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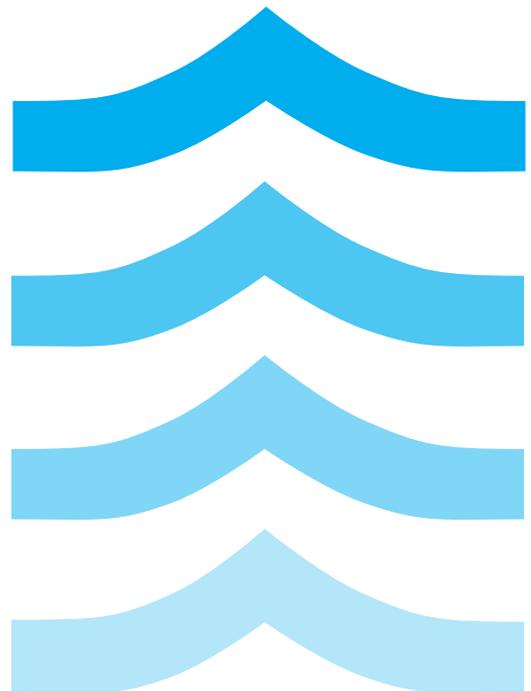
Clearing the Waters: **A Review of Corporate** **Water Risk Disclosure** **in SEC Filings**

A Ceres Report

June 2012

Authored by

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ABOUT CERES

Ceres is an advocate for sustainability leadership. It mobilizes a powerful coalition of investors, companies and public interest groups to accelerate and expand the adoption of sustainable business practices and solutions to build a healthy global economy. Ceres also directs the Investor Network on Climate Risk (INCR), a network of 100 institutional investors with collective assets totaling more than \$10 trillion.

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EXECUTIVE SUMMARY



The global economy depends on water resources to feed growing populations, generate electricity, fuel industrial processes or transport goods. In short, the world runs on water. As populations expand and industrialization and urbanization accelerate, global water supplies are feeling the pinch and companies are more vulnerable to disruptions in their operations, supply chains and logistics.

Water is often the primary vector of climate change. Climate impacts further exacerbate water risks by increasing variability in precipitation patterns and the occurrence and severity of extreme weather events.¹ In the last two years alone, Russia and the United Kingdom have grappled with unprecedented drought, Pakistan and Thailand faced catastrophic flooding, and parts of China, Australia and the United States suffered through both.

Consider the following:

- Texas is the leading beef producer and third largest producer of all agricultural products in the United States. In 2011, prolonged drought, triple-digit temperatures and high winds combined to cause an estimated US\$7.62 billion in crop and livestock damage, triggering nationwide price increases. The state's cotton producers suffered about US\$2.2 billion in losses, while apparel companies faced limited supplies, elevated prices and reduced earnings. At the end of 2011, 98 percent of the state remained in drought conditions.²
- Catastrophic flooding in Thailand in fall 2011 caused massive disruptions for the nation's manufacturers. Leading semiconductor companies shipped 27.7 percent fewer hard drives,³ and the sustained flooding also crimped supply chains for automakers Toyota and Honda. Honda expected the flooding to decrease sales in Thailand by 30 percent. In December 2011, Thai Prime Minister Yingluck Shinawatra estimated flood-related damages at US\$42 billion.⁴
- For the second time in six months, the Peruvian government declared a state of emergency in June 2012 to quell protests against mining operations accused of watershed destruction and groundwater contamination. Newmont's

\$5 billion Minas Conga project has been delayed and protests near Xstrata's Tintaya mine killed two and left dozens injured.⁵

CORPORATE ASSESSMENT & DISCLOSURE OF WATER RISK

With the physical and financial impacts of water issues on the rise, corporations need to do more to assess, disclose and address potential risks. New and better tools and datasets for identifying and managing water risks have emerged in recent years that fill key data gaps and advance corporate risk analysis and water management on a global scale, including the Ceres *Aqua Gauge*, the United Nations' *CEO Water Mandate*, the World Resources Institute's *Aqueduct* and the World Business Council for Sustainable Development's *Global Water Tool*.⁶

Investors exposed to these growing risks through their global investment portfolios are increasingly looking to companies to assess, manage and disclose financially material sustainability risks—including water-related risks. Water-focused reporting is on the rise through corporate sustainability reporting and the Carbon Disclosure Project's water survey; however, voluntary reporting alone is not sufficient. In growing numbers, investors are clamoring for more robust information that is standardized, comparable and easily accessible to inform their investment decisions. Investors are especially interested in seeing such disclosure in companies' financial filings.

Climate-related risks can be financially material. As a result, the U.S. Securities and Exchange Commission (SEC) issued

1 IPCC, "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation," IPCC Special Report, 2012, <http://www.ipcc-wg2.gov/SREX/>

2 Blair Fannin, "Updated 2011 Texas Agricultural Drought Losses Total \$7.62 billion," *AgriLife Today*, March 21 2012, <http://today.agrilife.org/2012/03/21/updated-2011-texas-agricultural-drought-losses-total-7-62-billion/>

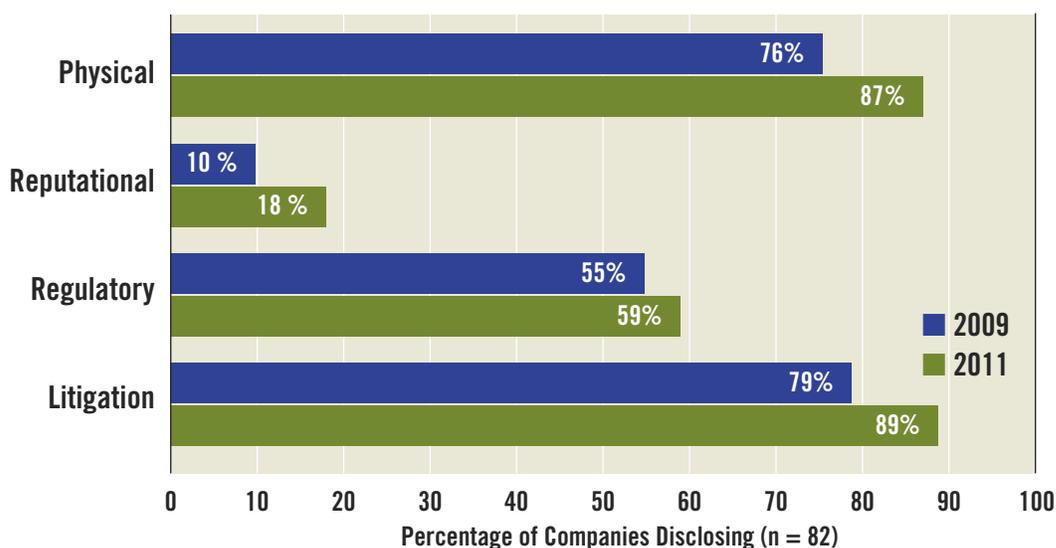
3 Len Jelinek, "Thailand Flood Impacts Semiconductor Test And Assembly Operations Of Multiple Suppliers," *iSuppli*, November 3 2011, <http://www.isuppli.com/Semiconductor-Value-Chain/News/Pages/Thailand-Flood-Impacts-Semiconductor-Test-and-Assembly-Operations-of-Multiple-Suppliers.aspx>

4 Reuters, "Thailand's Flood Crisis And The Economy," *AlertNet*, December 20 2011, <http://www.trust.org/alertnet/news/factbox-thailands-flood-crisis-and-the-economy>

5 Keith Slack, "Peru's Mining Conflicts Explode Again: Protests And Violence In Espinar," *Oxfam America*, June 6 2012.

6 See: The Ceres Aqua Gauge: <http://www.ceres.org/aquagauge>; The CEO Water Mandate: <http://ceowatermandate.org>; WRI's Aqueduct Water Risk Atlas: <http://insights.wri.org/aqueduct/atlas>; WBCSD's Global Water Tool: <http://www.wbcds.org/work-program/sector-projects/water/global-water-tool.aspx>

Figure 1: Disclosure of Water-Related Risks in SEC Filings



specific guidance in 2010⁷ outlining the types of climate change information companies should be providing to investors, including material water impacts. The SEC identified a variety of water-related risks that corporate issuers may need to disclose in their financial filings, including “significant physical effects of climate change, such as effects on the severity of weather (for example, floods or hurricanes), sea levels, the arability of farmland, and water availability and quality.”⁸

CHANGES IN CORPORATE WATER RISK DISCLOSURE SINCE 2009

This study identifies how corporate disclosure of water risk in financial filings has evolved since the release of the SEC’s guidance in 2010. It compares the water risk disclosure of 82 companies, building on baseline data gathered and analyzed by Ceres, Bloomberg and UBS as part of the 2010 report *Murky Waters: Corporate Reporting on Water Risk*.⁹

This report updates the *Murky Waters* analysis, comparing trends in water-related disclosures made in annual mandatory financial reports filed with the SEC in 2009 and 2011 (Forms 10-K, 20-F, or 40-F covering FY2008 and FY2010). Like *Murky Waters*, it looks at how the largest companies in eight water-dependent sectors—beverage, chemicals, electric power, food, homebuilding, mining, oil and gas and semiconductors—are disclosing their exposure to water-related physical, regulatory, reputational and litigation risks, as well as actions they are taking to mitigate those risks.

KEY FINDINGS

This report finds that though overall corporate disclosures of water-related risks in financial filings have increased since 2009, much reporting remains weak and inconsistent especially in regard to data on overall water use, financial exposure and potential supply chain risks. The following is a summary of high-level findings:

1 Disclosure of water risks has increased across the board.

Overall, company disclosures of water-related physical, regulatory, litigation and reputational risks increased between 2009 and 2011 (**Figure 1**). The biggest change over the three-year span was the percentage of companies disclosing water-related physical risks, which increased from 76 percent to 87 percent. The percentage of companies in the oil and gas and chemicals sectors reporting exposure to physical water risks increased 31 percent and 45 percent respectively. There was also a large jump in the number of food companies reporting exposure to water-related regulatory risks, from three companies to eight (a 46 percent increase).

2 More companies are making the connection to climate change.

In 2009, only eight of the 82 companies assessed (10 percent) disclosed that climate change posed growing physical risks in the form of water scarcity, flooding or quality issues to their operations and supply chains. In 2011, that number jumped to 22 (27 percent).

7 U.S. SEC, “Commission Guidance Regarding Disclosure Related to Climate Change,” February 8 2010, <http://www.sec.gov/rules/interp/2010/33-9106.pdf>

8 Ibid, p. 26

9 Ceres, “Murky Waters: Corporate Reporting on Water Risk,” 2010, <http://www.ceres.org/resources/reports/corporate-reporting-on-water-risk-2011/view>

3 Disclosure on water management systems and performance is growing, but still limited.

Multiple companies in the oil and gas, mining, beverage and homebuilding sectors disclose information on water management systems. For instance, **Royal Dutch Shell** discloses setting variable remuneration measures for its executives based on achieving internal sustainability indicators, including fresh water use. Alcoholic beverage company **Brown-Forman** discloses an environmental strategy that includes a process for assessing risks related to water availability and quality, and **Rio Tinto** reports on investments it is making to improve water quality monitoring near its mines in Australia.

4 There is a lack of quantitative data and performance targets.

Despite improvements in overall disclosure, data on company water use and the financial impacts of water-related risks remains infrequent in financial filings. Water use and discharge data and associated performance targets, particularly when provided at the site level, help investors understand the exposure of their portfolio companies to current and future water stress, as well as potential regulatory developments. Although company water use data was scant, some strong examples of disclosure include: **Anheuser-Busch InBev's** work to reduce water use in beer and soft drink production to 3.5 hectoliters of water per hectoliter of product; **BHP Billiton's** five-year target to improve the ratio of water the company recycles relative to the high-quality water it consumes by 10 percent; and **Suncor's** goal to reduce total water intake by 12 percent by 2015.

5 There is limited discussion of supply chain risk.

While many of the companies analyzed disclose exposure to water risks, much of this discussion is limited to risks in their direct operations. For many industries, water risks are most prominent in their supply chains. For example, weather disruptions (e.g. droughts or floods) in major agricultural sourcing areas can pose risks to food companies headquartered thousands of miles away. Despite this, most food companies disclose only very general, standardized language concerning potential supply chain disruptions caused by severe weather. Of the 11 evaluated, **Archer Daniels Midland, Bunge, PepsiCo** and **Smithfield** were the only food companies with water-related supply chain risk disclosure that mentioned specific agricultural commodities or regions facing water risk, or that discussed the impacts of climate change on their supply chains.

RECOMMENDATIONS

In light of these findings, the report recommends that companies:

✓ Undertake more rigorous analysis of potential water-related risks.

Floods, droughts, water quality degradation, increased competition for water resources, new regulations, weak water infrastructure, increased water tariffs, water rights disputes and severe weather can all pose financial risks to a company's operations and supply chains. Companies should continually identify and disclose the full range of material water-related risks and opportunities they face, as well as potential financial impacts.

✓ Augment qualitative disclosure with relevant quantitative data.

SEC disclosure should, wherever possible, focus on providing quantitative information (e.g., water use data, the percentage of operations impacted by a new regulation, the extent of financial losses due to drought, or the cost reductions achieved via innovations or efficiency improvements) as well as qualitative discussion.

✓ Ensure compliance with the SEC's guidance on climate change disclosure.

Overall disclosure of water-related risks has increased since the SEC issued its 2010 guidance on disclosing physical risks related to climate change. However, many corporate issuers are still silent on how climate change may impact their exposure to water-related risks when based on their industry and operations it seems likely that these risks exist.

✓ Provide investors with risk management information.

Given the trajectory of global megatrends, many companies are likely to face new or increasing water risks in the near future. Companies facing significant water risks should use their SEC filings to disclose information related to relevant risk management strategies (e.g. policies, standards, goals and progress toward targets). Such disclosure helps investors understand how companies are positioning themselves for strong financial performance in a water-constrained world.

