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THE URGENCY—AND THE OPPORTUNITY—OF SMART RESOURCE MANAGEMENT

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GLOBAL POPULATION GROWTH AND economic development have put a severe strain on the earth's limited supply of minerals, water, fuel, and other natural resources. For manufacturers that rely on these resources, unexpected price swings or supply shortages can hinder production, disrupt earnings, and derail growth plans. Companies are also facing growing environmental pressure from regulators, customers, investors, and the public.

Forward-looking leadership teams are committed to finding new, sustainable ways to grow their businesses while minimizing operating risk and environmental impact. This balancing act is tough, but our research into the resource management approaches of 50 leading companies in a wide variety of industries has identified best practices that can alleviate that tension. If implemented consistently and well, these guidelines can help companies take a better, smarter approach to resource management—reducing risks, cutting costs, spurring growth, supporting new business opportunities, and achieving a lasting competitive advantage.

A Surge in Resource Use

The growing global population, rapidly emerging economies, and rising incomes in many parts of the world are upsetting the delicate balance of the earth's resources. The demand for commodities and raw materials has exploded, fueled in large part by the economic growth of nations such as India and China. And the situation will only get more challenging. The United Nations estimates that the world's population will reach 8.5 billion in 2030, an increase of 16% since 2015.

Without sustainable agricultural, mining, and production practices, the environmental impact of housing, feeding, and clothing so many people will be enormous. But the benefits that companies can reap from saving resources while simultaneously cushioning environmental impacts are substantial too. Reducing worldwide resource use by only 1% could save approximately 840 million tons of metals, fossil fuels, minerals, and biomass annually—and 39.2 trillion liters of water. Using data from the Organisation for Economic Co-operation and

Development and the World Trade Organization, we estimate that such a reduction would translate into potential savings of approximately \$80 billion for the global economy (assuming that global resource extraction costs are about \$80 trillion, equal to 5% to 10% of global GDP).

Boosting resource efficiency is also urgently required. The good news is that it's possible. While resource extraction has tracked population growth over the last few decades, resource intensity—the amount of resources needed to generate a unit of economic growth—has not followed suit. As a result, worldwide GDP has grown faster than resource extraction. In short, companies have found ways to do more with less.

While we expect efficiency gains to continue—driven by the rise of the service economy coupled with smarter product and process designs that do more with fewer materials—contention for resources will persist in most sectors. The global growth in resource use will continue to put pressure on supply markets and drive prices higher. Moreover, the uneven geographic distribution of resources will add further wrinkles that create tensions between producers and the companies that buy from them. For instance, China produces 97% of the world's rare-earth metals that are integral to many modern technologies. The nation controls worldwide prices through export taxes and quotas. Similarly, Africa has 90% of the world's platinum and 56% of all diamond reserves. Supply disruptions can cause price volatility, and natural disasters can exacerbate the problem. Chile's 2009 earthquake caused copper prices to spike for 11 months—not surprising given that the country accounts for more than a third of global copper production.

Companies that rely on scarce natural resources—such as precious metals, energy, rare-earth metals, and water (the availability of which is low in much of the world)—thus face increasing operational risks. Without a proper resource management strategy, supply disruptions and price volatility can wreak havoc on production schedules, earnings, and growth.

The Writing on the Wall

In addition to the economic and geopolitical risks, companies in almost all industries face pressure from a variety of external sources to be more responsible in their resource management:

- **Regulatory Pressure.** In response to growing concerns about climate change, environmental damage, and resource scarcity, regulatory agencies are imposing fines and other constraints to reduce air and water pollution and encourage sustainable production methods for natural resources. These regulations are increasingly stringent and comprehensive. In December 2015, for instance, 195 nations attending the 21st Conference of the Parties on climate change in Paris agreed to limit global warming by curbing CO₂ emissions. With the EU's approval of the accord on October 4, 2016, the required threshold of 55 ratifying parties, representing at least 55% of global emissions, was successfully crossed—and participating countries began making their own plans to meet their commitments. In November 2016, the UK ratified the Paris goal of net zero carbon emissions by midcentury. Sweden is legally committed to be carbon neutral by 2045, which it will accomplish by reducing emissions to 85% of 1990 levels; the country will tackle the remaining 15% by investing in carbon-offsetting projects overseas. Japan set a medium-term goal of reducing its emissions by 26%, compared with a 2013 baseline, by 2030. Even with efforts by the current US administration to weaken environmental statutes, the trend toward tougher environmental regulation across the globe will likely continue.
- **Customer Pressure.** Especially in Europe and the US, today's consumers are becoming more knowledgeable, passionate, and critical of raw materials and methods of production. Many of these consumers distrust pesticides and genetically modified food, prefer organic farming methods, and want to know the path from farm to fork. The millennial generation in particular is increasingly

