CASE STUDY: BAYER AG

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<th>CASE STUDY</th>
<th>BAYER AG</th>
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<tr>
<td>Headquarters:</td>
<td>Leverkusen, Germany</td>
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<tr>
<td>Industry:</td>
<td>Chemicals</td>
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<tr>
<td>Revenues (2012):</td>
<td>$39 billion</td>
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<tr>
<td>Employees:</td>
<td>112,000</td>
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<tr>
<td>Key Initiatives:</td>
<td>• Developed climate change risk matrix to inform operational and R&amp;D decisions</td>
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<tr>
<td></td>
<td>• Building awareness and expertise among business units and staff</td>
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<td></td>
<td>• Engaging in research partnerships analyzing climate changes</td>
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COMPANY PROFILE

Bayer AG is a global enterprise with core competencies in the fields of health care, agriculture, and high-tech materials. Bayer HealthCare, with annual sales of approximately $23 billion in 2011, is one of the world’s leading companies in the healthcare and medical products industry. The company combines the global activities of Bayer’s Animal Health, Consumer Care, Medical Care, and Pharmaceuticals divisions. Bayer MaterialScience is among the world’s largest polymer companies, with business activities focused on the manufacture of high-tech polymer materials and the development of innovative solutions for products used in automotive, electrical and electronics, construction, and sports and leisure industries. The group had sales of approximately $14 billion in 2011. Bayer CropScience, a subgroup of Bayer AG responsible for the agricultural business, had annual sales of approximately $9.5 billion in 2011 and is one of the world’s leading innovative crop science companies in the areas of seeds, crop protection, and non-agricultural pest control.

BUSINESS DRIVERS AND INITIAL CONCERNS ABOUT IMPACTS OF CLIMATE CHANGE

The effects of climate change—warmer temperatures and increasingly variable weather extremes and precipitation patterns—will have significant effects on Bayer’s customers. The company considers these effects to pose more of an opportunity to better serve evolving customer needs than a risk to its bottom line. Based on extensive analysis of risks to its facilities, it has concluded that disruptions to operations, supply chain, or product delivery are already sufficiently minimized through supplier diversification and through strategies that build redundancies and flexibility into operations. But climate change impacts will increase demand for some of its existing products and drive development of new innovations that help Bayer’s customers in climate-sensitive sectors—agricultural producers, healthcare providers, and construction companies—to cope with more extreme weather events. For example, the United Nations Environment Program (UNEP) warns that rising temperatures and changing weather patterns could lead
to an increase in malaria infections of 40 to 60 million cases in Africa alone, creating a stronger need for Bayer products that treat and control the disease. As global average temperatures rise there will be more demand for products that help manage temperature and energy use in buildings, such as Bayer’s advanced insulation materials, and greater water scarcity is driving demand for more drought-resistant and stress-tolerant seeds.

COMPANY RESPONSES

Risk Assessment: Climate Change “Risk Matrix”

The company considers the most important risk management issue in the chemical industry to be safety. Ensuring the safety of employees, consumers, and the public is paramount to maintaining Bayer’s license to operate. The kinds of impacts from extreme weather—power outages interrupting production, water shortages delaying product delivery—are the kinds of risks that the company is already significantly invested in mitigating to ensure the safety and security of operations.

Business risks are collected and analyzed in Bayer’s centralized BayRISK management database. Each quarter, data on key performance indicators (KPIs) such as safety incidents, energy consumption, water use, and emissions at business units are submitted to a globally integrated BaySIS site information system. This site-specific information compiled each year enables the identification of year-on-year comparable trends, and supports capital investment decisions including for research and development (R&D). The 18-member staff of Bayer’s Environment and Sustainability (E&S) group share information and analyze environmental risks through a community of practice-based system. E&S managers meet quarterly at headquarters to assess risks affecting investment decisions and R&D strategy in the Sustainable Development, Technology and Innovation and the Health, Safety, Environment and Quality Committees. A member of the Board of Management of Bayer AG leads the committees and ultimately makes decisions about whether a shift in practice is necessary.