INTRODUCTION

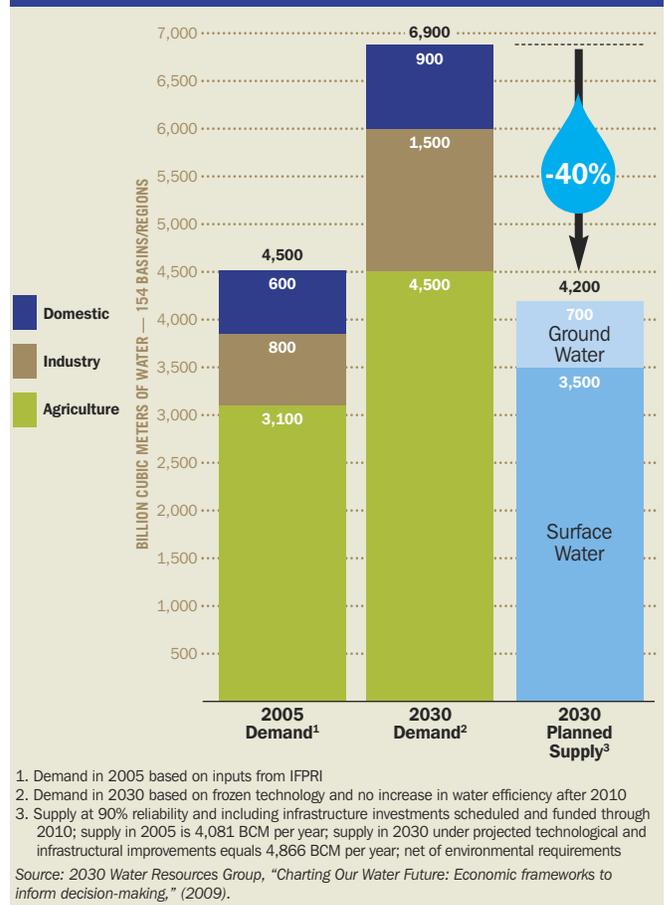


Water risks are intensifying globally. Access to water of sufficient quality and quantity to support local communities, ecosystems and economies is a major concern in many parts of the world.

Drivers like population growth, urbanization and industrialization are combining to exacerbate demand pressures and threaten water quality in some of the most economically important regions in the world. Overlaying all of these drivers are the growing impacts from climate change, including changes in water supply patterns, an uptick in the number and severity of extreme weather events and more severe and frequent cycles of drought and floods.¹ As a result of these trends, many regions of the world are on course to suffer major fresh water deficits in the next 20 years. According to demand projections in a recent study led by McKinsey, the world may face a 40 percent global water shortfall by 2030 (Figure 1).²

There is growing evidence that these water trends are having serious financial impacts on various business sectors (Box 1, p. 9). A 2011 survey sent to the Global 500 companies found that 38 percent of 190 respondents have already suffered water-related business impacts, with associated financial costs as high as US\$200 million (per company).³ Water-related impacts cited in the survey ranged from operational disruptions caused by droughts or floods and the costs to increases in the price of water itself and costs to comply with increased wastewater regulation. Physical water risks (the lack or overabundance of water in a particular place and the resulting impacts on water access and quality) are often the most obvious water challenges, but regulatory, litigation and reputational risks are also growing in many sectors.

FIGURE 1: Global Fresh Water Demand Gap Projected by 2030



1 For example, in 2011, the National Oceanic and Atmospheric Administration reported a record-breaking 14 weather disasters that caused at least a billion dollars of damage each in the United States alone—six of which involved droughts or flooding.
 2 2030 Water Resources Group, "Charting Our Water Future: Economic Frameworks To Inform Decision-Making," 2009, http://www.2030waterresourcesgroup.com/water_full/Charting_Our_Water_Future_Final.pdf
 3 Carbon Disclosure Project, "CDP Water Disclosure Global Report 2011," <https://www.cdproject.net/CDPResults/CDP-Water-Disclosure-Global-Report-2011.pdf>

BOX 1: Recent Financial Impacts From Water-Related Events

- In summer 2011, **Texas and Oklahoma suffered through the worst drought since the Dust Bowl.** Estimates put the cost of drought and associated wildfires at **US\$7.62 billion**, with impacts centered on the cotton and beef industries.⁴
- In November 2011, **catastrophic flooding in Thailand** impacted production, testing and assembly operations for at least eight semiconductor companies with facilities in the region. As a result, hard drive shipments declined 27.7 percent in the fourth quarter of 2011.⁵ Lloyd's of London estimated the disaster cost them **US\$2.2 billion**, and will cost the industry as a whole **US\$15-20 billion**.⁶
- In the summer of 2010, the **worst drought in 50 years hit Russia** and decreased wheat production 33 percent, leading the country to ban exports of the crop. The share prices of several multi-national food and beverage companies were adversely affected, and Russia's growth was impaired an estimated **US\$12 billion**.⁷
- **Drought in China** in the spring of 2012 left 3.5 million people with limited or no access to drinking water, and cost the affected provinces an estimated **US\$2.3 billion**.⁸

INVESTOR REQUESTS FOR IMPROVED DISCLOSURE ON WATER RISKS

To ensure companies are adequately identifying and addressing water-related risks and that investors are receiving robust information about water risk in their portfolios, these issues need to be included with other business metrics in financial filings. In 2010, the Ceres report *Murky Waters: Corporate Reporting on Water Risk*⁹ set out to baseline the water-related risk disclosures of 100 of the world's largest and most water-intensive companies. *Murky Waters* found that while many companies were addressing water issues in voluntary disclosures (e.g. sustainability or corporate social responsibility reports), few were providing information on water risks in their financial filings.

Since that time, water-related risks have become a topic of growing interest and concern among institutional investors. This increasing awareness is evidenced by strong investor support for the Carbon Disclosure Project's (CDP) water survey, an annual questionnaire sent to more than 500 of the world's largest companies in water-intensive sectors asking for a range of water-related information. As of May 2012, over 470 institutional investors representing US\$50 trillion in assets were signatories to the water survey.¹⁰

While voluntary reporting by companies on water issues is increasing through vehicles like the CDP survey and the Global Reporting Initiative's water indicators, voluntary reporting alone is not sufficient. Investors need information that is standardized and regulated, and are seeking stronger water-related disclosure in companies' financial filings.

In 2010, in response to multiple petitions from investors seeking improved disclosure, the U.S. Securities and Exchange Commission (SEC) formally recognized the potential materiality of water-related risks stemming from climate change.¹¹ The SEC's *Commission Guidance Regarding Disclosure Relating to Climate Change* outlines public companies' obligations under securities laws and SEC regulations to disclose material information concerning climate-related risks and opportunities, including relevant water risks.¹² The guidance identifies a variety of water-related risks that corporate issuers may need to disclose in their financial filings, including "significant physical effects of climate change, such as effects on the severity of weather (for example, floods or hurricanes), sea levels, the arability of farmland and water availability and quality."¹³

In light of these developments, this study analyzes how corporate disclosure of water risks in financial filings has changed since the 2010 report, identifies key risks and trends reported by companies in water-exposed sectors and highlights specific examples of strong water disclosure by companies.

4 Blair Fannin, "Updated 2011 Texas Agricultural Drought Losses Total \$7.62 Billion."

5 Len Jelinek, "Thailand Flood Impacts Semiconductor Test And Assembly Operations Of Multiple Suppliers."

6 Juliette Garside, "Thailand Flooding Costs Lloyd's Of London \$2.2bn," *The Guardian*, February 14 2012, <http://www.guardian.co.uk/business/2012/feb/14/lloyds-thailand-flooding-2bn-dollars>

7 BBC News, "Wheat Price Fears Hit Shares In Brewers And Food Firms," *BBC News Business*, August 6 2010, <http://www.bbc.co.uk/news/business-10892637>

8 Nadya Ivanova, "Rains Bring Relief For Six-Month China Drought, But Chronic Water Problems Loom," *CSR Wire*, June 15 2011, http://www.csrwire.com/csrlive/commentary_detail/4706-Rains-Bring-Relief-for-Six-month-China-Drought-But-Chronic-Water-Problems-Loom

9 Ceres, *Murky Waters: Corporate Reporting on Water Risk*, 2010, <http://www.ceres.org/resources/reports/corporate-reporting-on-water-risk-2010/view>

10 For a full list of signatories, see: <https://www.cdproject.net/en-US/Programmes/Pages/cdp-water-disclosure-signatories.aspx>

11 For more information and to view the petition, see: <http://www.ceres.org/press/press-releases/investors-environmental-groups-push-the-sec-to-require-full-corporate-climate-risk-disclosure>

12 U.S. SEC, "Commission Guidance Regarding Disclosure Related to Climate Change," February 8 2010, <http://www.sec.gov/rules/interp/2010/33-9106.pdf>

13 Ibid., p. 26

METHODOLOGY



This new study assesses the water risk disclosure of 82 publicly traded companies in eight sectors: beverage, chemicals, electric power, food, homebuilding, mining, oil and gas and semiconductors.¹⁴

These eight sectors either require large quantities of water or have substantial wastewater discharges associated with their direct operations, supply chains and/or products. The 82 companies assessed represent all of the companies analyzed in *Murky Waters: Corporate Reporting on Water Risk* that also file annual financial reports (i.e. Forms 10-K, 20-F, or 40-F) with the SEC.¹⁵ The study looks at the water-related disclosures made by these companies in the annual financial reports they filed with the SEC in 2009 and in 2011 (covering fiscal years 2008 and 2010). Ceres and Bloomberg collected the data for the 2009 filings as part of the original dataset analyzed for *Murky Waters*.¹⁶ The data from the 2011 filings was collected by Ceres using the same methodology to provide comparable data points.

Filings were reviewed for statements about water-related risk exposure. The statements were then analyzed and categorized according to the following definitions of water-related risk:

- 1. Physical Risks:** Physical water risks are defined as current or predicted changes in water quantity (e.g. droughts or floods) or quality that may impact a company's direct operations, supply chains and/or logistics. Physical water risks also include disruption of needed electric power due to water issues as many electricity sources require water for cooling (e.g. nuclear or coal plants) or for generation (hydropower).
- 2. Reputational Risks:** Reputational risks are defined as current or potential conflicts with the public regarding water issues that can damage a company's brand image or result in a loss of the company's license to operate in a certain community. Reputational risks are particularly

common in developing countries where infrastructure and/or regulation may not be sufficient to provide all users with access to safe and reliable drinking water supplies. The United Nations formally recognized access to safe water as a fundamental human right in 2010, and the human right to water is gaining visibility globally.¹⁷

- 3. Regulatory Risks:** Regulatory risks are defined as the impacts of current and/or anticipated water-related regulations on a given company. As physical and reputational pressures increase, many local and national governments are responding with more stringent water policies. If unanticipated, these regulatory changes can prove costly to companies and, in some cases, limit industrial activities in particular geographies. The United States, EU and China have all instituted stricter water-related regulations in recent years.¹⁸ As demand for and stress on water resources accelerate, this regulatory trend is likely to continue.
- 4. Litigation Risks:** Litigation risks refer to the consequences of lawsuits or other legal actions related to the company's impacts on water levels and water quality. As water challenges continue to gain more attention and water-related physical, reputational and regulatory risks increase, companies face increased litigation risks.

In addition to the four risk categories defined above, company disclosures related to corporate water policies, management practices, performance data and targets and water-related opportunities were analyzed to identify examples of strong disclosure.

14 For the purposes of this study and *Murky Waters*, the sectors reviewed were defined using the Industry Classification Benchmark (ICB) codes, a classification structure maintained by the Dow Jones Indexes and the FTSE Group. See: <http://www.icbenchmark.com>

15 *Murky Waters* analyzed 100 companies. Those that do not file with the SEC and those that underwent major changes (e.g. mergers) were omitted from this analysis.

16 *Murky Waters* used a systematic method for evaluating the quality, depth and clarity of water risk disclosure in both voluntary and mandatory corporate reporting by 100 large companies in eight water-intensive sectors (see *Murky Waters* p. 25). Reviewers analyzed the companies' FY2009 voluntary (e.g. sustainability or CSR reports, company websites) and mandatory (e.g. 10-K filings) disclosures.

17 For more information on the human right to water and UN Resolution 64/292, see: http://www.un.org/waterforlifedecade/human_right_to_water.shtml

18 Summary of key water regulations in China: <http://chinawaterrisk.org/regulations/water-regulation/>, the EU: http://europa.eu/legislation_summaries/environment/water_protection_management/index_en.htm, and the US: <http://water.epa.gov/lawsregs/>

COMPANIES ASSESSED



Beverage Sector	Chemicals Sector	Electric Power Sector	Food Sector
Anheuser-Busch InBev	Dow	American Electric Power	Archer Daniels Midland
Brown-Forman Corporation	DuPont	AES Corporation	Bunge
Constellation Brands	Mitsui	Constellation Energy	ConAgra
Diageo PLC	Monsanto	Dominion Resources	Dean Foods
Dr. Pepper Snapple Group	Mosaic	Duke Energy	General Mills
The Coca-Cola Company	PotashCorp	Entergy	Kellogg Co.
	PPG Industries	Exelon Corporation	Kraft Foods
Homebuilding Sector	Praxair	NextEra Energy ¹⁹	PepsiCo
Beazer Homes	Syngenta	NRG Energy	Sara Lee
DR Horton Inc.		PG&E Corp	Smithfield Foods
Hovnanian	Mining Sector	Pinnacle West ²⁰	Tyson Foods
KB Home	Alcoa	Southern Company	
Lennar	Anglo American	Xcel	Semiconductors Sector
NVR	Barrick Gold Corp		AMD
PulteGroup ²¹	BHP Billiton	Oil & Gas Sector	Analog Devices
Ryland	Consol Energy	BP	Infineon Technologies
Toll Brothers	Freeport-McMoRan	Canadian Natural Resources	Intel
	Massey Energy ²²	Chesapeake Energy	Micron
	Newmont	Chevron	ST Microelectronics
	Peabody Energy	ConocoPhillips	Taiwan Semiconductors
	Rio Tinto	Devon	Texas Instruments
	Teck	Encana	UMC (United MicroElectronics)
	Vale	Exxon-Mobil	
		Nexen	
		Range Natural Resources	
		Royal Dutch Shell	
		Suncor Energy	
		Total	

19 Florida Power & Light Group was renamed NextEra Energy in 2009.

20 The Pinnacle West Corporation and Arizona Public Service Company are now collectively known as Pinnacle West.

21 In 2009, Pulte acquired Centex Homes and the merged company became PulteGroup. Centex and Pulte were both analyzed in *Murky Waters*; PulteGroup is analyzed in this report.

22 In June 2011, Alpha Resources and Massey Energy merged to form Alpha Appalachia. This report and *Murky Waters* reviewed filings made by Massey Energy before the merger.

KEY FINDINGS

Analysis of the four categories of water risk (physical, reputational, regulatory, and litigation) revealed a number of trends:



- 1. Disclosure of water risks has increased across the board*
- 2. More companies are making the connection to climate change*
- 3. Data on water use and performance goals are lacking*
- 4. Supply chain risks are underreported*
- 5. Information on how companies are mitigating water risks and engaging stakeholders is limited, but growing.*

1 Disclosure of water risks has increased across the board.

Disclosure of water-related physical, regulatory, litigation and reputational risks in SEC filings increased from 2009 to 2011 (**Figure 1**). The biggest change over the three-year span was seen in the percentage of companies disclosing water-related physical risks, which increased from 76 percent to 87 percent. Changes in physical water risk disclosure within four sectors analyzed (chemicals, electric power, homebuilding, and oil and gas) account for this increase, while disclosure in the remaining sectors (beverage, food, mining and semiconductors) stayed the same (**Figure 2**).