aware of the importance of sustainability and believes that collective action can make a difference. (See “When Social Responsibility Leads to Growth: The European Grocery Market,” BCG article, October 2015.) According to Nielsen’s *2015 Global Corporate Sustainability Report*, a solid 66% of global survey respondents indicated that they are willing to pay a price premium for socially and environmentally sustainable products and services.

- **Investor Pressure.** Socially responsible green investing is gaining adherents among those who want their money to deliver positive social or environmental impact—not just financial returns. According to a recent sustainability study conducted by MIT and BCG, almost half of all investors are now willing to divest from companies that don’t provide transparency into their value chains. (See *Investing for a Sustainable Future: Investors Care More About Sustainability Than Executives Believe*, MIT-BCG report, May 2016.) Focusing on sustainability investments can pay off, as Generation Investment Management, an investment fund with approximately \$12 billion in assets under management, has shown. Cofounded by Nobel Peace Prize winners Al Gore and the Intergovernmental Panel on Climate Change, the fund outperformed the market by more than 5 percentage points with a return on investment of 12.1% from 2005 through 2015.
- **Public Pressure.** Cell phone cameras, social media, online blogs, and satellite tracking are powerful tools that unhappy neighbors, community activists, as well as politicians can use to call attention to business practices that they consider to be environmentally unfriendly. In 2015, while the Chinese company MMG was constructing its Las Bambas copper mine in Peru, prolonged protests led to violent clashes and the death of four people, and pictures of aggressive police officers and injured protesters spread quickly around the world.

- **Competitive Pressure.** Few companies are standing still when it comes to adopting sustainable practices, and many leading firms are finding that taking decisive action pays substantial dividends in terms of growth, market share, and public relations. Industry laggards are feeling the pressure to step up. Walmart, for example, seeks to be a sustainability leader—it saves approximately \$1 billion annually, compared with a 2005 baseline, by adapting its fleet to sustainability standards while simultaneously boosting its efficiency. Through route optimization, driver training, and improvements to the loading process, the company avoids an estimated 650,000 tons of CO₂ emissions annually.

For leadership teams, the writing is on the wall: commit to developing an effective resource management strategy or suffer the consequences. But not knowing where to start and what to prioritize can be stumbling blocks—even when companies have the best intentions.

