified as high-risk. This could include activities such as river restoration projects, reforestation of stream buffers and aquifer replenishment. Watershed protection plans should be linked to areas of risk, and typically encompass more than a one-off project in a single location.	3	3

MANUFACTURING SUPPLY CHAIN		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
6: Assesses water risks facing manufacturing suppliers			
6.1 Analysis of Watershed Conditions As part of risk assessment, uses third-party tools or data sets (or equivalent internal tools) to identify all significant supplier manufacturing facilities located in watersheds identified as water scarce or stressed (1 point); AND to identify supplier facilities in watersheds facing a broader set of risk factors such as impaired ecosystems or water quality, regulations, economic water scarcity, limited water access, etc. (1 point)	Third-party tools & methodologies that companies use to analyze watershed conditions include: WBCSD's Global Water Tool, GEMI's Global/Local Water Tool, Integrated Biodiversity Assessment Tool (iBAT), WRI's Aqueduct, WWF/DEG 's Water Risk Filter, Maplecroft water risk data. Many of the tools listed above have both a water stress/scarcity overlay and other data sets.	2	2
6.2 Analysis of Supplier Performance As part of risk assessment, the company uses information on significant manufacturing suppliers' water use, wastewater discharge and/or management practices to identify supplier facilities with higher environmental or social impacts	Direct forms of data collection could include the use of custom supplier surveys or gathering data from suppliers via sustainability reports, CDP or Sedex. Indirect data collection could be through the use of life-cycle analysis or similar methodologies to estimate general water use and wastewater discharge of specific manufacturing processes or facilities.	2	1
6.3 Analysis of Future Conditions As part of risk assessment, takes into consideration potential future changes in water availability, quality, regulations, climate change, demand/competition, ecosystem health, stakeholder concerns and impacts on local communities for all significant supplier manufacturing facilities		2	1
7: Has policies and programs to encourage manufacturing suppliers to improve water and wastewater measurement, management and reporting			
7.1 Supplier Policy Has a publicly available supplier policy that communicates expectations that manufacturing suppliers maintain environmental regulatory compliance (1 point) AND demonstrate continuous improvement beyond compliance (2 points for packaged food and beverage, 1 point for meat and agricultural products)	A supplier policy or code can be embedded in a larger company policy/code of ethics or can be a stand-alone policy, as long as the policy communicates a clear expectation that manufacturing suppliers maintain environmental regulatory compliance. For beyond compliance, the policy can be specific to water or can include water as one of a range of different areas where continuous improvement is expected.	3	2
7.2 Collects Data from Manufacturing Suppliers Asks significant manufacturing suppliers to report on water use, discharge and management practices	Companies may ask suppliers to report data through various tools, including CDP's water questionnaire, Sedex, or custom supplier surveys. "Significant" suppliers include those that supply a substantial portion of total inputs for production and/or are crucial to operations and cannot be easily substituted.	4	2
7.3 Water Management Program Requires direct manufacturing suppliers to have their own water management program that goes beyond compliance and that imposes comparable standards on their own suppliers		2	2
7.4 Watershed Protection Plan Company has developed a watershed protection plan or strategy for key watersheds identified as high risk, which includes plans to support projects that improve conditions for the watershed in collaboration with local stakeholders	"Plan" or "strategy" should include involvement in collaborative efforts to improve the conditions of rivers, lakes, and groundwater and related ecosystems that the suppliers facility depends on and are identified as high-risk. This could include activities such as river restoration projects, reforestation of stream buffers, aquifer replenishment. Watershed protection plans should be linked to areas of risk, and typically encompass more than a one-off project in a single location.	2	2