The depth and specificity of water risk disclosures has improved somewhat, with some companies providing more detailed discussions of physical, regulatory, reputational and litigation risk (**Table 1, p. 14**). Despite these improvements, however, most companies still fall short on identifying key geographies or specific operations where they are more exposed to physical water risk. As water is a highly local issue, this context is crucial in allowing investors to assess the potential severity or significance of the risk exposure.

FIGURE 1: Percentage of Companies Reporting Exposure to Water Risks by Category

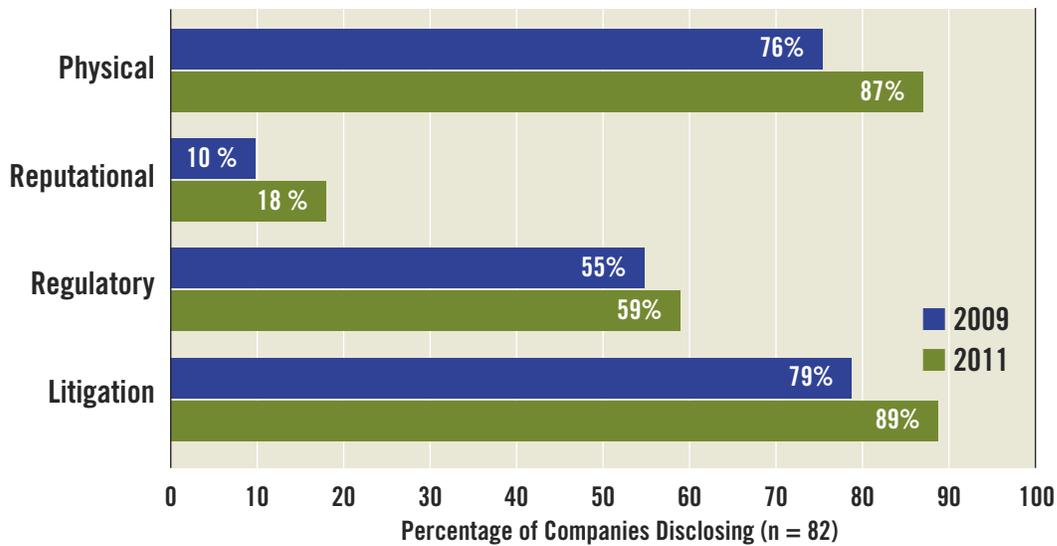


FIGURE 2: Percentage of Companies Disclosing Water-Related Physical Risks by Sector

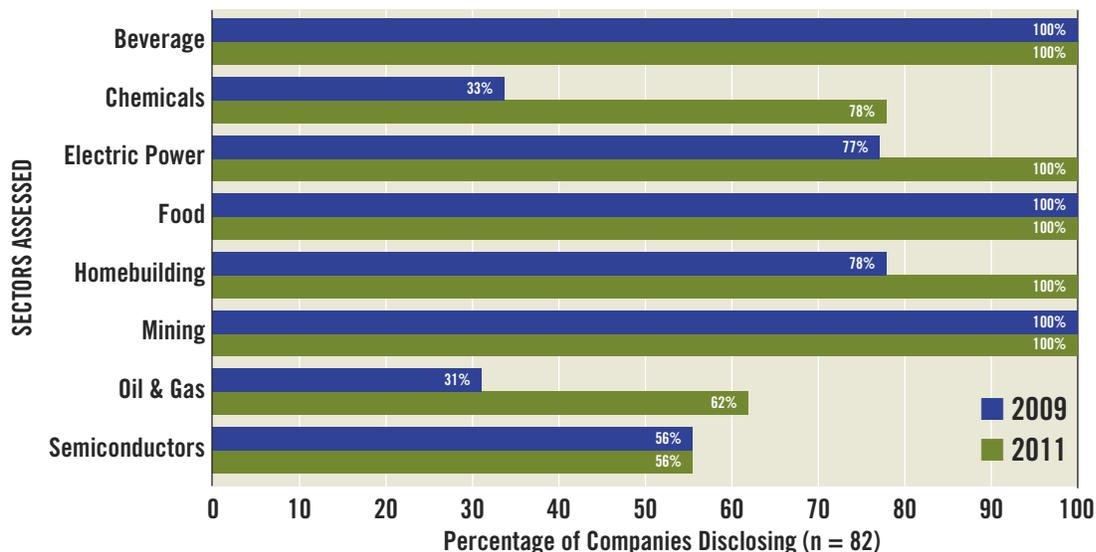


TABLE 1: Examples of Water-Related Disclosures by Risk Category (2011 Filings)

Type of Risk	Company	Statement
Physical: Water scarcity	The Coca-Cola Company	“Water scarcity and poor quality could negatively impact the Coca-Cola system’s production costs and capacity. Water is the main ingredient in substantially all of our products. It is also a limited resource in many parts of the world, facing unprecedented challenges from overexploitation, increasing pollution, poor management and climate change. As demand for water continues to increase around the world, and as water becomes scarcer and the quality of available water deteriorates, our system may incur increasing production costs or face capacity constraints which could adversely affect our profitability or net operating revenues in the long run.” (10-K, p. 13)
Physical: Water quality & quantity	Brown-Forman	“As water is one of the major components of our products, the quality and quantity of the water available for use is important to our ability to operate our business. If hydrologic cycle patterns change and droughts become more common and severe, there may be a scarcity of water in some of our key production regions including California and Mexico.” (10-K, p. 8)
Physical: Extreme weather and changes in precipitation patterns	Exelon Corporation	“The physical risks of climate change, such as more frequent or more extreme weather events, changes in temperature and precipitation patterns, changes to ground and surface water availability, sea level rise and other related phenomena, could affect some, or all, of the Registrant’s operations...Finally, climate change could affect the availability of a secure and economical supply of water in some locations, which is essential for Exelon’s and Generation’s continued operation, particularly the cooling of generating units.” (10-K, p. 45)
Regulatory: Changes in water prices, permits, and water quality standards	Anheuser-Busch InBev	“Water may also be subject to price increases in certain areas and changes in water taxation and regulation in certain geographies may result in a negative effect on operating income which could potentially challenge our profitability in certain markets. There is no guarantee that we will be able to pass along increased water costs to our customers in every case.” (10-K, p. 5)
Regulatory: Changes in environmental regulation	Suncor	“Changes in environmental regulation could have a material adverse effect on us from the standpoint of product demand, product reformulation and quality, methods of production, distribution costs and financial results... Some of the issues that are or may in future be subject to environmental regulation include: the possible cumulative regional impacts of oil sands development; the manufacture, import, storage, treatment and disposal of hazardous or industrial waste and substances; the need to reduce or stabilize various emissions to air; withdrawals, use of, and discharges to water; issues relating to land reclamation, restoration and wildlife habitat protection.” (40-F, pp. 57 & 61)
Reputational: Project interruptions due to negative public perception of water use	Nexen	“Public perceptions of greenhouse gas emissions, and water and land use practices in oil sands developments may directly or indirectly impair the profitability of our current oil sands projects and the viability of future oil sands projects in a number of ways...These perceptions may also impair our corporate reputation and limit our ability to access land and joint venture opportunities in other jurisdictions throughout the world.” (10-K, pp. 42 & 46)
Litigation: Competition & water rights	Freeport-McMoRan	“Our operations in North and South America are in areas where water is scarce and competition among users for continuing access to water is significant. Continuous production at our mines depends on our ability to maintain our water rights and claims.” (20-F, p. 44)
Litigation: Groundwater contamination	Royal Dutch Shell	“Shell Oil Company, along with numerous other defendants, have been sued by public and quasi-public water purveyors, as well as governmental entities, alleging responsibility for groundwater contamination caused by releases of gasoline-containing oxygenate additives. Most of these suits assert various theories of liability, including product liability, and seek to recover actual damages, including clean-up costs. Some assert claims for punitive damages.” (10-K, p. 137)

2 More companies are making the connection to climate change.

The SEC climate guidance issued in 2010 requires companies to disclose financially material risks from climate change, including “significant physical effects of climate change, such as effects on the severity of weather (for example, floods or hurricanes), sea levels, the arability of farmland, and water availability and quality.” In their 2011 filings, 22 of the 82 companies analyzed explicitly link climate change to water risks, compared to only eight companies in 2009 (*Table 2*). The types of climate change-related impacts disclosed include flooding, droughts, changes in precipitation and increased frequency and severity of extreme weather events. In many cases, the specificity of these disclosures has also improved since 2009.

3 Data on water use and performance goals are lacking.

Despite improvements in disclosure overall, data on company water use and quantitative targets for improving performance remain infrequently disclosed in financial filings. Water use and discharge data, particularly when provided at the site level, helps investors understand the exposure of their portfolio companies to current and future water stress, as well as potential regulatory developments. Although company water use data was scant, **Anheuser-Busch InBev**, **BHP Billiton**, **Suncor** and **United MicroElectronics** provide strong examples (*Table 3*).

TABLE 2: Making the Climate Connection: Companies Identifying Growing Water Risks Linked to Climate Change

Sector	2009	Percent	2011	Percent
Beverage	Coca-Cola Company	10%	Anheuser Busch InBev, Brown-Forman, Coca-Cola Company, Constellation Brands, Diageo	83%
Chemicals	Mosaic	7%	Mosaic, Mitsui, Syngenta	33%
Electric Power	Exelon Corp, Pinnacle West	15%	Exelon Corporation, Pinnacle West	15%
Food	—	0%	Bunge, PepsiCo, Smithfield Foods	27%
Homebuilding	—	0%	KB Home	11%
Mining	Alcoa, BHP Billiton, Freeport McMoRan	23%	Alcoa, BHP Billiton, Freeport McMoRan, Newmont	33%
Oil & Gas	—	0%	Nexen	8%
Semiconductors	Intel	9%	Intel, Taiwan Semiconductors	22%

TABLE 3: Water Data & Performance Targets (2011 Filings)

Anheuser-Busch InBev	“Reduce water use for beer and soft drinks plants to an industry-leading 3.5 hectoliters of water per hectoliter of product (hl/hl).” (10-K, p. 49)
BHP Billiton	“We have a five-year target of a 10 percent improvement in the ratio of water recycled to high-quality water consumed by 30 June 2012.” (20-F, p. 122)
Suncor	“Suncor has set four key environmental performance goals it intends to reach by 2015 (the base year for planned improvements is 2007): reduce total water intake by 12 percent, increase land area reclaimed by 100 percent, improve energy efficiency by 10 percent and reduce air emissions by 10 percent.” (40-F, p. 18)
United Micro-Electronics	“In 2010, UMC completed water footprint verification for our 200 mm and 300 mm wafers. These verifications provide scientific and reliable statistics on the carbon and water information of products manufactured in our fabs as well as self-reviews of environmental impact.” (20-F, p. 38)

4 Supply chain risks are underreported.

While many of the companies analyzed disclose exposure to water risks, much of this discussion is confined to risks facing their direct operations. For many industries, water risks are most prominent in the supply chain. For example, weather disruptions (e.g. droughts or floods) in major agricultural sourcing areas can pose risks to food companies headquartered thousands of miles away. Despite this, most of the food companies disclose only very limited, standardized language around potential supply chain disruptions caused by severe weather. **Archer Daniels Midland, Bunge, PepsiCo** and **Smithfield** were the only food companies (of the 11 evaluated) with water-related supply chain risk disclosure that mentioned specific agricultural commodities or regions facing water risk, or that discussed the impacts of climate change on their supply chains.

5 Information on how companies are mitigating water risks and engaging stakeholders is limited, but growing.

Multiple companies in the oil and gas, mining, beverage and homebuilding sectors disclose information on systems in place to manage water (**Table 4**). Notably, all 13 oil and gas companies analyzed disclose information on water-related management systems and/or efforts to improve efficiency or wastewater discharge. As water is a complex and highly local issue, good management strategies require engagements with stakeholders like local communities, governments, environmental groups, peer companies and/or other industries in the region. Some companies in the oil and gas and mining sectors also include discussion of ways they engage relevant stakeholders on water issues.

TABLE 4: Water Risk Management & Stakeholder Engagement

Beverage Sector	In 2009, Coca-Cola was the only beverage company to disclose management responses to mitigate the potential impacts of water risks on direct operations. In 2011, all six beverage companies reviewed cite management responses. For example, Diageo's disclosures focus on company operations in water-stressed areas, water conservation efforts at individual facilities and the creation of a new water strategy.
Homebuilding Sector	Beazer Homes' 2011 filing includes discussion of their "eSMART Initiative," a home-building program focused on energy and water efficiency and improved indoor air quality. The eSMART Initiative was cited throughout the company's 10-K and described as a comprehensive environmental stewardship program which seeks to make water conservation standard in all of its homes.
Mining Sector	Rio Tinto's subsidiary Energy Resources Australia has invested A\$11.2 million toward water management improvements across its entire uranium mining operation. The company has also installed water quality sensors in local waterways to improve its ability to detect and respond to changes in water quality.
Oil & Gas Sector	To manage its water use, Shell has set remuneration measures for its executives based on the company achieving internal sustainability indicators, including fresh water use. Their annual bonus scorecard measures performance on fresh water use (alongside safety, spills and energy efficiency). Nexen conducts community consultations prior to siting new projects and Suncor and Encana discuss efforts to work with peers, trade associations, suppliers and regulators to improve environmental and social performance.
Semiconductor Sector	Intel discusses working proactively with governments, environmental groups and the industry at large to promote sustainability on a global scale.

RECOMMENDATIONS



While disclosure of water-related risks in SEC filings has increased from 2009 to 2011, substantial gaps remain. It is important to recognize that an increase in the number of companies disclosing water-related information does not necessarily speak to the quality of the information disclosed.

Based on the findings of this analysis, the report recommends that companies:

✓ Undertake ongoing analysis of potential water-related risks.

Floods, droughts, water quality degradation, increased competition for water resources, new regulations, weak water infrastructure, increased water tariffs, water rights disputes and severe weather can all pose financial risks to company operations and supply chains. Companies should continually identify and disclose the full range of material water-related risks and opportunities they face, as well as their respective financial impacts.

✓ Augment qualitative disclosure with relevant quantitative data.

SEC disclosure should, wherever possible, focus on providing quantitative information (e.g., the percentage of operations impacted by a new regulation, the extent of financial losses due to drought, or the cost reductions achieved via innovations or efficiency improvements) as well as qualitative discussion. Relevant quantitative disclosures provide investors with a better understanding of where water hits a company's value chain and how the company is positioning to manage water-related risks and seize opportunities in the future.