Starting in 2007, the E&S group began to develop a better picture of climate change risks to its operations and customers. One of the drivers was Bayer’s commitment at the World Economic Forum to a public-private partnership promoting more resilient and sustainable agricultural systems. Another driver was the losses and damage experienced from Hurricanes Katrina (2005) and Ike (2008) at the company’s operations in Baytown, Texas (Box 1). Managers wondered whether changes needed to be made to anticipate similar risks in the future. The first step was to start building awareness internally in a way that connected the issue to the business. The E&S group does not talk about impacts from “climate change,” but rather about the increased risks from weather extremes in terms of, for example, changes in yield or impacts on cooling water availability—challenges that the company has already experienced or witnessed over the last decade. Stronger storms, flooding, and drought are readily visible, and managers care most about those near-term impacts on their businesses.

To build internal knowledge and expertise on extreme weather and climate change impacts, Bayer’s E&S subgroups are engaging in strategic research projects with publicly funded research organizations. A partnership with the Potsdam Institute for Climate Impact Research developed scenarios of changes in hydrology, air temperature, sea level, and river flows that may affect how agricultural and healthcare sector needs might evolve on different continents over the next 10, 50, and 100 years. Bayer is also a founding member of Climate-KIC, a knowledge-sharing group established by the European Commission that, among other things, works on projecting, forecasting, and managing climate extremes.

These analyses have identified increases in precipitation, weather extremes, and droughts due to climate change as potential risks. Sites in coastal regions (Baytown, Texas; Map Ta Phut, Thailand; Caojing, China; Cuddalore, India) may be exposed to more damaging hurricanes. Several sites in Europe, North America, and Asia are potentially threatened by flooding, and the company’s Indian site may be subject to monsoon rains, which could disrupt or halt plant operations or damage property. Longer droughts could lead to indirect impacts on the company, such as higher energy costs or electricity service disruptions. And disruptions or increased costs in the shipping-based parts of Bayer’s logistics, on which it relies for critical supplies of salt and coal in Germany, for example, could occur if river water were to fall below critical levels.²

Bayer’s analysis does not indicate that these risks will have a substantive impact on its operations within the next 10 years. A risk evaluation of company sites by Bayer’s insurer Pallas Insurance indicated no change in exposure to weather-related risk; the evaluation estimated the probabilities for “worst-case scenario” events and the need for additional protective measures to be very low.³ Climate change factors per se are therefore not
explicitly captured in the BayRISK database. That said, trends in extreme weather, drought, or precipitation may be seen through historical changes in KPIs over time that indicate changing water resources or energy use due to rising temperatures in different regions.

To help the company consider the potential future risks from climate change impacts, the E&S group worked with financial experts to build a climate change “risk matrix” with which to evaluate and prioritize climate-related risks over Bayer’s 10- to 20-year planning horizon. The risk matrix is used as an overlay to improve the analysis of the BayRISK database information. The 5x5 matrix ranks risks according to their potential extent of damage and frequency of occurrence, and assigns a simple high, medium, or low impact rating. For example, when the potential supply chain risks related to shipping were assessed, lower water levels on the Rhine River due to more intense droughts were assigned a rating of “low risk” in the BayRISK System, given the availability of alternate transport via rail and truck.

These climate change and extreme weather assessments, only five years old, are still in their early stages, but they will likely become more critical for corporate planning in the future. Moreover, given the long lead times required for bringing new innovations to market—from five to 15 years—and planning for investments in assets that last for up to 50 years, information provided to Bayer’s scientists and strategic planners today is helping to inform decision-making for the future.