MANUFACTURING SUPPLY CHAIN		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
8: Supports and incentivizes manufacturing suppliers to strengthen water management practices			
8.1 Educational Support Provides educational resources or advising to manufacturing suppliers to strengthen water management	"Educational resources" can include trainings or supplier educational summits, access to free technology or water audits, and advising/consulting services from customers.	1	1
8.2 Direct Financial Incentives Provides direct financial incentives to suppliers to encourage stronger water management	"Direct financial incentives" include scenarios where a premium is paid for high performance; baseline performance levels are a requirement for getting or renewing contracts; contracts are made more favorable in some way to the supplier (larger or longer-term); and favorable financing terms are available for equipment or IT solutions.	1	1
8.3 Indirect Financial Incentives Provides indirect financial support to suppliers to encourage stronger water management	"Indirect financial incentives" include scenarios where a company provides financial support to on-the-ground nonprofit organizations, government agencies, industry associations or other third parties, which in turn provide financial or advising support to manufacturing suppliers to improve water management practices.	1	1

AGRICULTURAL SUPPLY CHAIN		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
9: Assesses water-related risks facing key agricultural inputs and sourcing regions			
9.1 Analysis of Watershed Conditions As part of risk assessment, company uses third-party tools or data sets (or equivalent internal tools) to identify all major agricultural sourcing regions in watersheds identified as water scarce or stressed (1 point for packaged food & beverage, 2 points for meat & agricultural products); AND to identify sourcing regions in watersheds facing a broader set of risk factors such as impaired water quality, changes in precipitation due to climate change, threatened ecosystems, regulations, economic water scarcity, weak water access, etc. (1 point for packaged food & beverage, 2 points for meat & agricultural products)	Third-party tools & methodologies that companies use to analyze watershed conditions include: WBCSD's Global Water Tool, GEMI's Global/Local Water Tool, Integrated Biodiversity Assessment Tool (iBAT), WRI's Aqueduct, WWF/DEG 's Water Risk Filter, Maplecroft water risk data. Many of the tools listed above have both a water stress/scarcity overlay and other data sets.	2	4
9.2 Characterization of Water Demands and Pollution Impacts As part of risk assessment, company gathers data on the relative water requirements and impacts typically associated with the production of its major agricultural inputs, including: crop dependence on rainfall vs. irrigation, associated water pollution impacts such as erosion and run-off/groundwater infiltration of chemical fertilizers, manure, pesticides, insecticides or herbicides	Data can be collected in a variety of ways, including through review of academic literature or government data, by conducting water footprint analyses of crops, by getting advice/information through outside consultants or NGOs, or by directly surveying agricultural producers. "Major agricultural inputs" are commodities that make up a significant portion of agricultural inputs purchased by the company.	2	2
9.3 Analysis of Future Conditions As part of risk assessment, takes into consideration current and potential future changes in water availability, quality, regulations, climate change, demand/competition, ecosystem health, stakeholder concerns and impacts on local communities for key agricultural sourcing regions		2	2
10: Has policies and programs to encourage agricultural producers to measure, manage and report their water use and pollution impacts			
10.1 Sustainable Agriculture Policy Has a policy that defines principles of sustainable agricultural sourcing, including with respect to water use and water pollution	Policies ideally include at least some or all of the following: improving irrigation water efficiency, maintaining and improving soil quality and protecting soil biodiversity, decreasing runoff, decreasing use of pesticides and herbicides.	2	2
10.2 Time-Bound Goals for Agricultural Sourcing Has set time-bound goals to source major agricultural inputs more sustainably (2 points if goal(s) apply to "some" major agricultural inputs and 4 points if they apply to "all" major agricultural inputs)	"Major agricultural inputs" are commodities that make up a significant portion of the agricultural inputs purchased by the company. "Some" is at least 1 time-bound goal set for at least 1 significant agricultural input.	4	4