✓ Ensure compliance with the SEC's guidance on climate change disclosure.

Overall disclosure of water-related risks has increased since the SEC issued its 2010 guidance on disclosing physical risks related to climate change. However, many corporate issuers are still silent on how climate change may impact their exposure to water-related risks when, based on their industry and operations, it seems likely that these risks exist. Companies looking for additional resources on compliance with the SEC guidance with respect to water risks should see the May 2012 report released by Ceres, Oxfam America and Calvert Investments entitled *Physical Risks From Climate Change: A Guide for Companies and Investors on Disclosure and Management of Climate Impacts*.¹

✓ Provide investors with risk management information.

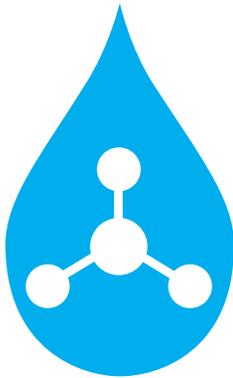
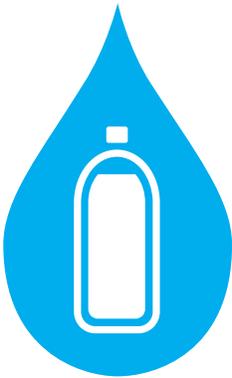
Given the trajectory of global megatrends, many companies are likely to face new or increasing water risks in the near future. Companies facing significant water risks should use their SEC filings to disclose information related to relevant risk management strategies (e.g. policies, standards, goals and progress toward targets). Such disclosure helps investors understand how companies are positioning themselves for strong financial performance in a water-constrained world. Companies seeking to develop more robust management responses to water risk should see the 2011 Ceres report, *The Ceres Aqua Gauge: A Framework for 21st Century Water Risk Management*.²

1 Oxfam America, Calvert Investments & Ceres, *Physical Risks From Climate Change: A guide for companies and investors on disclosure and management of climate impacts*, May 2012, <http://www.ceres.org/resources/reports/physical-risks-from-climate-change/view>

2 See: www.ceres.org/aquagauge

SECTOR-BY-SECTOR ANALYSIS

September 2012





BEVERAGE SECTOR

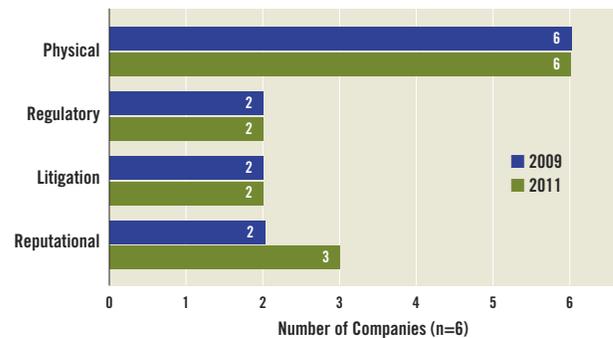
Beverage companies are very visible water users, as water is the primary ingredient in most of their products. Beverage manufacturers have faced scrutiny when their water use was, or was perceived to be, in conflict with the priorities of local communities and other users in the watershed. Beverage companies are also vulnerable to increasing taxation and regulation on water in regions with persistent water shortages. In addition to the water

required for the products themselves, the beverage sector is sensitive to shocks (for example, droughts) in their agricultural commodity supply chains that lead to price fluctuations in the inputs they rely on. Beverage companies are increasingly disclosing water-related risks and many companies are also discussing the actions they are taking to mitigate these risks and protect water supplies into the future.

The 2009 and 2011 financial filings of the following beverage companies were reviewed:

- Anheuser-Busch InBev
- Brown Forman Corp
- Coca-Cola Company
- Constellation Brands
- Diageo
- Dr. Pepper Snapple Group

BEVERAGE SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- Overall, the beverage sector discloses more information on physical water risk exposures than other sectors. 2011 water risk disclosures in the beverage sector are much the same as they were in 2009. Most companies' disclosures focus on water scarcity risks, water management strategies and approaches to water accounting and stakeholder engagement.
- **Brown-Forman's** disclosure on water and environmental issues has increased substantially since 2009. The company's 2011 10-K filing discloses a new environmental strategy including a system in development to analyze water quality and quantity risks. The company identifies that water scarcity could negatively affect its ability to secure supply of key inputs for its products, like grain and grapes, and discusses actions it is taking to mitigate this risk.
- **Diageo's** 2011 20-F discloses an over-arching new water strategy, "The Diageo Blueprint," designed to guide Diageo's approach to managing and protecting water resources. Diageo also explicitly states the potential risks of water scarcity and poor water quality to the company's products and operations.
- **AB Inbev's** 2011 10-K recognizes the water needed for the company's operations and supply chain (including agriculture), as well as the potential impacts of changes in water prices, taxes and regulations in certain geographies.
- **The Coca-Cola Company's** 2011 10-K includes language that directly links climate change to potential water quality degradation and exacerbated water scarcity, and states the risks water issues present to both the company's supply chain and direct operations.



PHYSICAL RISKS

All of the beverage companies analyzed disclose water-related physical risks. Since 2009, **Brown-Forman Corporation, The Coca-Cola Company, Constellation Brands** and **Diageo** have all expanded their discussion of water-related physical risks to include water quality as well as quantity concerns. **Diageo, AB InBev** and **Coca-Cola Company** also include language that highlights the link between climate change and water scarcity.

Coca-Cola Company and **Constellation Brands'** 2011 disclosures highlight the potential risks of water scarcity, poor water quality and water issues exacerbated by climate change. For example, **Constellation Brands** states:

Water is essential in the production of our products and the quality and quantity of water available for use is important to the supply of grapes and our ability to operate our business. Water is a limited resource in many parts of the world and if climate patterns change and droughts become more severe, there may be a scarcity of water or poor water quality which may affect our production costs or impose capacity constraints. Such events could adversely affect our results of operations and financial condition. (10-K, p. 14)

REGULATORY RISKS

All six of the beverage companies disclose facing environmental regulatory risks. However, only **AB InBev** and **Coca-Cola Company** explicitly address water-related regulatory risks. **AB InBev** identifies changes in water rates and taxes as a potential risk:

Water may also be subject to price increases in certain areas, and changes in water taxation and regulation in certain geographies may result in a negative effect on operating income which could potentially challenge our profitability in certain markets. There is no guarantee that we will be able to pass along increased water costs to our customers in every case. (10-K, p. 5)

REPUTATIONAL RISKS

In 2011, **Brown-Forman, Coca-Cola Company** and **Constellation Brands** all link the company's use of water to its reputation in their 10-Ks. For example **Constellation Brands'** 2011 10-K states:

Our reputation could be impacted negatively by public perception, adverse publicity (whether or not valid), or our responses relating to: A perceived failure to maintain high ethical, social and environmental standards for all of our operations and activities; Our environmental impact, including use of agricultural materials, packaging, water and energy use and waste management; or Efforts that are perceived as insufficient to promote the responsible use of alcohol. (10-K, p.18)

LITIGATION RISKS

In 2011, all beverage companies reviewed disclosed some level of litigation risk related to environmental compliance, but only **Coca-Cola Company** and **AB InBev** specifically cite litigation risk related to the use of water and disposal of wastewater.



DISCLOSURE OF MANAGEMENT RESPONSE

In addition to discussion of risks, some companies also disclose water accounting data, water management strategies and the ways in which they work to address water issues in their supply chains and engage relevant stakeholders on water issues. In 2009, none of the beverage sector companies analyzed disclosed data on water use or specific goals to reduce water use or wastewater discharge in their SEC filings. In 2011, **Diageo** and **AB InBev** disclose some water accounting information. For example, **AB InBev** discloses a series of water-related performance targets, including reducing water use per beer and soft drink product “to an industry-leading 3.5 hectoliters of water per hectoliter of product.” (10-K, p. 49)

In 2009, **Coca-Cola Company** was the only beverage company to disclose information about its water management policies and systems but in 2011, four companies—**AB InBev**, **Brown-Forman**, **Coca-Cola Company** and **Diageo**—cite water management policies and systems in place. **Brown-Forman**’s 2011 10-K states that the company has developed a system to assess water risks and reduce water use and other sustainability impacts:

Our comprehensive environmental sustainability strategy includes provisions for assessing climate change risks related to the availability and prices of our key agricultural inputs, including grains, agave, and grapes, and to adopt mitigation measures where appropriate. We are also developing a process for assessing risks related to water availability and quality. In concert with these measures, we have set clear goals to improve water and energy efficiency, increase the use of renewable energy, minimize greenhouse gas emissions, and reduce waste throughout our products’ lifecycles, which we believe will improve our business operations. (10-K, p. 38)

Diageo’s disclosures focus on company operations in water stressed areas, water conservation efforts at individual facilities and the creation of a new water strategy:

In May 2011 Diageo launched a new water strategy: The Diageo Blueprint. This will guide Diageo’s approach to managing water and protecting water tables in the regions where Diageo operates over the coming years.... The aim of the strategy is to optimise Diageo’s impact on water resource use by focusing efforts on countries where Diageo has a significant presence that face the greatest challenges in meeting the water-related [Millennium Development Goals]. Diageo couples these initiatives with its community programmes designed to increase local access to safe water as described in more detail below. (20-F, pp. 19 & 20)





CHEMICALS SECTOR

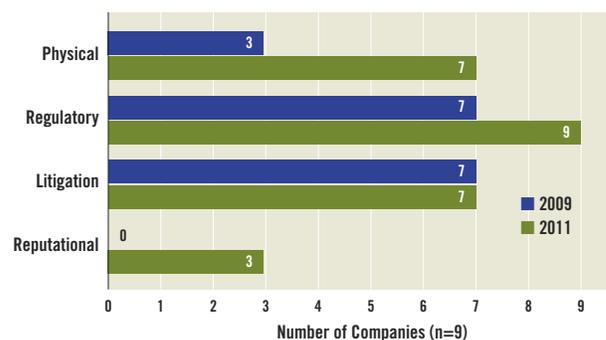
The chemicals sector is highly diverse and includes a variety of water-dependent activities. Some processes rely on very high quality water, while others require large volumes of water for cooling purposes. Increasingly, the industry is expanding from its historical base in North America, Europe and Japan to more water-stressed areas in India, China and the Middle East. Chemical companies operating in the EU already face growing regulatory pressure to phase out chemicals that significantly affect water resources and human health.

More recently, the U.S. EPA announced sweeping changes to its enforcement of existing chemical regulations under the Toxic Substances Control Act (TSCA), including a process that could lead to further regulation of chemicals that pose high risks to the environment and human health.¹ Such regulation could lead to increased costs for permitting and more stringent treatment standards for effluent streams discharged to surface water and/or municipal treatment plants.

The 2009 and 2011 financial filings of the following chemicals companies were reviewed:

- ◆ Dow
- ◆ DuPont
- ◆ Mitsui
- ◆ Monsanto
- ◆ Mosaic
- ◆ Potash
- ◆ PPG Industries
- ◆ Praxair
- ◆ Syngenta

CHEMICALS SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- In 2011, chemical sector disclosures related to water-related physical and reputational risks increased (by four and three companies, respectively).
- Three companies—**Mitsui**, **Mosaic** and **Syngenta**—explicitly link climate change to water-related physical risks.
- In its 2011 20-F, **Syngenta** discusses water-related business opportunities. The company is developing and selling products to improve the water productivity of plants and increase tolerance to drought and heat.
- In its 2011 20-F, **Mitsui** cites work with subsidiary companies to improve wastewater treatment processes and facilities and to increase water supply (via seawater desalination), indicating the company sees the need for clean and adequate water as significant.

¹ U.S. EPA, <http://www.epa.gov/lawsregs/laws/tsca.html>



PHYSICAL RISKS

In 2009, three of the companies analyzed discussed severe weather and/or floods as a potential risk affecting the costs of business. In 2011, seven companies (**Dow, Mitsui, Monsanto, Mosaic, Potash, PPG** and **Syngenta**) cite such risks, and three—**Mosaic, Mitsui** and **Syngenta**—go on to make the connection between climate change and severe weather events such as droughts, floods and hurricanes. **Syngenta's** 2011 20-F discusses the impacts of water-related physical risks on agriculture, citing climate change as a driver of both risk and opportunity for the company's genetically modified crops:

Syngenta's results are also affected by the growing importance of biotechnology to agriculture and the use of genetically modified crops. In future years, climate change may have both positive and negative impacts on Syngenta's results. Climate change may make growing certain crops more or less viable in different geographic areas, but is not likely to reduce overall demand for food and feed. Syngenta currently sells and is developing products to improve the water productivity of plants and increase tolerance to drought and heat. (20-F, pp. 30)

REGULATORY RISKS

All nine companies in the chemicals sector cite some form of water-related regulatory risks in their 2011 SEC filings, compared to seven in 2009. Regulatory risk statements were for the most part general, classifying risks broadly in terms of environmental regulations, environmental remediation and/or environmental, health and safety standards that encompass water use and/or discharge. **Praxair's** 10-K discusses how increased water and energy regulations pose both risks and new opportunities for the company, particularly in markets such as China. (10-K, pp. 22 & 23)

LITIGATION RISKS

Seven chemical companies (**Dow, DuPont, Monsanto, Mosaic, PPG Industries, Praxair** and **Syngenta**) disclose water-related litigation risks. As with the regulatory risk disclosures, discussions of litigation risks are mostly general. Litigation risks tend to be framed as arising from environmental regulations, remediation costs and permitting issues—many of which encompass water (surface or ground) contamination issues.