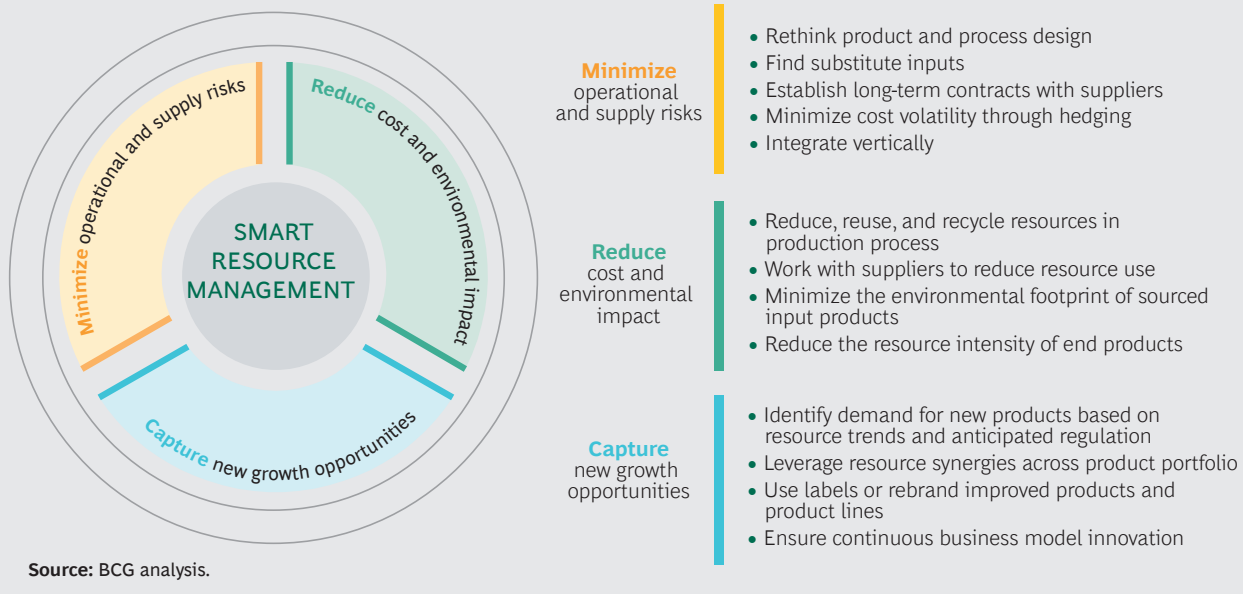
A Three-Pronged Approach

Although few companies today question the importance of sustainability or the need for a resource management strategy, the approaches we’ve seen vary widely in their focus and effectiveness. To determine how business leaders are approaching the challenge—and which initiatives work the best—we studied the resource management activities of over 50 companies across a wide mix of industries. Our analysis reveals that the best strategies have three distinct and highly strategic objectives:

- To minimize the operational and supply risks of resource dependence
- To reduce the cost and environmental impact of operations
- To capture new growth opportunities

But each objective demands different tactics. We call this approach smart resource management. (See Exhibit 1.)

EXHIBIT 1 | Three Key Pillars of Smart Resource Management



MINIMIZE OPERATIONAL AND SUPPLY RISKS

To determine your company’s degree of operating risk, first analyze the natural resources and commodities that are used during each step of production—and how critical these inputs are. In other words, conduct a full materiality assessment. If a major change in an input’s supply or price would have a substantial negative effect on your company’s growth or earnings or place you at a competitive disadvantage, make offsetting those risks a priority.

To identify at-risk resources, your team should consider two primary factors: the resource availability, influenced by price and scarcity, and the profit impact and importance of the resource to your products and operations. (Exhibit 2 provides examples by industry.) Not surprisingly, the greatest risks come from scarce, mission-critical resources for which no substitutes are available.

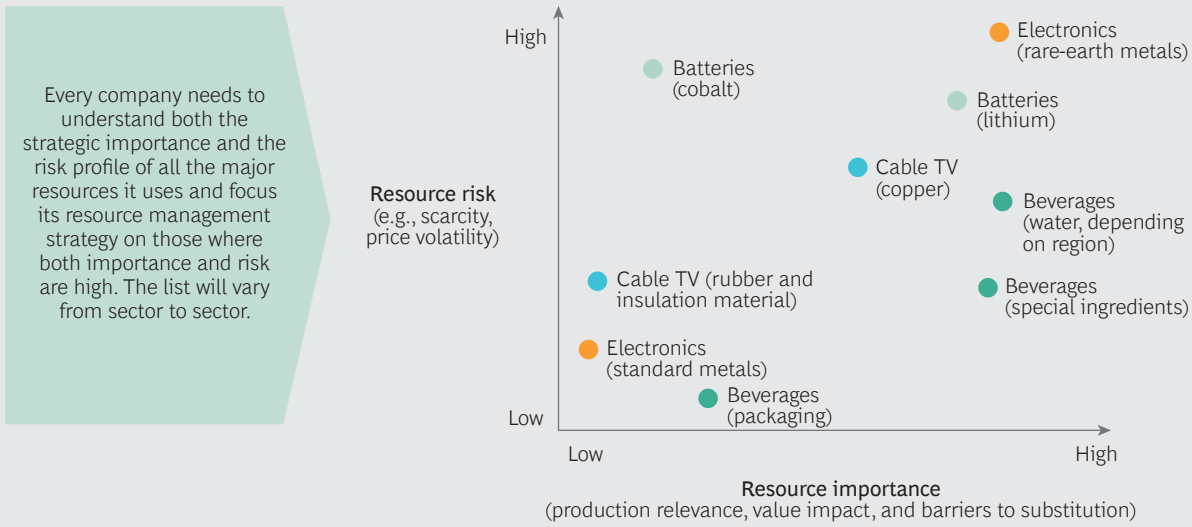
In the beverage industry, for example, water and product-specific ingredients are critical and have no substitutes. Packaging, though, offers many different options, is theoretically easy to substitute, and is not the primary driver of value to consumers.