AGRICULTURAL SUPPLY CHAIN		Packaged Food & Beverage	Meat & Agricultural Products
Indicator	**Scoring Guidance**	**Points**	
10.3 Multi-Stakeholder Efforts Participates in multi-stakeholder efforts to develop metrics that enable reporting of water-related and other sustainability data by agricultural producers	Relevant "multi-stakeholder efforts" include Field To Market (FTM), the Stewardship Index for Specialty Crops, the Innovation Center for U.S. Dairy metrics initiative, the Sustainability Consortium, Bonsucro, the Global Roundtable for Sustainable Beef, Forest Stewardship Council, Rainforest Alliance certification, organic certification, Roundtable for Sustainable Palm, Roundtable on Responsible Soy.	2	2
10.4 Certified Sources Procures commodities from certified sources. (1 point for "some" commodities and 2 points for "major" commodities)	"Major commodities" is defined as more than 50% of commodities procured by a company. "Some commodities" is at least 1 commodity from at least 1 certified source.	2	2
10.5 Gathers Data from Producers Directly or indirectly gathers data from producers on their farming practices and water-related performance	Companies can gather data from producers indirectly through their manufacturing suppliers, or through audits, third-party data bases and tools, custom surveys or IT tools developed by companies and provided to growers to aid them in managing their water management practices.	1	4
10.6 Watershed Protection Plan Has developed a watershed protection plan or strategy for key watersheds identified as high risk which includes plans to support projects that improve conditions for the watershed in collaboration with local stakeholders	"Plan" or "strategy" should include involvement in collaborative efforts to improve the conditions of rivers, lakes, and groundwater and related ecosystems that producers depend on and are identified as high-risk. This could include activities such as river restoration projects, reforestation of stream buffers, aquifer replenishment. Watershed protection plans should be linked to areas of risk, and typically encompass more than a one-off project in a single location.	2	2
11: Supports and incentivizes agricultural producers in the supply chain to strengthen water management practices			
11.1 Educational Support Provides educational or agronomic resources to producers to encourage adoption of practices that reduce impacts and improve water efficiency	"Educational resources" include hosting trainings or field days, free advising from an on-staff agronomist and/or sustainable agriculture experts.	2	2
11.2 Direct Financial Incentives Provides direct financial incentives to producers to encourage adoption of practices that reduce impacts and improve water efficiency	"Direct financial incentives" for producers includes scenarios where contracts are made more favorable in some way to the producer (larger or longer-term); a premium is paid to producers; favorable financing terms or interest-free loans are offered for equipment or IT solutions; or financial guarantees (a type of insurance) or purchase guarantees are offered to producers who take the risk of trying new farming practices.	2	2
11.3 Indirect Financial Incentives Provides indirect financial support to producers to encourage adoption of practices that reduce impacts and improve water efficiency	"Indirect financial incentives" include scenarios where a company provides financial support to on-the-ground nonprofit organizations or government agencies/ resource conservation districts which in turn provide agronomic and environmental educational resources, financial incentives or other forms of support to producers to encourage different farming practices.	2	2