Syngenta, manufacturer of the herbal pesticide Atrazine, discloses being subject to multiple lawsuits alleging harm in connection with the use of or exposure to Atrazine or Atrazine-containing products. **Syngenta's** 2011 20-F cites multiple Atrazine-related lawsuits, including one in March 2011:

The claims in this lawsuit...seek compensatory and punitive damages for all past and future costs incurred by the plaintiffs in the removal of atrazine from raw water supplies, and certification of a class of all public water providers in the six states which have had or will have detectable levels of atrazine in their raw drinking water. (20-F, pp. 89 &90)

Lawsuits related to Atrazine threaten the company's revenue, and **Syngenta** "intends to vigorously defend these cases." (p. 90)

REPUTATIONAL RISKS

In 2011, three companies (**DuPont, Monsanto** and **Mosaic**) reported water-related reputational risks—none of the companies reviewed cited reputational risks in 2009. **Mosaic's** filing discusses reputational risks in terms of reduced customer satisfaction that may result if severe weather and other physical risks impact transportation and distribution systems. **Monsanto's** disclosure focuses more generally on the impacts of various risks, including severe weather like droughts and floods, on operations, performance, public perception and competitiveness. **DuPont's** filing was the most comprehensive of the three, addressing reputational risks attributable to factors including environmental risks, severe weather, public perception of the company and product safety:

Failure to appropriately manage safety, human health, product liability and environmental risks associated with the company's products, product life cycles and production processes could adversely impact employees, communities, stakeholders, the company's reputation and its results of operations. Public perception of the risks associated with the company's products and production processes could impact product acceptance and influence the regulatory environment in which the company operates. While the company has procedures and controls to manage process safety risks, issues could be created by events outside of its control including natural disasters, severe weather events and acts of sabotage. (10-K, p. 7)



DISCLOSURE OF MANAGEMENT RESPONSE

In addition to discussion of physical, regulatory, litigation and reputational risks, **Dupont, Mitsui, Monsanto, and Potash** also disclose water accounting data, water management strategies or the ways in which they work to address water issues in their supply chains and engage relevant stakeholders on water issues.

In its 2011 10-K, **Potash** discloses that the company reduced their release of chemicals to water and air by 31 percent and reduced water intake per unit of production by 26 percent (from a FY2000 baseline). They are also working to implement a more rigorous environmental audit system at their manufacturing sites worldwide, and the 10-K discusses the need for solutions to meet the energy, water and food needs of rapidly growing economies.

Mitsui discusses its commitment to water infrastructure projects in order to secure access to water for its shale gas operation:

We also aim to continue responding to the growing needs to upgrade infrastructure related to power generation, water supply and transportation and also secure stable sources for related raw materials. (20-F, p. 18)

Dupont's 2011 10-K discloses that the company has voluntary programs to decrease water usage:

Company policy requires that all operations fully meet or exceed legal and regulatory requirements. In addition, the company implements voluntary programs to reduce air emissions, minimize the generation of hazardous waste, decrease the volume of water use and discharges, increase the efficiency of energy use and reduce the generation of persistent, bioaccumulative and toxic materials. (10-K, p.41)

Monsanto's 2011 10-K cites a joint venture with BASF to develop drought-tolerant high-yield crops:

During 2007, we announced a long-term joint R&D and commercialization collaboration in plant biotechnology with BASF that will focus on high-yielding crops and crops that are tolerant to adverse conditions such as drought. We have completed all North American and key import country regulatory submissions for the first biotech drought-tolerant corn product. Pending necessary approvals, we expect to move to on-farm testing plots with growers around 2012 to obtain on-farm data. Over the long-term life of the collaboration, we and BASF will dedicate a joint budget of potentially \$2.5 billion to fund a dedicated pipeline of yield and stress tolerance traits for corn, soybeans, cotton, canola and wheat. (10-K, p. 39)





ELECTRIC POWER SECTOR

The electric power sector relies on water in a variety of ways. Adequate quantities of water at sufficiently low temperatures are required for cooling steam electric fossil fuel, nuclear and some solar thermal generation facilities.² If the surface temperature of a water body is too high, its water will no longer be useful for efficient cooling. The temperature of water discharged by plants after cooling is also regulated in order to protect aquatic ecosystems. In addition to temperature, water quantity is a concern. A decrease in flow that drops water levels below optimal heights for pumping systems can force facilities to reduce generation or shut down entirely. Hydropower, because of its direct dependence on adequate water levels, is also quite vulnerable to changes in the amount and timing of natural water flows. These flows could be impacted by climate change as well as by the actions of other users in the watershed.

Additionally, the U.S. electric power industry faces several evolving water-related regulations. In September 2009, the EPA announced its intention to revise the rules for water discharges from steam electric (coal, oil and gas)

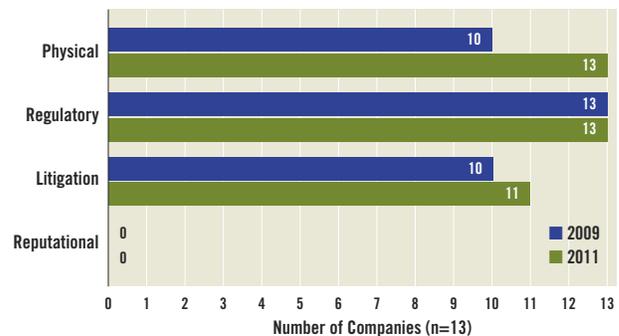
power plants. The EPA plans to propose a rulemaking by November 2012 and take final action by 2014.³ While the extent of these changes remains to be seen, they will likely focus on point sources, coal ash ponds and flue gas desulfurization systems which together account for the majority of pollutant loads discharged by electric power plants. The new standards could require plants to upgrade systems, purchase new technology, or re-evaluate effluent disposal practices to remain in compliance.

Power plant cooling structures must also adhere to the Clean Water Act's Section 316(b), which now requires that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts.⁴ These impacts include impingement, where aquatic species are trapped against the screen on an intake pipe, and entrainment, where smaller species (or eggs and larvae) are drawn into the cooling water system and subjected to heat, chemical and physical stress that is often fatal.

The 2009 and 2011 financial filings of the following electric power companies were reviewed:⁵

- ◆ American Electric Power
- ◆ AES Corporation
- ◆ Constellation Energy⁶
- ◆ Dominion Resources
- ◆ Duke Energy
- ◆ Entergy
- ◆ Exelon Corp
- ◆ NextEra Energy
- ◆ NRG Energy
- ◆ PG&E Corp
- ◆ Pinnacle West/Arizona Public Services (APS)
- ◆ Southern Company
- ◆ Xcel

ELECTRIC POWER SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- In 2009, 10 electric power companies cited water availability as a physical risk in their SEC filings and all 13 companies analyzed in 2011 cite water-related physical risks. **Pinnacle West** and **Exelon Corp** make an explicit link between climate change and the availability of a secure and economical supply of water.
- All 13 companies analyzed cite droughts and hydrologic conditions (the amount and form of water available, e.g.

rain vs. snow) as a risk that, via reduced water levels, could adversely affect operations at their power stations.

- All 13 companies also discuss regulation regarding cooling water intake structures and the costs of compliance with environmental regulations.
- **Entergy** and **Pinnacle West** were the only companies in the sector to discuss water management policies and systems in their 2011 filings.

2 For more information on water use in solar thermal generation, see: http://www.nrel.gov/csp/pdfs/csp_water_study.pdf

3 The standards would apply to plants "primarily engaged in the generation of electricity for distribution and sale which results primarily from a process utilizing fossil-type fuel (coal, oil, or gas) or nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium." (40 CFR Part 423.10) See: U.S. EPA, Steam Electric Power Generating Industry Effluent Guidelines, http://water.epa.gov/scitech/wastetech/guide/steam_index.cfm

4 U.S. EPA, Cooling Water Intake Structures, <http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/index.cfm>

5 Florida Power & Light Group was subsequently renamed NextEra Energy. The Pinnacle West Corporation and Arizona Public Service Company are now collectively known as "Pinnacle West."

6 On March 12, 2012, Constellation Energy completed its merger with Exelon and is now a part of Exelon Corp.



PHYSICAL RISKS

In 2011, all 13 companies in the sector cite water-related physical risks in their disclosures (versus 10 in 2009). Several companies (**AES, Duke, Entergy, NRG** and **PG&E**) make general statements about climate risks affecting weather conditions, while others (**Exelon, Pinnacle West, Southern Company** and **Xcel**) make more detailed statements linking climate change to extreme weather and water availability.

Pinnacle West/APS discusses the importance of a reliable water supply for power generation, and how drought could impact its Four Corners facility located in the Navajo Indian reservation west of Farmington, New Mexico:

Assured supplies of water are important for APS's generating plants. At the present time, APS has adequate water to meet its needs. However, the Four Corners region, in which Four Corners is located, has been experiencing drought conditions that may affect the water supply for the plants if adequate moisture is not received in the watershed that supplies the area... The lack of access to sufficient supplies of water could have a material adverse impact on APS's business and results of operations. Assured supplies of water are important for APS's generating plants. Water in the southwestern United States is limited and various parties have made conflicting claims regarding the right to access and use such limited supply of water... APS's inability to access sufficient supplies of water could have a material adverse impact on our business and results of operations. (10-K, pp. 22 & 32)

Exelon cites changes to ground and surface water availability (droughts, floods, extreme weather events) as physical risks of climate change that could affect the company's water usage. The company also discusses the impacts of droughts on the availability of cooling water, which is a limiting factor for the company's ability to generate power at maximum capacity:

...Drought-like conditions limiting water usage can impact Generation's ability to run certain generating assets at full capacity. These conditions, which cannot be accurately predicted, may have an adverse effect by causing Generation to seek additional capacity at a time when wholesale markets are tight or to seek to sell excess capacity at a time when markets are weak. (10-K, p. 46)

REGULATORY RISKS

In both 2009 and 2011, all of the electric power companies analyzed disclose water-related regulatory risks, discuss regulation regarding cooling water intake structures (Section 316(b) under the Clean Water Act) and cite the costs of compliance with environmental regulations. This high degree of regulatory uncertainty is evident in company filings.⁷ For example, **Entergy** has extensive disclosure on cooling water intake structure regulations that cites how regulatory uncertainty makes it difficult to predict how much additional expenditure the company must allocate to meet regulations:

The EPA finalized new regulations in July 2004 governing the intake of water at large existing power plants employing cooling water intake structures. The rule sought to reduce perceived impacts on aquatic resources by requiring covered facilities to implement technology or other measures to meet EPA-targeted reductions in water use and corresponding perceived aquatic impacts... Deadlines for determining compliance with Section 316(b) and for any required capital or operational expenditures are unknown at this time due to the remand of the rule to the EPA. As a result, management cannot predict the amounts Entergy will ultimately be required to spend to comply with Section 316(b) and any related state regulations, although such amounts could be significant. (10-K, pp. 219-220)

Exelon also cites the potential financial implications of new regulations under Section 316(b) that require retrofitting cooling water intake structures at nuclear and fossil power plants:

Generation will incur material costs of compliance if regulations under Section 316(b) of the Clean Water Act require retrofitting of cooling water intake structures at nuclear and fossil power plants owned by Generation. (10-K, p. 75)

The Clean Water Act also requires that companies protect designated beneficial uses of water resources. Beneficial uses are determined by the state and can include drinking water supply, primary contact recreation (like swimming) and aquatic ecosystem support. Under this obligation, **PG&E** is required to limit the temperature of the water they discharge in order to protect aquatic species:

⁷ As of this publication, the EPA delayed finalizing section 316(b) until June 27, 2013.



ELECTRIC POWER SECTOR

The Utility's Diablo Canyon power plant employs a "once-through" cooling water system that is regulated under a Clean Water Act permit issued by the Central Coast Board. This permit allows the Diablo Canyon power plant to discharge the cooling water at a temperature no more than 22 degrees above the temperature of the ambient receiving water, and requires that the beneficial uses of the water be protected. The beneficial uses of water in this region include industrial water supply, marine and wildlife habitat, shellfish harvesting, and preservation of rare and endangered species. In January 2000, the Central Coast Board issued a proposed draft cease and desist order alleging that, although the temperature limit has never been exceeded, the Utility's Diablo Canyon power plant's discharge was not protective of beneficial uses. (10-k, p. 40)

LITIGATION RISKS

In 2011, 12 of the 13 companies (excluding **NextEra**) disclose litigation risks related to water, with **Pinnacle West** and **Entergy** providing the most detail in this regard. In the United States, electric power companies can face litigation related to their contribution to water resource degradation via withdrawals and/or discharges as well as service interruptions brought on by insufficient water resources. They may also be subject to disputes over water rights in water-stressed areas of the country as competition for resources intensifies.

DISCLOSURE OF MANAGEMENT RESPONSE

Although most of the electric power companies reviewed discuss water-related risks, relatively few disclose water accounting data, water management strategies, or stakeholder engagement on water issues. All 13 companies cite how extreme weather and storms could reduce their ability to meet peak demand and negatively impact customer satisfaction. In addition to the potential impacts of extreme weather events, **PG&E** discusses management strategies for handling decreased snowpack in the Sierra Nevada Mountains:

Climate scientists also predict that climate change will result in significant reductions in snowpack in the Sierra Nevada Mountains. This impact could, in turn, affect PG&E's hydroelectric generation...one adaptation strategy the Utility is developing is a combination of operating changes that may include, but are not limited to, higher winter carryover reservoir storage levels, reduced conveyance flows in canals and flumes in response to an increased portion of precipitation falling as rain and reduced discretionary reservoir water releases during the late spring and summer. If the Utility is not successful in fully adapting to projected reductions in snowpack over the coming decades, it may become necessary to replace some of its hydroelectricity from other sources, including GHG-emitting natural gas-fired power plants. (10-K, p. 32)

Entergy discusses its water-monitoring program at certain nuclear plant sites, alluding to ongoing issues with tritium leaks into groundwater. Tritium is a radioactive isotope of hydrogen produced in nuclear reactors and is a health hazard when inhaled, ingested via food or water, or absorbed through the skin.⁸



⁸ A 2011 Associated Press review of U.S. Nuclear Regulatory Commission records found evidence of tritium leaks at an estimated 48 of 65 nuclear sites in the United States, along with 375 instances where tritium groundwater levels were detected above the EPA drinking water standards. See: Jeff Donn, "Radioactive Tritium Leaks Found at 48 U.S. Nuke Sites," *Associated Press*, June 21 2011, http://www.msnbc.msn.com/id/43475479/ns/us_news-environment/#.T71N43YtZt



FOOD SECTOR

Water plays a central role in the food industry. An estimated 70 percent of all water use globally goes to agricultural purposes, and water use for agriculture has doubled over the past century. As populations increase, so does the demand for food and the water required to grow it. Because of the water intensity of agriculture, food commodity shortages due to drought, floods or changing weather patterns can lead to significant price volatility that can affect food processors and manufacturers. Currently, the United States is experiencing its most severe drought since the 1950s—88 percent of corn and 87 percent of soybean crops are grown in regions experiencing drought. As the world’s leading corn and soybean producer, U.S. drought impacts are felt on a global scale. Over the last two months, maize and

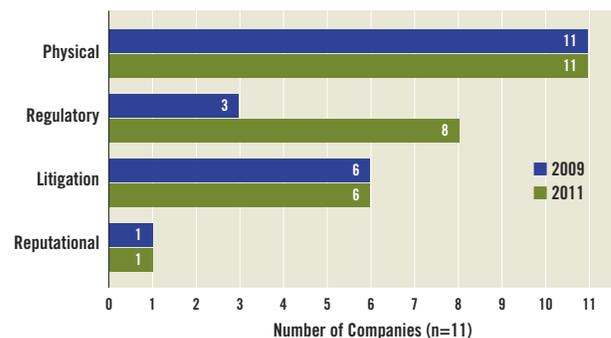
soybean prices leapt 30 and 19 percent, respectively, with cascading impacts for beef, dairy, and poultry.⁹

Globally, agriculture both contributes to and suffers from poor water quality. Contaminated water can ruin crops and transfer disease to consumers and farmers, and run-off from farming activities can pollute ground and surface water with sediments and pesticides. In the U.S., there is growing concern about and scrutiny over the agriculture sector’s water impacts. In 2011, the EPA revised regulations under the Clean Water Act governing confined animal feeding operations (CAFOs) in an effort to prevent animal waste from contaminating groundwater. Under the proposed rule, CAFOs would be required to collect and report requested operational information directly to the EPA to remain in compliance.