After identifying at-risk resources, the next step is to minimize the operating risks of

resource dependence. Risk mitigation options include:

- **Rethinking Product or Process Design.** By redesigning a product or process, you may be able to lessen or completely eliminate the need for a scarce or costly resource. For instance, Toyota reengineered its hybrid engine to reduce its dependence on China’s rare-earth metals. Similarly, SABMiller redesigned its production process in order to lessen water usage, cutting consumption per hectoliter of beer produced by 20% from 2008 through 2013.
- **Finding Substitute Inputs.** Sometimes you can use a different input to replace a high-risk commodity or natural resource without compromising cost, safety, or quality. Cathay Pacific and United Airlines reduced their dependence on traditional jet fuels by investing in a technology that turns municipal waste into synthetic crude oil that can be converted into fuel. Collaborating with or funding leading research centers and universities can give you early access to new materials—and a competitive edge.
- **Establishing Long-Term Contracts with Suppliers.** By agreeing to long-term contracts, you can increase short-

EXHIBIT 2 | Identifying the Most Critical Resource Risks



Source: BCG analysis.

term costs but mitigate longer-term risks. Also, deeper relationships with key suppliers may give your company priority status when raw materials and other inputs are in short supply. An example is Norsk Hydro, a Norwegian aluminum and renewable-energy company that signed two long-term power contracts with Switzerland-based energy company Axpo Group to hedge against electricity price fluctuations for its aluminum plant in Neuss, Germany. The first contract comprised 0.9 terawatt hours (100 megawatts) annually for 2018 through 2025, while the second—which was added to the agreement—covered 1.3 terawatt hours (150 megawatts) annually for 2018 through 2025. These agreements constitute an important risk minimization measure because electricity costs make up about 40% of total costs in aluminum production.

- Minimizing Cost Volatility Through Hedging.** One way you can address the risks of scarcity and boost margins is to lock in critical inputs at lower prices. Hedging comes with risks and is not easy to get right, but—with the right research and analytics capabilities—you can do it effectively. The airline industry has demonstrated what a difference hedging capabilities can make: only a

few airlines like Jet Blue stayed profitable when oil prices rose strongly starting in 2011 and continued for a few years. Fuel costs are a key cost driver for US airlines, ranging from 33% to 37% of operating costs.

- Integrating Vertically.** You can mitigate some operating risk through vertical integration: buying a source of resources you need. For example, in 2014, one of Europe's largest manufacturers of chocolate and confectionary products purchased a Turkish hazelnut producer whose main product is a key ingredient in many of the manufacturer's best-selling chocolate products. And, since 2013, a leading US coffee house chain has successfully mitigated the risk associated with its coffee supply by acquiring coffee farms and integrating them into the company's value chain.

By using one or more of these tactics, you can reduce your company's resource dependence and associated operational risks.

REDUCE COST AND ENVIRONMENTAL IMPACT

The second aspect of an effective smart resource management strategy is to promote green business practices and to reduce any negative impact on the environ-

ment—largely by decreasing your use of natural resources overall, reusing materials, and replenishing diminished supplies where possible while creating a benefit on the cost side.