APPENDIX B

Detailed Company Scores

		Agricultural Products						Beverage						Meat						Packaged Food																				
		ADM	Bunge	Cargill	Chiquita Brands	Fresh Del Monte	Ingredion	Brown-Forman Corp.	Coca-Cola Company	Constellation Brands	Dr Pepper Snapple Group	Molson Coors Brewing Co	Monster Beverage	Hormel Foods Corp.	JBS	Perdue Farms Inc.	Pilgrim's Pride	Smithfield Foods	Tyson Foods	Campbell Soup	ConAgra Foods Inc.	Dean Foods	Flowers Foods	General Mills	Hain Celestial	Hershey	J.M. Smucker	Kellogg Co.	Keurig Green Mountain	Kraft Foods Group	McCormick & Co.	Mead Johnson	Mondelēz International	Nestlé	PepsiCo Inc.	Pinnacle Foods	Unilever	WhiteWave Foods
Governance & Management		0	3	6	9	0	3	8	11	5	6	11	0	0	3	6	0	11	0	14	3	8	0	11	0	2	3	11	9	0	0	11	9	14	14	0	22	0
	1.1	0	3	0	3	0	3	0	3	0	3	0	0	0	3	0	0	3	0	3	3	3	0	6	0	0	0	6	3	0	0	3	3	0	3	0	3	0
	1.2	0	0	6	6	0	0	6	3	3	3	3	0	0	0	6	0	6	0	6	0	0	0	3	0	0	3	3	6	0	0	6	6	6	6	0	6	0
	1.3	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
	2.1	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	2	0	2	0	0	0	2	0	2	2	0	2	0
	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0
	2.3	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	3	0
Direct Operations		2	13	2	7	4	0	16	25	12	9	17	0	7	4	0	3	16	3	13	16	3	3	20	1	12	11	18	2	0	7	9	15	25	18	1	16	1
	3.1	0	1	0	1	0	0	1	1	1	1	1	0	1	1	0	0	1	0	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	0
	3.2	0	1	0	0	0	0	1	1	0	1	1	0	1	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0
	3.3	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1	0	1	0	0	0	0	1	1	1	0	0	0
	3.4	0	1	0	0	0	0	1	1	1	0	0	0	1	0	0	1	1	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	1	0	1	0	0
	3.5	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	0	0	1	1	0	0	0	1
	3.6	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	3.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	3.9	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	2	0	2	2	0	0	2	0	0	0	2	0	0	0	0	2	2	0	0	2	0
	3.10	0	2	0	0	2	0	0	2	0	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	2	2	0	2	0
	4.1	0	4	0	2	0	0	4	4	4	2	4	0	2	0	0	0	4	2	4	4	0	0	4	0	4	4	4	2	0	2	4	4	4	4	0	4	0
	4.2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	2	0	0	0	0	2	2	2	0	2	0
	4.3	0	2	0	2	0	0	2	2	2	0	2	0	0	0	0	0	2	0	2	2	0	0	2	0	2	2	2	0	0	2	2	2	2	2	0	2	0
	5.1	2	2	2	2	2	0	2	2	0	2	4	0	2	0	0	2	2	0	2	2	2	2	2	0	2	2	2	0	0	2	2	2	4	2	0	2	0
	5.2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	5.3	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Manufacturing Supply Chain		1	0	0	0	0	0	1	16	1	0	9	0	2	1	0	0	2	1	9	2	0	1	7	0	7	2	5	9	3	1	3	7	11	6	0	10	1
	6.1	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0
	6.2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	2	0	0	0	0
	6.3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	7.1	1	0	0	0	0	0	0	1	0	0	3	0	2	1	0	0	2	1	3	1	0	1	3	0	3	1	3	3	3	1	1	3	3	3	0	3	1
	7.2	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	4	0	0	0	4	0	4	0	0	4	0	0	0	4	4	0	0	4	0
	7.3	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0
	7.4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8.1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	8.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural Supply Chain		7	13	9	4	3	2	4	15	6	0	7	1	2	4	3	0	4	4	9	10	2	1	19	7	5	11	20	11	3	6	0	12	14	17	0	22	9
	9.1	0	2	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	2	2	0	1	0	2	0	1	0	2	0
	9.2	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	2	0	0	0	2	2	2	0	2	0
	9.3	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2	0	0	2	0	0	0	2	0	2	0
	10.1	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	2	0	2	0
	10.2	0	0	0	0	0	0	0	4	0	0	0	0	2	0	0	0	2	0	2	2	0	0	4	2	2	2	4	0	0	0	0	2	2	2	0	4	2
	10.3	2	2	2	0	2	2	2	2	2	0	2	0	0	2	2	0	0	2	2	2	2	0	2	2	2	2	2	2	2	2	0	2	2	2	0	2	2
	10.4	1	1	1	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	1	1	0	1	1	2	1	1	1	1	1	1	0	1	1	1	0	1	1
	10.5	4	4	4	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	1	0	1	1	0	0	0	0	1	1	1	0	1	0
	10.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	11.1	0	0	2	0	0	0	0	0	0	0	2	0	0	2	0	0	2	0	2	2	0	0	2	0	0	0	2	0	0	0	0	0	2	2	0	2	2
	11.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	2	2
	11.3	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	2	2	2	0	0	0	2	2	2	0	2	0
Total Score		10	29	17	20	7	5	29	67	24	15	44	1	11	12	9	3	33	8	45	31	13	5	57	8	26	27	54	31	6	14	23	43	64	55	1	70	11

For an Excel version of this data, see www.ceres.org/foodwaterrisk.