**Box 1: Rebuilding at Baytown**

Like all responsible chemical manufacturers, Bayer considers the possible safety risks from natural disasters such as earthquakes, tornadoes, and hurricanes when siting new facilities and planning for the safe shutdown of plants after a disruptive event. The effects of Hurricanes Katrina and Ike—in which the Baytown plant was minimally affected but employee homes and communities suffered significant damage—shifted the focus of Bayer’s risk analysis to the importance of employee support and community aid in restoring normal business operations. Bayer responded to Hurricane Katrina by providing communities with tarps, chain saws, flashlights, over 200 generators, ready-to-eat meals, water, first aid supplies, and cleaning supplies. In addition, Bayer provided:

- A work crew to visit employees’ homes to place the tarps on roofs, since many people have a hard time maneuvering on steep roofs
- Seven tanker trucks, each holding 8,000 gallons of fuel, to fill up employees’ cars and generators
- Temporary trailers for employees whose homes were so damaged that they were no longer inhabitable
- Funds for immediate repairs, from Bayer employees at other sites
- Catering services that served hot meals from the company parking lot 24 hours a day for over three weeks

The company learned from this experience that rebuilding affected communities after an extreme weather event is as important as the procedures for safely shutting down and restarting the plants themselves.

**Risk Management: Supplementing Business as Usual**

Bayer is already heavily invested in maintaining a flexible global production system in order to ensure safety, provide for continuity of operations, and meet obligations to customers. Globally distributed manufacturing sites and supply chains ensure that Bayer is able to shift supply of products among sites in the event of potential catastrophes, including those caused by extreme weather. Furthermore, the company believes that existing risk prevention practices and emergency response plans could be readily adapted if weather extremes were to increase in the future. Of particular importance for Bayer’s business continuity planning is ensuring reliable and high-quality supplies of energy and water. If power supplies or cooling water is lost, it can sometimes take up to a full—and costly—week to restart a Bayer production plant.

The climate change “risk matrix” is helping Bayer to think about future impacts on power supply or cooling systems from extreme weather events or changes in water availability. To mitigate production losses and safety issues from electricity outages, Bayer is both reducing sites’ energy consumption and seeking alternative forms of energy and energy storage solutions that would increase flexibility of energy supply in the future.
Extreme weather and climate change factors are also making their way into decision-making about major new investments. Bayer’s new manufacturing site in coastal Caojing, China, is located in a low-lying geography very similar to that of Baytown, Texas. Bayer’s safety program applied the lessons learned from plant shutdowns after hurricanes near Baytown to enhance its Top Performance in Process and Plant Safety Program (TOPPS) employee safety training and materials at the new Caojing site. It also has developed more extensive plans to provide relief directly to company employees following any weather disasters.

**Business Opportunities: Climate-Smart Solutions**

For Bayer, one of the most important uses of information about past and future changes in climate, precipitation, and extreme weather is understanding how its customers’ needs will evolve. Many of Bayer’s product development and R&D efforts have focused for decades on the business challenges that customers face with volatile and unpredictable weather. Bayer customers are not necessarily asking for “climate change” protection per se. Yet the company is increasingly seeing impacts to its customer segments from extreme weather and is learning about future impacts from its research partnerships and climate “risk matrix,” which validate its continued focus on innovative solutions for a more drought-ridden and unpredictable climate. The company’s decision to extend an R&D partnership that is developing advanced mosquito nets to control malaria came out of its initial evaluation in 2007 that indicated warmer temperatures, higher precipitation and more mosquitoes in some parts of the world in the coming decades.

“Being forward-thinking affords market advantages. Providing information to our scientists and strategic planners now about climate changes occurring over the 10, 20 or even 50 years is helping to inform decisions today about innovation and competitiveness for the future.”

