Global tectonics:
Part 7

Resource Management: Allocating Precious Stores

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EXECUTIVE SUMMARY

Water, food, and energy will be at the forefront of resource allocation concerns in the decades to come. Earth's most precious renewable resource, water is becoming increasingly scarce; food, although produced at a rate to nourish all the Earth's inhabitants, can't reach the necessary locations; and energy, a driving force in the global economy, faces an uncertain future. Businesses must invest in strategic resources to position themselves to succeed as these forces unfold.

12 TRENDS changing the world

A five-year research project reveals that the future of commerce worldwide will be greatly influenced by a dozen "global tectonics" that will affect business leaders across all industries:

1. Biotechnology
2. Nanotechnology
3. Information technology
4. Population
5. Urbanization
6. Disease and globalization
7. **Resource management**
8. Environmental degradation
9. Knowledge dissemination
10. Economic integration
11. Conflict
12. Governance

Businesses around the world must remain attentive to the changes in the availability of critical resources — water, food, and energy. Each of these resources and their respective challenges will present businesses with potential opportunities, costs, and risks. Businesses will have to be able to use technological innovation, cope with regional conflicts, and increase operational efficiency. Businesses that create policies to respond strategically to these changing tectonic forces will be able to avoid and manage escalating costs, take advantage of increasing opportunities, and prosper in the future.

Over the next 25 years, businesses will play a key role in inventing and developing new technologies such as desalinization plants, biotechnology, and renewable fuels to help relieve resource scarcity. Corporations and governments are already forging partnerships to commercialize resources and improve the production and efficiency of water management systems, food security and distribution, and energy availability.

Water's increasing value

Water is Earth's most precious renewable resource and its growing scarcity, as a result of a population explosion, urbanization, and environmental degradation, is increasing its demand and value as a commodity. The invaluableness of water lies in the fact that it has no equitable substitute and is necessary for the production of other vital resources such as food and energy. The process of ensuring that the public and industry have access to water — or blue gold, as many have begun to refer to it — is one of the most challenging problems confronting countries and corporations in the 21st century.

Water is critical to the health of the global population. In addition, it is essential to development, and it supports numerous economic activities, such as irrigated agriculture, transportation, hydroelectric energy, and various other industries. Agriculture is perhaps the most important use of water, making up approximately 70 percent of all global freshwater withdrawals. Large-scale farming would be unable to provide food for the world's large populations without irrigation, and crops would never be able to be grown in the deserts of the Middle East and the western United States. Considering the recent energy crisis and escalating oil prices, new advances in hydroelectrical power are necessary.

Astonishingly, 97.4 percent of the Earth's water is too salty to use for irrigation or as drinking water. Of the small amount of fresh water present on the planet, less than 1 percent of it is available for use. Since fresh water is renewable only by rainfall, only this water can be considered available for human consumption. Rainfall is the only source of fresh water that can be extracted without putting strain on finite sources.

Currently, 1.2 billion people lack access to safe and affordable water for their domestic use. More than 900 million people in rural areas that have an income below the $1-a-day poverty line lack access to water for their livelihoods. The reality of global water scarcity analyses is that up to two-thirds of the world's population will be affected by water scarcity over the next few decades. Water will be scarce in areas with low rainfall and relatively high population density. These areas include Asia, the Middle East, and sub-Saharan Africa. More than 90 percent of people in the Middle East live in areas of water stress insofar as fresh water is consumed faster than its replenished. In addition, developed nations are coping with scarcity and pollution problems exacerbated by droughts and climate changes.

As a result of a global population explosion, urbanization, industrial and agricultural pollution, shrinking wetlands, inequitable distribution, and climatic changes, the world's water demand is at an all-time high and supply is at an unsustainable level.

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Water shortage and inequitable distribution can intensify international tensions and be a source of conflict along borders of international watersheds. At a water conference in 2003, Peter Gubser, president of American Near East Refugee Aid, explained the relevance of water to conflict in the Middle East. Gubser emphasized that the most important commodity running under the sand and soil of the region is not oil but water. In Israel, water for agriculture is used efficiently but not sustainably. Israel and Lebanon have exchanged hostilities over Lebanon's construction of a pumping station upriver from Israel. In addition, Turkey created serious frictions with the Syrian government with its construction of more than a dozen dams along the Tigris and Euphrates rivers.

Even between friendly neighbors with strong economic ties such as the United States and Mexico, tensions mount. Under a 1944 water-sharing treaty, Mexico and the United States share water from the Rio Grande and the Colorado River in the western United States. However, Mexico has fallen behind in its water payments and now owes 1.4 million acre-feet of water to its northern neighbor. The southern Texan farmers complain that Mexico's failure to release the water is causing them severe crop losses. The tension mounts as these farmers declare that Mexico's crops upriver are flourishing while their crops are dying. The farmers and politicians in northern Mexico say that severe drought prevents them from repaying the water debt and that there simply is no longer enough water. Conflicts over water resources will become increasingly important issues between neighboring countries and trading partners.

Water scarcity affects the world in various ways: It is the primary cause of disease, it results in famine, and it damages economies. It is staggering

to think that the lack of safe drinking water alone causes 80 percent of the world's health problems and results in 40,000 deaths every day.

Water scarcity also affects the economic growth of nations due to costs associated with improving infrastructure, creating new means of conservation, and producing new technologies. As water becomes increasingly scarce, governments must exploit less-accessible sources of fresh water through appropriating and purchasing a greater share of aggregate economic input, such as dams, pumping stations, and supply infrastructure. Many water-stressed areas, such as the Middle East and Africa, are beginning to develop desalinization plants to cope with water scarcity. The expenses associated with research and development of these new infrastructures costs governments millions and even billions of dollars.