APPENDIX C

Water Risks in Key Agricultural Commodities

Several water risk assessment tools are available to companies that rely on agricultural commodities as part of their core business operations. One such tool, the Water Risk Filter[2] developed by WWF and DEG, tracks water risk exposure in the production of 120 crops and provides a Water Risk Score for each. Each score is specific to crop and production location.

To illustrate the water risk inherent in the production end of agricultural supply chains, Water Risk Filter data was requested for the top ten agricultural commodities most commonly sourced[3] by the 37 companies examined in this report. These commodities were: almonds, cocoa, coffee, corn, grapes, palm oil, soybean, sugarcane, tomatoes and wheat.[4]

The physical water risk scores associated with each of these ten crops in the countries and river basins where they are produced are provided here. The Water Risk Filter calculates a physical water risk score using a weighted index of quantitative indicators related to water scarcity and groundwater depletion, water pollution, drought frequency and threats to biodiversity, among others.[5, 6]

Crop water risk is a function of regional water conditions and the physical water requirements and pollution impacts of the specific crop. Exhibit C.1 offers a global snapshot of how physical water risk varied on average among top crop-producing countries. Almonds, grapes, and tomatoes garnered "some" to "high" physical water risk in all four countries responsible for the majority of their production. Sugarcane and wheat production in India also garnered risk scores of 4 ("high risk") or greater.

Exhibit C.1: Water Risk Scores by Crop & Growing Region

Growing Region (Country)	Percent of Global Production Volume*	Physical Water Risk Score (1-5)**	Growing Region (Country)	Percent of Global Production Volume*	Physical Water Risk Score (1-5)**
Almonds* **			**Palm Oil**		
United States	56%	4.0	Indonesia	42%	2.3
Spain	10%	3.6	Malaysia	40%	2.6
Iran	7%	4.0	Thailand	4%	2.3
Italy	5%	3.0	Nigeria	4%	3.1
Cocoa			**Soybean**		
Cote d'Ivoire	32%	2.7	United States	35%	3.3
Indonesia	19%	2.4	Brazil	27%	2.5
Ghana	16%	3.0	Argentina	19%	2.7
Nigeria	9%	2.5	China	6%	3.2
Coffee			**Sugarcane**		
Brazil	33%	2.2	Brazil	41%	2.2
Vietnam	15%	2.6	India	20%	4.1
Indonesia	9%	2.5	China	7%	2.8
Colombia	7%	2.7	Thailand	5%	3.2
Corn			**Tomatoes**		
United States	39%	3.5	China	31%	3.5
China	21%	3.5	United States	9%	4.0
Brazil	7%	2.6	India	9%	3.9
Mexico	3%	3.4	Turkey	7%	4.1
Grapes			**Wheat**		
China	12%	3.5	China	17%	3.7
Italy	12%	3.5	India	12%	4.0
United States	10%	2.6	United States	9%	3.3
France	9%	3.4	Russia	8%	2.9

*Production volumes reflect 5-year average production data (2007-2011) provided by the UN's Food and Agricultural Organization (FAO)

**1: No or very limited risk, 2: limited risk, 3: some risk, 4: high risk, 5: very high risk

***Trends in global almond production have shifted since this data was collected. According to FAO, in 2013, Australia was the second highest producer of almonds, accounting for 5.5% of global production compared to an average 1.3% from 2007 to 2011. Conversely, almond production in Spain fell from an average 10.2% to 5.1% by 2013. Iran and Italy currently rank fifth and eighth in global production volume at 3.0% and 2.5%, respectively.