The 2009 and 2011 financial filings of the following food companies were reviewed:

- ◆ Archer Daniels Midland
- ◆ Bunge
- ◆ Conagra
- ◆ Dean Foods
- ◆ General Mills
- ◆ Kellogg Co.
- ◆ Kraft Foods
- ◆ PepsiCo
- ◆ Sara Lee
- ◆ Smithfield
- ◆ Tyson Food

FOOD SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- All 11 food companies analyzed discussed the impacts of extreme weather and commodity price volatility in their 2009 and 2011 financial filings.
- Regulatory risk disclosure has increased from three companies in 2009 to eight in 2011.
- In 2009, none of the companies analyzed linked water-related risks to climate change directly. In 2011, three companies (**Bunge**, **PepsiCo** and **Smithfield**) discussed this linkage.
- **PepsiCo** addresses a variety of water-related issues in its 2011 10-K. It is the only food company to explicitly link the impact of climate change and drought to the price of water itself, cite potential reputational risks related to water, and reference specific water management policies in place at the company.
- **Bunge** has expanded their discussion of water risks substantially since 2009. In 2011, the company cites water shortages (among other variables) as potentially material risks that could adversely impact the location and costs of agricultural commodities and the supply and demand for those commodities.

⁹ Joe DeCapua, “US Drought Impacts Global Food Security,” *Voice of America*, August 8 2012, <http://www.voanews.com/content/us-drought-food-security-8aug12/1475641.html>,
Oakshire Financial, “The Consequences of the US Drought,” July 30 2012, <http://oakshirefinancial.com/2012/07/30/the-consequences-of-the-us-drought/>



PHYSICAL RISKS

All 11 food companies analyzed disclose physical risks related to water. Disclosures ranged from very general (**ADM**, **Dean Foods**, **Sara Lee**) to highly specific. **Bunge** and **Smithfield Farms** both discuss how climate-related changes in precipitation/water availability could impact costs and operations. **Bunge** discusses the potential implications of the physical impacts of climate change on costs, operations, and supply and demand patterns:

The potential physical impacts of climate change... could include changes in rainfall patterns, water shortages, changing sea levels, changing storm patterns and intensities, and changing temperature levels that could adversely impact our costs and business operations, the location and costs of global agricultural commodity production, and the supply and demand for agricultural commodities. These effects could be material to our results of operations, liquidity or capital resources. (10-K, p. 17)

Smithfield Farms underscores the industry's reliance on agricultural supply chains:

As an agriculture-based company, changes to the climate could also affect key inputs to our business as the result of shifts in temperatures, water availability, precipitation, and other factors. Both the cost and availability of corn and other feed crops, for example, could be affected. (10-K, p. 10)

PepsiCo takes their disclosure a step farther, linking the impacts of climate change and drought to the price of water and other commodities key to its production:

There is growing concern that carbon dioxide and other greenhouse gases in the atmosphere may have an adverse impact on global temperatures, weather patterns and the frequency and severity of extreme weather and natural disasters. In the event that such climate change has a negative effect on agricultural productivity, we may be subject to decreased availability or less favorable pricing for certain commodities that are necessary for our products, such as sugar cane, corn, wheat, rice, oats, potatoes and various fruits. We may also be subjected to decreased availability or less favorable pricing for water as a result of such change, which could impact our manufacturing and distribution operations. In addition, natural disasters and extreme weather conditions may disrupt the productivity of our facilities or the operation of our supply chain. (10-K, p. 18)

REGULATORY RISKS

Disclosures of water-related regulatory risks increased markedly from 2009 to 2011. This increase is likely due in some part to the EPA's revised regulations under the Clean Water Act governing confined animal feeding operations. These regulations seek to prevent animal waste from contaminating groundwater. Few companies' filings elaborated beyond general statements, such as **Dean Foods'** disclosure in 2011 that the company paid wastewater surcharges to remain in compliance:

Certain of our facilities discharge biodegradable wastewater into municipal waste treatment facilities in excess of levels allowed under local regulations. As a result, certain of our facilities are required to pay wastewater surcharges or to construct wastewater pretreatment facilities. (10-K, p. 12)

REPUTATIONAL RISKS

As in 2009, **PepsiCo** was the only company analyzed in the food sector to issue statements directly addressing the adverse impact water scarcity and poor water management could have on the company's reputation:

...In addition, water is a limited resource in many parts of the world. Our reputation could be damaged if we do not act responsibly with respect to water use... Damage to our reputation or loss of consumer confidence in our products for any of these or other reasons could result in decreased demand for our products and could have a material adverse effect on our business, financial condition and results of operations, as well as require additional resources to rebuild our reputation. (10-K, p. 13)

LITIGATION RISKS

Six of the 11 food companies analyzed disclose litigation risks of some kind. Four of these companies disclosed fairly general statements about the risk of litigation due to environmental regulations that cover issues like wastewater discharge and runoff. **Smithfield Farms** and **Dean Foods**, however, both disclose information on specific cases alleging improper wastewater disposal.



DISCLOSURE OF MANAGEMENT RESPONSE

Very few companies in the food sector went beyond disclosing physical, regulatory, litigation and reputational risks. Information on water accounting data, water management strategies and approaches to addressing water issues in their supply chains was virtually nonexistent.

However, **PepsiCo**'s 2011 10-K does cite water management as part of a comprehensive strategy to manage and address sustainability risks and public health trends:

We are united by our unique commitment to Performance with Purpose, which means delivering sustainable growth by investing in a healthier future for people and our planet. Our goal is to continue to build a balanced portfolio of enjoyable and wholesome foods and beverages, find innovative ways to reduce the use of energy, water and packaging and provide a great workplace for our associates. (10-K, p. 2)





HOMEBUILDING SECTOR

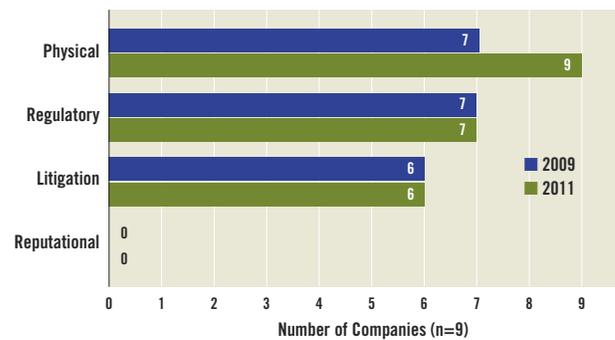
The homebuilding sector is subject to extensive regulations related to erosion, storm water pollution control, water protection and wastewater discharge. In November 2009, the EPA released new guidelines to limit effluent discharge from construction and development industries. However, the sector’s biggest regulatory challenges are likely due to “slow-growth” or “no-growth” initiatives undertaken by local communities

that feel large developments may strain local resources. In water-stressed parts of the United States, existing or anticipated water shortages may lead regulators to restrict or prohibit housing development. For example, California state laws require water agencies to withhold approvals until it can be determined that sufficient water resources exist to serve large new developments for at least 20 years.¹⁰

The 2009 and 2011 financial filings of the following homebuilding companies were reviewed:

- ◆ Beazer Homes
- ◆ DR Horton Inc.
- ◆ Hovnanian
- ◆ KB Home
- ◆ Lennar
- ◆ NVR
- ◆ PulteGroup
- ◆ Ryland
- ◆ Toll Brothers

HOMEBUILDING SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- All nine companies analyzed cite water-related physical risks in 2011, compared to only seven companies in 2009. Specifically, each company mentions weather events that contribute to slowdowns in construction, such as floods and hurricanes. **KB Home** and **Hovnanian** also cite the availability of water supply in locations they operate as a risk—this particular issue was not raised by any of the companies in their FY2009 filings.
- In 2011, all of the companies analyzed disclose facing litigation risks related to the Clean Water Act. Seven of the nine disclose settlements with the EPA and other regulatory agencies to remediate water bodies or implement environmental restoration projects.
- **Beazer Homes’** 2011 filing includes discussion of their “eSMART Initiative,” a home-building program focused on energy and water efficiency and improved indoor air quality.
- In 2009, **KB Home** launched a new initiative called *My Home My Earth*, refining and improving its product offerings to compete with resale homes and address the energy efficiency concerns of its customers. As of 2011, **KB Home** also offers its homebuyers several options to help them to further lower energy consumption, water use and utility bills. **KB Home** also became the first homebuilder in the country to construct homes to meet the EPA’s new WaterSense® specifications.¹¹

10 California Government Code, Section 66473-66474.10. Available: <http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=66001-67000&file=66473-66474.10>

11 The WaterSense® program requires that the company’s homes meet high standards for water efficiency and performance, compared to standard new or typical existing homes.



PHYSICAL RISKS

The homebuilding companies analyzed disclose a variety of physical risks. Over half of the companies (**Beazer Homes, DR Horton, Hovnanian, KB Home** and **Ryland**) specifically cite droughts and floods as physical risks to business, and two companies (**NVR** and **Toll Brothers**) cite only floods. **KB Home's** 2011 10-K directly links the water risks associated with climate change to potential changes in the company's operating costs, asset values and growth prospects:

There is growing concern from the scientific community and the general public that an increase in global average temperatures due to emissions of greenhouse gases and other human activities will cause significant changes in weather patterns and increase the frequency and severity of natural disasters. An increased frequency or duration of extreme weather conditions and environmental events could limit, delay and/or increase the costs to build new homes and reduce the value of our land and housing inventory in locations that become less desirable to consumers or blocked to development. Projected climate change, if it occurs, may exacerbate the scarcity of water and other natural resources in affected regions, which could limit, prevent or increase the costs of residential development in certain areas. (10-K, p. 16)

REGULATORY RISKS

Seven companies cite water-related regulatory risks in their 2011 SEC filings (the same number as 2009). **Beazer Homes, Lennar, Toll Brothers, DR Horton** and **Hovnanian** all categorize regulations concerning the "adequacy of water and sewer facilities" as business risks. They discuss increasingly stringent regulations regarding storm water and delays or preclusions on development due to building moratoriums, "slow-growth," or "no-growth" initiatives, noting that these initiatives could be implemented in areas where water and sewage treatment facilities are deemed insufficient.

LITIGATION RISKS

Six companies in this sector (**Hovnanian, KB Home, NVR, PulteGroup, Ryland Homes** and **Toll Brothers**) disclose water-related litigation risks of some kind in their 2011 SEC filings. These disclosures refer to specific cases or discussions with the EPA, the Department of Justice and other regulatory agencies regarding the Clean Water Act with emphasis on meeting storm water discharge requirements.

PulteGroup and **Toll Brothers** both cite specific water bodies that were negatively affected by their operations and subsequent actions taken to remediate the areas, in addition to the amount they paid in civil penalties to settle with the EPA. The other five companies (**Hovnanian, KB Home, Centex, NVR** and **Ryland Homes**) disclose the amount of civil penalties they paid to settle storm water discharge claims with the EPA but do not reveal actions taken at specific sites to restore water bodies.

REPUTATIONAL RISKS

As in 2009, none of the homebuilding sector companies analyzed cite water-related reputational risks.



DISCLOSURE OF MANAGEMENT RESPONSE

Beazer Homes, DR Horton, Hovnanian, Lennar and Toll Brothers all cite environmental policies and management systems in place to manage the removal of toxic wastes, environmental remediation activities and storm water. The homebuilding industry has also identified a number of water-related business opportunities related to providing customers with more water and energy efficient homes. In 2006, the EPA created a water saving program called WaterSense®, which aims to bring labeled products to the marketplace and make it easier to identify and purchase high-performing, water-efficient products. For a homebuilding company to qualify for the program, it is required to build homes that meet high standards for energy and water efficiency performance. As **KB Home's** 2011 10-K states:

We became the first homebuilder in the country to construct homes to meet the EPA's new WaterSense® specifications in 2010. The ENERGY STAR and WaterSense programs require that our homes meet high standards for energy and water efficiency and performance, respectively, compared to standard new or typical existing homes. (10-K, p.5)

Similarly, **Beazer Homes'** 2011 10-K discusses an environment-focused product strategy designed to make energy saving, water conservation and improved air quality components standard in all of its eSMART homes:

Our product strategy is to design and build high performance homes that are more enjoyable, more desirable and more affordable. Our eSMART homes are engineered for energy-efficiency, cost savings and comfort. Our eSMART initiative represents a comprehensive program focused on environmental stewardship which seeks to make energy saving, water conservation and improved air quality components standard in all of our homes. These energy efficient homes minimize the impact on the environment while reducing our homebuyers' annual operating costs. (10-K, p.7)





MINING SECTOR

Mining operations cannot be relocated, making the sector particularly susceptible to changing local water availability and pressure from local communities to reduce water use and water quality impacts. Unaddressed community concerns about the water impacts of mining can lead to loss of social license to operate. In November of 2011, **Newmont** suspended operations at sites in Peru after community concerns about the company's water practices attracted the attention of the Peruvian government. The delays cost the company an estimated \$2 million a day, and public scrutiny is ongoing.¹² In addition to local concerns, mines are also vulnerable to severe weather

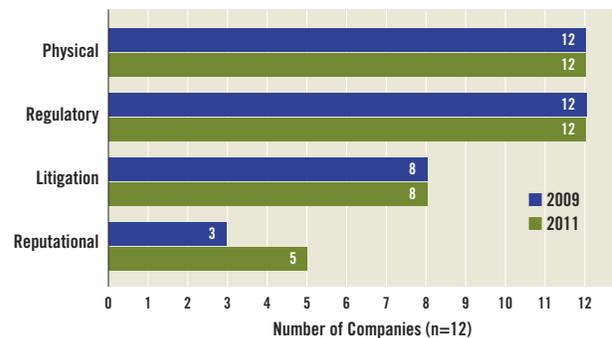
events (particularly floods) that can halt operations and pose risk to surrounding watersheds through increased effluent discharge and sediment displacement.