—Achim Ilzhoefer, Corporate Environment & Sustainability Center, Bayer AG

Warmer temperatures and more damaging weather events have implications in particular for Bayer MaterialScience (BMS) and Bayer CropScience (BCS) business units. BMS estimates that approximately 20 percent of its approximately $9.7 billion in 2011 revenues came from climate-related business and BCS’s business as a whole is climate-related since it serves the agricultural sector. BCS is already seeing how water shortages, heat, and excessive rainfall are affecting agricultural yields for crops such as maize, barley, and wheat; these stresses are reducing yields in some cases up to 80 percent. Rising temperatures and more severe storms will require both better insulation to save energy and stronger building materials developed by BMS.

Bayer has been pursuing these opportunities by investing in new products, expanding its R&D capabilities for existing product lines, and forming research partnerships:

- Emerging “climate-smart” agriculture combines practices and technologies that increase crop productivity and resilience to weather stresses, along with reduced environmental impact. Bayer recognizes that trends in climate change impacts, combined with predicted world population growth over the next several decades, will likely drive higher food prices and thus drive business growth for the company. BCS is investing in R&D for products that alleviate the consequences of changing weather patterns—including floods, droughts, heat, cold, and storms—on crop yields. For example, the insecticide Confidor improves the resilience of crops against potentially greater incidence of pest outbreaks as well as against increased groundwater salinity. BCS is investing approximately $26 million over the next five years to expand its seed research laboratory in Singapore to support the development of pest- and heavy weather-resistant seed varieties and hybrids. BCS is working with Australia’s national science agency to develop cereals better capable of growing under moisture and heat stress. In 2011, BCS estimates that it spent approximately $37 million on R&D related to climate change.

- Because buildings have a typical lifespan of 80 or more years, their existing equipment and systems—including HVAC, lighting, windows, and control systems—is often outdated and inefficient. Annual revenues from the buildings retrofit business in the United States are estimated to be $16 billion by 2020. Demand for building materials may also increase as destroyed buildings need to be rebuilt. BMS’ high-performance polycarbonate
insulation materials lend enhanced stability to buildings exposed to severe storms, in addition to increasing energy efficiency. In the United States, BMS formed the Impact Shielding Team in 2011 to develop and commercialize building protection solutions for structures in high-risk environments. In 2011, BMS estimates it spent approximately $120 million on R&D related to climate change.

- In light of the expected spread of malaria, BCS worked in partnership with the World Health Organization to bring LifeNet mosquito nets to market in May 2012, that continuously release insecticidal protection against mosquitoes.

Bayer expects that the most significant impacts to its customers from climate and weather changes are still 10 years away but that they will drive demand and business growth for products already on the market and for new innovations. Given the long lead times required for commercializing new innovations—it can take 15 years to bring a new genetically modified crop variety to market—information gathered today will help inform decision-making for years to come.

CHALLENGES AND BARRIERS

Bayer recognizes that relying on the BayRISK database of past trends and risks is not sufficient for predicting future extreme weather events, especially when they will be made more volatile and unpredictable with climate change. Bayer’s climate change research partnerships and its “risk matrix” developed over the past five years are helping to add a forward-looking picture of risks beyond what the BayRISK analysis provides. The E&S group receives solid support from management for its risk assessments, given Bayer’s already strong commitment to investing in capacity and knowledge building that will drive risks down and build operational flexibility at every company site.

But the climate change risk management program is still in its early stages, and the E&S group still finds it challenging to convince decision-makers and board members of the need to act on the wider picture of risks that forward-looking scenarios of climate and weather changes suggest. Part of that challenge is difficulty with communicating about climate- and weather-related risks whose timing and locations are inherently unpredictable. Climate change not only imposes physical constraints on Bayer and its customers but also multiplies the level of unpredictability around availability, quality, and price of key commodities such as energy and water. The nature and magnitude of risks change at each Bayer site in each country every year, and it is difficult to develop a long-term picture of future risks that will be applicable to each site, business type, and regional location. And forward-looking scenarios of future change, while helpful, are still only limited tools generating predictions—not proof—of more frequent or severe impacts.
ENDNOTES


3 Id.

4 Id.