Exposure to physical water risk in agricultural production should also be assessed at the river basin level. Individual river basins, both within a given country and trans-boundary, contend with varying ecosystem threats and water uses that affect the physical water risk associated with crop production. Physical water risks can also vary within river basins: downstream water availability and quality depend in part on upstream water use, for example. However, gauging the overall water risk of crop production in a given basin can be a useful start to addressing risk exposure and management in agricultural supply chains.

Nearly 20 percent in the 311 river basins captured in the Water Risk Filter analysis of our crops of interest were production locations with high physical water risk scores (4 or higher). These river basins were located across six continents and included production of all ten of our crops of interest.

Eight of these 59 basins were production sites for five or more high-risk crops (Exhibit C.2). All but two of these basins were trans-boundary.

Crops with physical risk scores exceeding 4.5, indicating the highest level of risk, were produced in just eight river basins (Exhibit C.3). These crops included wheat, tomatoes, grapes, cocoa, corn and soybeans. The Yongding, Bravo and Chelif river basins were associated with production of several highest-risk crops, with tomato production captured in all three basins. The highest-risk production of cocoa was concentrated in Peru's Ocoña, Majes and Santa River Basins.

Exhibit C.2: River Basins with Five or More High Risk* Crops

Basin	Country	Number of High Risk Crops
Chira	Ecuador, Peru	7
Bravo	Mexico, United States	6
San Joaquin	United States (CA)	5
Salinas	United States (CA)	5
Yongding	China	5
Guadiana	Portugal, Spain	5
Limpopo	South Africa, Botswana, Zimbabwe, Mozambique	5
Limari	Chile	5

**Indicates a physical water risk score greater than 4 on a 1-5 scale.*

Exhibit C.3: The Highest Risk Crops were Produced in 8 River Basins

Basin	Country	Crop	Physical Water Risk Score
Yongding	China	Wheat	4.793
		Tomatoes	4.629
		Corn	4.565
		Soybean	4.553
Bravo	Mexico, United States	Tomatoes	4.768
		Grapes	4.746
Chelif	Algeria	Tomatoes	4.524
		Grapes	4.502
Ocoña	Peru	Cocoa	4.614
Majes	Peru	Cocoa	4.550
Santa	Peru	Cocoa	4.550
Luan	China	Wheat	4.508
Chira	Ecuador, Peru	Tomatoes	4.501

APPENDIX D

Additional Resources

Water Risk Tools & Datasets

Organization	Tool or Resource	Website
Alliance for Water Stewardship (AWS)	AWS Certification Standard	www.allianceforwaterstewardship.org
Bloomberg	BMAP Water Stress Overlay	Bloomberg Terminal
CDP	CDP Water Information Request	www.cdp.net/water
CEO Water Mandate	CEO Water Mandate Corporate Disclosure Guidelines	www.ceowatermandate.org/disclosure
Ceres	Ceres Aqua Gauge Water Risk Management Tool	www.ceres.org/aquagauge
Ceres	SEC Climate & Water Disclosure Search Tool	http://www.ceres.org/resources/tools/sec-climate-disclosure
Ceres	An Investor Handbook on Water Risk Integration	www.ceres.org/investorwaterhandbook
GEMI	GEMI Local Water Tool	http://www.gemi.org/localwatertool
Maplecroft	Maplecroft Global Water Security Risk Index	www.maplecroft.com/about/news/water-security.html
National Integrated Drought Information System	U.S. Drought Monitor	www.drought.gov
Trucost	Water Risk Monetizer	www.waterriskmonetizer.com
U.S. Environmental Protection Agency (EPA)	EPA Toxics Release Inventory Program	www2.epa.gov/toxics-release-inventory-tri-program
U.S. Environmental Protection Agency (EPA)	EPA Enforcement and Compliance History Online	echo.epa.gov
U.S. Environmental Protection Agency (EPA)	Nitrogen and Phosphorus Pollution Data Access Tool	www2.epa.gov/nutrient-policy-data/nitrogen-and-phosphorus-pollution-data-access-tool
Water Footprint Network	Water Footprint Network's Assessment Tool	waterfootprint.org/en/resources/interactive-tools/water-footprint-assessment-tool
Water Footprint Network	WaterStat (water footprint statistics)	waterfootprint.org/en/resources/water-footprint-statistics
World Business Council for Sustainable Development	Global Water Tool	www.wbcsd.org
World Resources Institute (WRI)	Aqueduct Water Risk Atlas	www.wri.org/aqueduct
Worldwide Fund for Nature (WWF)	WWF-DEG Water Risk Filter	waterriskfilter.panda.org