Mining operations also depend on reliable electricity supplies to run their operations. Inability to secure cost-effective energy resources during floods, droughts, or other severe weather events can raise costs and, in some cases, force production curtailment. In the United States, coal-mining techniques that involve blasting ridge tops ("mountaintop removal") to expose deposits are under increasing scrutiny due to the damage they pose to freshwater and ecosystems.

The 2009 and 2011 financial filings of the following mining companies were reviewed:

- ◆ Alcoa
- ◆ Anglo American
- ◆ Barrick Gold Corp
- ◆ BHP Billiton
- ◆ Consol Energy
- ◆ Freeport-McMoRan
- ◆ Massey Energy¹³
- ◆ Newmont
- ◆ Peabody Energy
- ◆ Rio Tinto
- ◆ Teck
- ◆ Vale

MINING SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- Overall, mining sector disclosures of water-related risks were very similar in 2009 and 2011. The industry discloses extensively on water-related physical, regulatory and litigation risks.
- All of the companies analyzed in the mining sector disclose water-related physical risks, with particular emphasis on water scarcity. Four of the 12 companies link climate change directly to water scarcity.
- **BHP Billiton's** 2011 20-F presents water as a global issue that has "social, cultural, environmental and economic value at a local, regional, national and international level and is therefore critical to maintaining a 'social license to operate'" (20-F, p. 83). The company also set a water reduction target and explains how it manages water and wastewater at specific sites.
- **Barrick Gold's** 2011 40-F discusses water sources for each mine, how water treatment facilities are designed

to prevent surface and groundwater contamination and the number of facilities with zero water discharge. The company also mentions plans to conduct water conservation pilot projects at certain sites and actions taken in response to specific regulatory restrictions in environmentally sensitive areas.

- In its 2011 10-K, **Newmont** discusses the importance of sufficient water supplies for continued mining operations and cites risks to operations at its Conga mine in Peru, where water stress is a key community concern. The company also details the difficulties it faces in securing water rights and the risk of operational disruptions due to loss of water rights and/or droughts.
- **Freeport-McMoRan** cites collaborations with governments and communities to address issues related to drinking water and sanitation.

¹² Project delays: <http://finance.yahoo.com/news/newmont-cuts-costs-conga-210025703.html>

Ongoing concerns: http://www.earthworksaction.org/media/detail/shareholders_ngo_raise_questions_about_newmont_minings_social_and_environment

¹³ Alpha Resources and Massey Energy merged in June of 2011 to form Alpha Appalachia.



PHYSICAL RISKS

All of the companies analyzed in the mining sector disclosed water-related physical risks in both 2009 and 2011. In 2011, the majority of companies (**Alcoa, Freeport-McMoRan, Massey Energy, Peabody, Rio Tinto** and **Teck**) cite physical risks related to droughts and floods as well as variations in rainfall. Many companies' filings highlight the risk of water shortages and the importance of an adequate water supply for their operations, including **Alcoa, BHP Billiton, Freeport-McMoRan, Newmont, Rio Tinto, Teck** and **Vale**. **Newmont**, for example, cites water supply risks and discusses the importance of adequate water supplies for its extractive operations:

Continuation of our mining production is dependent on the availability of sufficient water supplies to support our mining operations. Our mining operations require significant quantities of water for mining, ore processing and related support facilities. Our operations in North and South America and Australia are in areas where water is scarce and competition among users for continuing access to water is significant. (10-K, p. 21)

Four companies (**Alcoa, BHP Billiton, Freeport-McMoRan** and **Newmont**) mention the link between climate change and water. **Vale** and **Alcoa** also express concerns related to the water required for reliable energy production. **Vale** states:

If we are unable to secure reliable access to electricity at acceptable prices, we may be forced to curtail production or may experience higher production costs, either of which would adversely affect our results of operations. We face the risk of energy shortages in the countries where we have operations and projects due to excess demand or weather conditions, such as floods or droughts. (20-F, p. 8)

Peabody's filing also cites drought as a risk to the company's ability to comply with air quality regulations without incurring additional costs:

If the areas in which our mines and coal preparation plants are located suffer from extreme weather events such as droughts, or are designated as non-attainment areas, we could be required to incur significant costs to install additional emissions control equipment, or otherwise change our operations and future development. (10-K, p. 11)

REGULATORY RISKS

The mining industry is highly regulated with respect to impacts on water quality and the usage, disposal, storage and/or treatment of hazardous substances. This is reflected in the high level of water-related regulatory risk disclosure in the sector's 2009 and 2011 SEC filings. Most companies analyzed discuss pertinent environmental regulations with specific reference to the Clean Water Act, groundwater quality and permitting. **Newmont** and **Teck's** filings also discuss the critical importance of securing water rights and potential risks to those rights. **Teck** discusses how water rights have come to the fore in its foreign operations:

Water rights have become an area of increasing focus for our foreign operations and community relations are significantly impacted by access and sourcing of water matters. If water supplies become scarce or are negatively impacted due to environmental reasons, such as drought, or other reasons, water supplies to our operations might be reduced in order to maintain supplies to the local communities we operate in. Any reduction in water, or other necessary infrastructure supplies, may preclude development of otherwise potentially economic mineral deposits or may negatively impact production and/or sales from our impacted operations. (40-F, pp. 45 & 46)

In addition to discussion on water rights and changes to legislation, many companies also mention environmental incidents (e.g. spills and permit violations). Of the 12 companies analyzed in this sector, **Rio Tinto** provides the most detailed disclosure of environmental incidents and their associated costs:

In 2011, there were 18 environment incidents... These incidents were of a nature to affect the environment or to concern local communities. Of these, nine resulted from water discharge, six were spills and three related to air emissions. Examples of these include: discharge standards for water being exceeded and also the overflow of leachate from a landfill to an adjacent water course at Alucam, Cameroon; leakage of unleaded petrol from a storage tank at Gove, Australia... During 2011, 13 operations incurred fines amounting to U.S.\$540,328 (U.S.\$80,150 in 2009). (20-F, p. 112)



Barrick Gold cites six environmental incidents related to water pollution and environmental degradation in its 2011 filings. The company also discusses glacier protection regulations that could impact operations near glaciers:

On September 30, 2011, the National Law on Minimum Requirements for the Protection of Glaciers was enacted in Argentina, and came into force in early November 2011. The federal law bans new mining exploration and exploitation activities on glaciers and in the “peri-glacial” environment, and subjects ongoing mining activities to an environmental audit. If such audit identifies significant impacts on glaciers and peri-glacial environment, the relevant authority is empowered to take action, which according to the legislation could include the suspension or relocation of the activity. (40-F, p.93)

REPUTATIONAL RISKS

In 2011, six companies (**BHP Billiton, Barrick Gold Corp, Consol Energy, Freeport-McMoRan, Rio Tinto and Teck**) disclose reputational risks related to the environmental impact of their operations (compared to three in 2009). None of these reputational risk statements mention water explicitly. However, due to the nature of the industry and the content of the disclosures, it can reasonably be assumed that water issues are included under the “environmental” umbrella. **BHP Billiton** discusses reputational risks as a result of mining activities, acknowledging “local communities may become dissatisfied with the impact of our operations, potentially affecting costs and production, and in extreme cases viability” (20-F, p. 11). The company explains that, “despite our best efforts and best intentions, there remains a risk that health, safety, environmental and/or community incidents or accidents and related regulations may adversely affect our reputation or license to operate” (20-F, p.11).

Barrick Gold also discusses reputational risks arising from public concerns about the perceived impacts of mining activities:

There is an increasing level of public concern relating to the perceived effect of mining activities on the environment and on communities impacted by such activities. Certain NGOs, some of which oppose globalization and resource development, are often vocal critics of the mining industry and its practices, including the use of cyanide and other hazardous substances in processing activities. Adverse publicity generated by such NGOs or others related to extractive industries generally, or Barrick’s operations specifically, could have an adverse effect on the Company’s reputation or financial condition and may impact its relationship with the communities in which it operates. While Barrick is committed to operating in a socially responsible manner, there is no guarantee that the Company’s efforts in this respect will mitigate this potential risk. (40-F, p. 87)

LITIGATION RISKS

Eight companies (**Alcoa, Barrick Gold Corp, Consol Energy, Freeport-McMoRan, Massey Energy, Newmont, Peabody and Teck**) disclose water-related litigation risks. Disclosures range from general environmental litigation risks to specific discussion of water issues. **Barrick Gold Corp, Alcoa, Freeport-McMoRan** and **Teck** disclosed the most specific statements. **Freeport-McMoRan** discusses water issues and risks at their operations in the American Southwest, explaining how water scarcity can give rise to legal disputes over water rights:

Our operations in North and South America are in areas where water is scarce and competition among users for continuing access to water is significant. Continuous production at our mines depends on our ability to maintain our water rights and claims. At our North America operations, under state law our water rights give us only the right to use public waters for a statutorily defined beneficial use at a designated location... In Colorado, our surface water and groundwater rights are subject to adjudication and we are involved in legal proceedings to resolve disputes regarding priority of administration of rights, including priority of some of our rights for the Climax mine. (10-K, p. 44)

Overall, the scope of company disclosures on water-related litigation risks ranged from company-wide to site specific.

Alcoa includes an in-depth section on a case in Brazil concerning the impacts of its mining operations on the region’s water system:

Alcoa Alumínio S.A. (Alumínio) received service of a lawsuit that had been filed by the public prosecutors of the State of Para in Brazil in November 2009. The suit names the company and the State of Para, which, through its Environmental Agency, had issued the operating license for the company’s new bauxite mine in Juruti. The suit concerns the impact of the project on the region’s water system and alleges that certain conditions of the original installation license were not met by the company. In the lawsuit, plaintiffs requested a preliminary injunction suspending the operating license... and ordering payment of compensation. (10-K, p. 35)



DISCLOSURE OF MANAGEMENT RESPONSE

BHP Billiton, Barrick Gold Corp, Freeport-McMoran and **Rio Tinto** provide information on specific water management systems in place at their companies. **Rio Tinto** emphasizes the importance of having an environmental system in place to minimize water usage:

Key to successful mineral development is a culture of trust, transparency and mutual benefit to all parties. This is established through honest engagement with all stakeholders, including governments and local communities. Equally important is our determination to minimise the Group's environmental footprint, particularly when it comes to carbon, water and biodiversity... We are refreshing our approach to sustainable development to ensure it remains focused on the social, environmental, economic and governance risks most relevant to delivering our business strategy. By building relationships with our stakeholders, and by applying risk analysis and management effectively throughout our business, we can create opportunities out of external challenges, and extend our license to operate. (20-F, pp. 18 & 19)

Rio Tinto goes on to disclose direct financial investments in water management improvements at Energy Resources of Australia (a wholly owned subsidiary):

Energy Resources of Australia (ERA) has invested A\$11.2 million towards water management improvements across its entire operation, and additional real time water quality sensor points in local waterways have improved ERA's ability to monitor releases and protect the environment. A programme of infill drilling within Ranger pit commenced in October 2011 to confirm confidence in the mineralisation. As a result of this work and pit redesign due to a localised area of instability on the south wall, the Ranger in situ reserves were reduced by approximately 2,400 tonnes. (20-F, p. 56)

BHP Billiton and **Freeport-McMoran** both disclose efforts to manage water use at specific sites. In its 2011 20-F filing, **BHP Billiton** acknowledges water as a potential limiting factor to future production and discloses measures taken to secure water at its Chilean mine:

...Escondida mine is the largest and one of the lowest-cost copper producers in the world... We have been working to address two potential limitations on future production at Escondida: power and water... To address limitations on the availability of water, we carefully manage our use and re-use of available water, explore for alternative sources, and have built a desalination plant that currently provides water only to the sulphide leach plant but which could be expanded, if necessary. (20-F, pp.37-38)

BHP Billiton also includes water re-use targets:

We have a five-year target of a 10 per cent improvement in the ratio of water recycled to high-quality water consumed by 30 June 2012. This water use index has improved seven per cent on our FY2007 base year. (20-F, p. 98)





OIL & GAS SECTOR

The oil and gas sector faces a variety of water-related risks. Leaks, spills, and the disposal of produced water pose contamination risks, while extraction, upgrading, and refining can require large quantities of water, thus exposing companies to water supply risks. Upstream oil and gas operations are also becoming more water intensive as companies expand into unconventional resources (e.g. oil sands, shale gas, tight oil, oil shale, etc.).

Many oil and gas companies now practice hydraulic fracturing, a process that involves injecting a mix of water, sand, and chemicals at high pressure into relatively impermeable shale rock to forcibly release oil and natural gas. In 2011, the French government banned the practice, largely due to concerns about its impacts on water quality. The law not only blocks future development but also revokes existing permits—effectively stranding significant investments by a number of companies, including Europe’s third largest oil company **Total SA**, whose Montelimar permit was

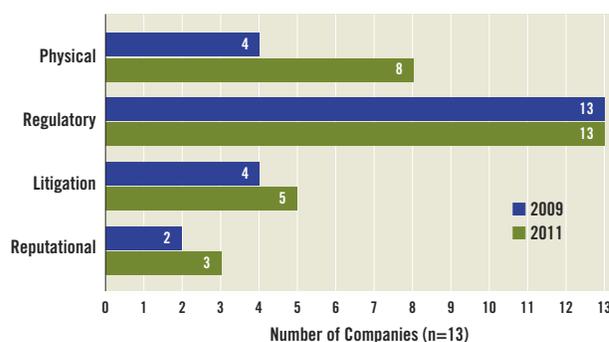
canceled.¹⁴ International bans and moratoria are in place in South Africa, the Canadian province of Quebec, and Bulgaria. In the United States hydraulic fracturing is banned in Vermont and North Carolina and under moratoria in New Jersey, Maryland, and New York (although there may be regional allowances). In addition, there are over 50 local and municipal bans on the practice nationwide.¹⁵

Bans and moratoria often cite significant environmental and social impacts coupled with the current lack of scientific and practical knowledge in mitigating those impacts as reasons to halt the process. Commonly raised water concerns include the large volume of water required (and the truck traffic required to transport that water), possible contamination of drinking water through migration of fracturing fluids or methane through abandoned wells, improperly built drill casings, or surface spills, and the large volume of wastewater produced from the wells.