A number of leading companies are working with suppliers and customers to sharply reduce the use of natural resources. A deep understanding of how raw materials are used during each step of your value chain is critical—as are traceability and transparency along the value chain. Many companies are investing in technologies and systems to enhance their understanding of resource use. They are increasingly using sophisticated big data analytics to assess risk, reduce emissions, and boost resource efficiency. Big data analytics are becoming more prominent irrespective of the industry, from mining to food producers. Danone, the French manufacturer of food and dairy products, uses an enterprise resource planning system to model its end-to-end value chain. The system analyzes up to 35,000 products per month to capture the company’s real-time carbon emissions as well as its energy and water consumption, with a goal of reducing CO₂ emissions and costs. A European transnational food and beverage company has developed proprietary water-stress indexes that allow it to forecast when and where business-critical water scarcity is likely to occur.

Many of the companies we analyzed are focusing on sustainable business practices and saving a lot of money at the same time. Aquafina reduced the plastic content of its water bottles by more than half over a ten-year period, avoiding millions in material costs while helping the environment. From 2009 through 2014, its parent company, PepsiCo, saved \$375 million by decreasing water consumption, reducing waste, improving packaging, and promoting energy and fleet efficiency. Sustainability pioneer Interface uses 50% recycled or bio-based materials for its carpet tiles, which helped it avert \$488 million in waste costs from 1995 through 2012.

Sustainable production can also help your company prevent future environmental

damage caused by agriculture, mining, and forestry. Palm oil, for instance, is in high demand around the world because of its low cost, high margins, and versatility, but farming of the popular commodity has destroyed millions of acres of rainforest over the past 20 years, endangering wildlife and contributing to global climate change. In 2003, the World Wildlife Fund joined forces with industry players and nongovernmental organizations to form the Roundtable on Sustainable Palm Oil, which introduced standards for sustainable palm oil production and certification, offers transparency into the industry supply chain, and provides access to high-value markets. This type of broad-based progress is possible only if a wide array of supply chain players and government agencies commit to it and cooperate.

CAPTURE NEW GROWTH OPPORTUNITIES

Perhaps the most interesting aspect of smart resource management is how often it can lead to new businesses models and growth opportunities. Companies at the forefront of sustainability are exploring whether reducing waste, rethinking product design, and overcoming resource shortages can open up new markets and increase revenues. By exploring these options, your company may find that green products can command a price premium.

When the EU released stricter tire regulations aimed at improving safety and efficiency, one of the world’s largest tire manufacturers not only complied but developed new green products to differentiate itself from the competition. In addition to using natural materials such as rice husk ash, the new products reduced waste and decreased water usage by up to 70%. The new tires were enormously popular with consumers. In 2016, revenue from the tires accounted for about half of the company’s total revenues.

A leading global manufacturer of lighting and electronics has capitalized on smart resource management by introducing an innovative business model, lighting as a service. Customers lease the lighting, including

fixtures and installations, while the manufacturer retains ownership and takes responsibility for repairs and parts recycling. Customers pay only for the light they use. In a large US city, the company provides LED lighting for parking garages (more than 15,000 fixtures), with no upfront cost for the city. The company generates its earnings from the annual energy savings, which amount to \$2 million, and has secured a ten-year maintenance contract with the city. This new offering allows real-time monitoring of electricity consumption and reduces energy usage by 68%. And it gives the lighting company an incentive to improve the longevity of its products and design them for easy repair and reduced waste production, given that the company is responsible for all costs associated with ownership, maintenance, and disposal.

Eastman Chemical has also realized the benefits of smart resource management. The company has developed an insulating glass system that can be retrofitted onto any commercial or residential building. The glass sharply improves insulation,

ultraviolet protection, and noise reduction. According to company sources, Eastman refurbished all 6,514 windows of the Empire State Building, which will save \$4.4 million per year and reduce carbon emissions by 105,000 metric tons annually over the next 15 years.

Embracing Smart Resource Management

Implementing a smart resource management approach and making a profit are not mutually exclusive, although they are in many cases intertwined. To reap the benefits, however, it is crucial to elevate resource management in your company's overall decision making and strategic considerations. Getting the support of the board and giving a chief sustainability officer a clear charter are also important—so too is establishing as much transparency as possible in resource flows along the entire value chain. The experiences of the many companies mentioned earlier prove it: being sustainable also means being profitable if you do it right.

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