Agriculture-Related Tools & Datasets

Organization	Tool or Resource	Website
Ceres	Climate & Water Risks Facing U.S. Corn Production	www.ceres.org/cornmaps
Field to Market: The Alliance for Sustainable Agriculture	Fieldprint Calculator	www.fieldtomarket.org/fieldprint-calculator
Innovation Center for U.S. Dairy	Farm Smart Tool	sites.usdairy.com/farmsmart/Pages/Home.aspx
The Stewardship Index for Specialty Crops	Specialty Crop Sustainability Metrics	www.stewardshipindex.org
Sustainable Agriculture Initiative (SAI) Platform	SAI Platform	www.saiplatform.org
U.S. Department of Agriculture	Farm & Ranch Irrigation Survey	www.agcensus.usda.gov/Publications/2012/Online_Resources/Farm_and_Ranch_Irrigation_Survey
UN Food and Agriculture Organization (FAO)	FAOSTAT & AQUASTAT	faostat3.fao.org & www.fao.org/nr/water/aquastat/main/index.stm

Endnotes

Executive Summary

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12 Monika Freyman et al. "An Investor Handbook for Water Risk Integration: Practices & Ideas Shared by 35 Global Investors," Ceres, March 2015, www.ceres.org/investorwaterhandbook

13 SASB is developing and disseminating sustainability accounting standards and indicators to help public corporations disclose material, decision-useful information to investors. See: www.sasb.org

Chapter 1

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Chapter 5

1 For an in-depth discussion of the SEC Climate Guidance, see: Berkley Adrio, "Clearing the Waters: A Review of Corporate Water Disclosure in SEC Filings," Ceres, June 2012, https://www.ceres.org/resources/reports/clearing-the-waters-a-review-of-corporate-water-risk-disclosure-in-sec-filings/view

2 For details, see Ceres' Investor Network for Climate Risk, www.ceres.org/investor-network/incr/incr-working-groups; UNPRI, www.unpri.org/areas-of-work/clearinghouse/coordinated-collaborative-engagements/; ICCR, www.iccr.org/iccrs-issues/water-stewardship-and-sustainability

3 Monika Freyman et al. “An Investor Handbook for Water Risk Integration: Practices & Ideas Shared by 35 Global Investors,” Ceres, March 2015, www.ceres.org/investorwaterhandbook

4 SASB is developing and disseminating sustainability accounting standards and indicators to help public corporations disclose material, decision-useful information to investors. See: www.sasb.org

Appendices

1 Barton, et al., “The Ceres Aqua Gauge: A Framework for 21st Century Water Risk Management, 2012, http://www.ceres.org/issues/water/corporate-water-stewardship/aqua-gauge

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4 Water risk scores for animal agriculture products, including beef and dairy, were not included in this data set.

5 Further details regarding the Water Risk Filter knowledge base, including citations for each component of the physical water risk indicators, can be found here: http://waterriskfilter.panda.org/en/KnowledgeBase#2

6 Data for these indicators were obtained using default weights from the Water Risk Filter questionnaire. These weightings can be found by visiting the Water Risk Assessment tool: http://waterriskfilter.panda.org/en/Assessment#WaterRiskAssessmentTab/facility/992

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