The 2009 and 2011 financial filings of the following oil and gas companies were reviewed:

- BP
- Canadian Natural Resources
- Chesapeake Energy
- Chevron
- ConocoPhillips
- Devon
- Encana
- Exxon-Mobil
- Nexen
- Range Natural Resources
- Royal Dutch Shell
- Suncor Energy
- Total

OIL & GAS SECTOR: Water-Related Risk Disclosure



14 Tara Patel, “France to Keep Fracking Ban to Protect Environment, Sarkozy Says,” Bloomberg Businessweek, October 4, 2011, <http://www.businessweek.com/news/2011-10-04/france-to-keep-fracking-ban-to-protect-environment-sarkozy-says.html>

15 The development of <http://www.fracfocus.org>, by two state agencies, as a voluntary reporting tool to disclose chemicals used in fracturing fluids has been gaining momentum with seven state regulators and one Canadian province now requiring mandatory disclosure to the site. http://www.rff.org/centers/energy_economics_and_policy/Documents/Shale_Maps/shale_maps_master.pdf



SECTOR HIGHLIGHTS:

- Disclosure of water-related physical, litigation, and reputational risks increased from 2009 to 2011, with the largest changes found in discussion of physical risks (from four to eight companies) including scarcity, floods, droughts and monsoons. Four more companies disclosed facing water-related physical risks in 2011 compared to 2009. This may be due to increases in more water-intensive unconventional fuel exploration and extraction.
- All of the companies involved in hydraulic fracturing operations cite risks related to the EPA's regulatory efforts. However, Encana is the only company in the group that also discloses risks related to accessing the water supplies necessary for hydraulic fracturing and the potential for the process, if mismanaged, to pose pollution risks. Eight of the 13 companies disclose facing physical water risks.
- **Nexen, BP** and **Shell** all cite water-related reputational risks. **Shell** discusses community concerns regarding their hydraulic fracturing activities, **Nexen** discusses possible negative public reaction to certain wastewater disposal practices, and **BP** and **Shell** cite neighboring communities as important stakeholders and discuss preserving local heritage and job creation.
- Several companies (**Suncor, Shell, Total** and **Encana**) have increased disclosure of their water risk management strategies and systems, including companywide water intake reduction goals (**Suncor**), using technology to reduce the need for water (**Encana** and **Shell**), new environmental action plans designed to improve environmental performance (**Total**) and collaborative efforts with stakeholders to advance best practices in hydraulic fracturing and reduce water use in exploration and production operations (**Encana**).
- In 2009, only one company (**Total**) disclosed working with NGOs and other stakeholders on programs related to water access. In 2011, five companies (**BP, Encana, Nexen, Shell** and **Total**) cite collaborative efforts with stakeholders on water-related issues.
- **Shell** indicates that annual bonuses for senior executives are tied to internal sustainability measures, including freshwater use, energy efficiency and operational spills.



PHYSICAL RISKS

In 2009, four out of 13 companies cited exposure to water-related physical risks. In 2011, despite the fact that all thirteen companies are involved in hydraulic fracturing in some way, this number only increased to eight (**BP, Chevron, Canadian Natural Resources, Nexen, Range, Shell, Suncor** and **Total**). Disclosures of water-related physical risks include both adverse weather conditions (floods, droughts, monsoons and hurricanes) and water scarcity. As the energy industry moves into more water intensive fuels, securing adequate water supplies may become more difficult due to reasons that include physical scarcity. **Shell** discusses this issue in its 20-F:

As world energy demand rises, the energy industry is becoming one of the larger industrial consumers of fresh water globally. Shell's water footprint may expand in the future with the development of unconventional resources, such as tight gas and oil sands, and our biofuels business. A combination of growing stakeholder expectations, water-related legislation and demand for water resources may drive action that affects our ability to secure access to fresh water and to discharge water from our operations. (20-F, p. 51)

REGULATORY RISKS

In both 2009 and 2011, all of the oil and gas sector companies cite adverse effects they could face due to increased environmental regulation of groundwater contamination. All 13 companies cite groundwater contamination as an operational risk in the context of upcoming legislation and regulatory initiatives relating to hydraulic fracturing, a process regulated by state oil and gas commissions. Many companies also mention a recent EPA assertion of regulatory authority over hydraulic fracturing involving diesel additives under the Safe Drinking Water Act. However, **Encana** was the only company to cite the ability to access water supplies as a potential risk to hydraulic fracturing operations.

Several companies, including **Suncor**, cited risks due to increased regulation related to water management and tailings ponds in the Albertan oil sands. **Suncor** gives examples of the material adverse effects the company could face due to increased environmental regulations and specifically mentions the need to reduce or stabilize water withdrawals, use, and discharges in its oil sands operations.

LITIGATION RISKS

As in 2009, **Shell, Chevron, ConocoPhillips** and **Exxon-Mobil** disclose litigation risks related to groundwater contamination. In 2011, **Range Resources** also joined the group. Litigation risks were primarily linked to existing or potential lawsuits due to water contamination allegedly caused by company operations.

REPUTATIONAL RISKS

In 2011, three companies (**Nexen, BP** and **Shell**) disclose stakeholders' concerns about company water practices, up from one company in 2009. **Nexen** discusses negative public perceptions of water use in operations related to extracting coal bed methane (CBM) as well as the development of oil sands:

Negative public perception around water-saturated CBM production could impede our access to the resource... Public perceptions of greenhouse gas emissions, and water and land use practices in oil sands developments may directly or indirectly impair the profitability of our current oil sands projects and the viability of future oil sands projects in a number of ways. (10-K, pp. 42 & 46)



DISCLOSURE OF MANAGEMENT RESPONSE

Disclosure on actions related to improving water withdrawal, consumption and discharge has improved significantly since 2009 (from five companies disclosing such information to 12). In 2011, half of all companies in the sector (**BP, Chesapeake Energy, Nexen, Encana, Exxon-Mobil** and **Shell**) disclose water management policies and systems. For example, **Nexen** describes efforts to minimize water use in exploration and production:

We have developed a water strategy designed to minimize water use in our exploration and production operations. This strategy is embodied by the following four principles: optimize water use efficiency; minimize our impacts on ecosystem functions and ensure public health and safety are not affected by our activities; engage with stakeholders to promote responsible watershed management and evaluate opportunities to provide water management benefits to stakeholders; and measure and communicate our water management performance. This strategy was implemented with an emphasis on compliance and early adoption of best practices, incorporating water assessment tools in our investment decision-making process, developing water management systems to enhance water tracking and reporting, and seeking water re-use opportunities. Increased environmental regulation could increase our operating costs and affect our profitability. (10-K, p. 39)

Shell's 2011 20-F includes an entire section devoted to water issues. The section discusses the development of new technology to reduce freshwater needs in specific regions, working with water authorities on gray water, measures taken to prevent contamination of surface and groundwater in tailings, and summarizes the challenges facing the energy sector as a whole. The company has also linked a portion of variable compensation, through its Executive Director Scorecard, to water and other sustainability-related metrics:

For 2011, we have followed the advice of a number of shareholders to refer to internal measures of sustainable development. These targeted measures, monitored in accordance with industry guidelines, will be safety, which we believe underpins all sustainable development, along with operational spills, energy efficiency and fresh water use. (20-F, p. 61)

Suncor discloses collaborative work with other oil sands operators designed to move the industry to innovate beyond environmental compliance:

Suncor will also work closely with the Oil Sands Leadership Initiative (OSLI). Comprised of Suncor, Total and three other like-minded oil sands companies, this organization is squarely focused on innovations that lead to continuous improvement in environmental, social and economic performance. (40-F, p. 6)

Both **Suncor** and **Nexen** include some water performance data in their 2011 SEC filings. **Suncor** discusses performance goals:

Suncor has set four key environmental performance goals it intends to reach by 2015 (the base year for planned improvements is 2007): reduce total water intake by 12%, increase land area reclaimed by 100%, improve energy efficiency by 10% and reduce air emissions by 10%. In addition, Suncor has advanced strategies focused on operational excellence aimed at further improving process safety and reliability, which in turn will impact our environmental impact. (40-F, p. 18)

Nexen, on the other hand, discusses water usage at the site level but does not quantify water consumption or withdrawals:

The [bitumen extraction] process at the Mildred Lake North Mine uses hot water, steam and caustic soda to create a slurry, while at the Aurora North Mine, the oil sands are mixed with warm water. Close to 90% of the water used in operations is recycled from the upgrader and mine sites. Incremental water is drawn from the Athabasca River in accordance with existing licenses. (10-K, p. 14)





SEMICONDUCTORS SECTOR

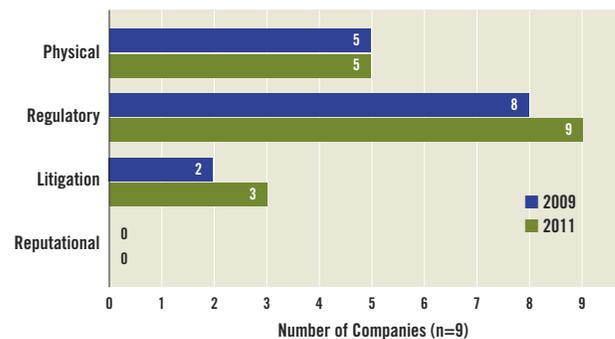
The semiconductor industry relies on large volumes of exceptionally high quality water to complete a variety of steps in the manufacturing process. For example, the slurry used to polish chips must be rinsed from the chip's surface. In order to properly clean such a tiny area without leaving residue, the water must be completely free of minerals (referred to as "ultrapure" water). The process to create ultrapure water is improving, but it still takes more than one gallon of water to create a

gallon of ultrapure water. As a result, the semiconductor industry's operational results can be seriously affected by water-related disruptions where the company, their customers, and/or suppliers operate. Many companies in the sector have major operations in locations subject to severe weather, droughts, floods, and interruptions in electricity or water supply that can disrupt operations. These areas include Taiwan, semi-arid regions of Israel, the southwestern U.S., and California.

The 2009 and 2011 financial filings of the following semiconductor companies were reviewed:

- ◆ Advanced Micro Devices (AMD)
- ◆ Analog Devices
- ◆ Infineon Technologies
- ◆ Intel
- ◆ Micron
- ◆ ST Microelectronics
- ◆ Taiwan Semiconductors
- ◆ Texas Instruments
- ◆ United MicroElectronics (UMC)

SEMICONDUCTORS SECTOR: Water-Related Risk Disclosure



SECTOR HIGHLIGHTS:

- Five companies in the sector cite water-related physical risks—the same number as 2009. **Intel** and **Taiwan Semiconductors** also linked climate change to water risks in both 2009 and 2011 filings.
- None of the semiconductor companies analyzed cite specific water-related policies and management systems.
- **Intel** has the most extensive disclosure in all categories analyzed for this report, including its efforts to engage stakeholders to discuss performance on sustainability issues.
- In 2011, **Taiwan Semiconductor** provides detailed disclosures on how climate change poses economic and physical risks to its business. The company also highlights the potential for operational disruptions due to shocks in the water supply.
- **United Microelectronics** includes information on water use and recycling in the manufacturing process as well as water footprint verification for its 200mm and 300mm wafers.



PHYSICAL RISKS

As in 2009, five semiconductor companies disclose water-related physical risks to business. **STMicroelectronics** and **Texas Instruments** cite risks posed by severe weather events and natural disasters. **Intel**, **Taiwan Semiconductors**, and **United Microelectronics** mention severe weather and go on to list risks due to water-related interruptions in utilities and prolonged drought. **Intel** and **Taiwan Semiconductors** also link climate change directly to water risks in their disclosures. For example, **Intel** states:

Many of our operations are located in semi-arid regions, such as Israel and the southwestern United States. Some scenarios predict that these regions may become even more vulnerable to prolonged droughts due to climate change. (10-K, p. 21)

As in 2009, **Taiwan Semiconductors** discusses the water-intensive nature of the semiconductor industry and the risk inadequate water supplies pose to operations. In 2011, the company expanded this discussion to risks posed by flooding, droughts, and water shortages in areas of operation:

Our results of operations could be materially adversely affected by natural disasters or interruptions in the supply of utilities (such as water or electricity) in the locations in which we, our customers or suppliers operate. We have manufacturing and other operations in locations subject to natural disasters such as severe weather and earthquakes as well as interruptions or shortages in the supply of utilities (such as water and electricity) that could disrupt operations. In addition, our suppliers and customers also have operations in such locations...The semiconductor manufacturing processes also use extensive amounts of fresh water. Due to the growth of the semiconductor manufacturers in the Hsinchu Science Park and Tainan Science Park, and the droughts that Taiwan experiences from time to time, there is concern regarding future availability of sufficient fresh water and the potential impact insufficient water supplies may have on our semiconductor production. (10-K, p. 10)

REGULATORY RISKS

All nine of the companies analyzed cite water-related regulatory risks and mention that their operations are subject to environmental regulations on wastewater disposal.

LITIGATION RISKS

In 2009, **AMD** and **Texas Instruments** were the only companies that disclosed water-related litigation risks. In 2011, **Infineon Technology** joined the group. **AMD's** 2011 filing quantifies the estimated cost of environmental litigation:

We are named as a responsible party on Superfund clean-up orders for three sites in Sunnyvale, California that are on the National Priorities List... We have computed and recorded an estimated environmental liability of approximately \$3.6 million and have not recorded any potential insurance recoveries in determining the estimated costs of the cleanup. (10-K, p. 33)

REPUTATIONAL RISKS

No company in the semiconductor sector disclosed water-related reputational risks in 2009 or 2011.



DISCLOSURE OF MANAGEMENT RESPONSE

In addition to discussion of physical, regulatory, litigation and reputational risks, some companies also disclose water accounting data, water management strategies, and the ways in which they work to address water issues in their supply chains and engage relevant stakeholders on water issues.

United Microelectronics discloses some information on water use and recycling in the manufacturing process as well as having completed water footprint verification for its 200mm and 300mm wafers:

We use a large amount of water in our manufacturing process. We obtain water supplies from government-owned entities and recycle approximately 85% of the water that we use during the manufacturing process... in 2010, UMC completed water footprint verification for our 200 mm and 300 mm wafers. These verifications provide scientific and reliable statistics on the carbon and water information of products manufactured in our fabs as well as self-reviews of environmental impact. (20-F, pp. 32 & 38)

Intel discloses further details on the company's focus on reducing natural resource use, including targets on water use:

Our compliance efforts focus on monitoring regulatory and resource trends and setting company-wide performance targets for key resources and emissions. These targets address several parameters, including product design; chemical, energy, and water use; climate change; waste recycling; and emissions. (10-K, p. 14)

Intel discloses information on working proactively with governments, environmental groups, and the industry at large to promote global environmental sustainability. While it can be assumed that environmental sustainability includes water, water issues are not referenced directly:

We are committed to sustainability and take a leadership position in promoting voluntary environmental initiatives and working proactively with governments, environmental groups, and industry to promote global environmental sustainability. We believe that technology will be fundamental to finding solutions to the world's environmental challenges, and we are joining forces with industry, business, and governments to find and promote ways that technology can be used as a tool to combat climate change... (10-K, p. 12)





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