Water scarcity also stifles agricultural production, which amounts in huge losses to the agriculture industry, especially for regions that rely on agriculture as a primary source of income.

There are some obvious possibilities for business in the areas of developing technologies to capture rainwater, purify current water sources, devise efficient storage facilities, and desalinate marine water.

Food's uneven distribution

Currently there are enough resources to nourish all of Earth's 6 billion inhabitants; however, despite this, people around the globe continue to suffer from extreme malnourishment.

The global availability of food, the second critical resource under consideration, is tied to governance, water scarcity, conflict, and technology. Worldwide, hunger is caused by a lack of access to and distribution of food, conflict, and poor infrastructure. Specifically, the uneven distribution of food and agricultural technology is the root of many of the world's hunger problems. Drought and water scarcity is also a significant cause of food production shortages around the world. When food-insecure regions experience water shortages, such as those discussed earlier, food scarcity is exacerbated significantly.

The uneven distribution of food and agricultural technology is the root of many of the world's hunger problems.

Poor food distribution systems and deteriorated or non-existent rural agricultural infrastructure is a leading cause of food insecurity in developing countries. Many regions simply do not have enough rural roads, warehouses, and adequate irrigation systems, which has resulted in high transport costs and a lack of storage facilities. For example, in the aftermath of 2004's Hurricane Francis, waves of food aid were transported to Haiti. However, much of this food stayed in Port-au-Prince rather than reaching its intended recipients due to the lack of roads and other distribution channels.

Political conflict is also a direct cause of food insecurity. It also depresses production and income from crucial cash crops and livestock. This reduction in income further decreases food security and the coping capacity of those who depend on these sources for their livelihood. The Food and Agriculture Organization of the United Nations claims that conflict cost Africa more than $120 billion worth of agricultural production in the 20th century. As many regions endure conflict, when their food distribution infrastructure is poor, it is made even more difficult for citizens to receive the necessary aid.

Many countries continue to suffer from the consequences of previous wars; these events take a toll on food security and economic development long after the end of the fighting. Mozambique endured a devastating civil war for more than 16 years, during which more than 2 million landmines were scattered across the country. That country is still plagued by landmines that kill agricultural workers, make land hazardous to farm, and has stifled post-war development.

The U.N.'s Food and Agriculture Organization has begun to endorse modified food, such as drought-resistant crops, claiming that genetically enhanced crops have been found to be safe. However, developing countries are not benefiting as much as possible because private research is focused on lucrative cash crops such as cotton, maize, canola, and soybeans. In order for the worlds hungry to benefit from biotechnology, governments will need to sponsor research that focuses more on staple crops such as rice, potatoes, and cassava.

Despite the United Nation's endorsement of genetically modified foods, many regions of the globe, such as Europe and Africa, have widespread opposition. A majority of this criticism is rooted in the unknown long-term human health and environmental effects in addition to concern that it is the multinational corporations that stand to gain the most. Although the topic of genetically modified foods is a controversial issue, it is still impor-

The root causes of poverty

Hunger and malnutrition are killing nearly 6 million children each year, according to a report by the Food and Agriculture Organization of the United Nations.

Many of these children die from a handful of treatable infectious diseases they may have survived if their bodies had not been weakened by malnutrition. Hunger and malnutrition are among the root causes of poverty, illiteracy, disease, and mortality of millions of people in developing countries, says the report "The State of Food Insecurity in the World," which was published in November 2005.

The report focuses on the critical importance of hunger reduction, which is the explicit target of the 1996 World Food Summit and of the first Millennium Development Goal, which calls for the eradication of extreme poverty and hunger. The report stresses that hunger reduction is also essential for meeting all Millennium Development Goals.

Relief workers distributing food in Florida after 2004's Hurricane Frances had an easy time compared to workers who tried to help communities in rural Haiti. There, they found the lack of roads and distribution channels insurmountable obstacles.

tant for countries to research the use of genetically modified foods and crops, insofar as any advancement in the quest to alleviate world hunger is advantageous.

It is essential for countries around the world to combine their efforts in combating world hunger, as the direct and indirect costs of hunger are significant to both developed and developing countries. The present rate of hunger costs millions of lives in addition to billions of dollars in lost productivity and earnings as a result of premature death, disability, medical costs, absenteeism, and low educational opportunities. By comparison, the costs of intervention that can dramatically reduce hunger are miniscule. Numerous studies suggest that every dollar invested in well-targeted interventions to reduce undernourishment can yield more than five times as much in benefits. Therefore, when nations provide aid and concentrate their efforts to fight world hunger, not only is it a humanitarian effort, but it also contributes to the financial wealth of the world as a whole.

Energy's uncertain future

Energy is vital to the economic health and the quality of life all around the world as well as a driving force in the global economy. The availability of energy is a global concern that is closely tied to an increasing demand from manufacturers, environmental concerns, the adoption and acceptance of technological innovations, and political instability in top energy producing nations. Nations and companies must implement policies and take the necessary measures to adapt to the changing global landscape of energy.

Manufacturing and commercial activities use more energy than any other category of energy consumption, including transportation and residential heating and cooling. Sixty percent of industrial energy use goes toward manufacturing, with the remainder going to mining, construction, agriculture, fisheries, and forestry.

Political disorder in many of the world's top energy producing regions has caused concern and uncertainty in the global market. Since many nations have a high reliance on oil and gas reserves, governments and companies are concerned about instability in regions that provide these energy sources. The Middle East, Venezuela, and Nigeria are significant sources of oil but have all suffered conflict as a result of war, civil rivalry, corruption, and terrorism.

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Political instability in these areas provides significant constraints in access to energy sources and affects the price of these resources. Oil is a major source of wealth in the Niger Delta, and violence over oil, especially illegally diverted oil that accounts for about 10 percent of Nigeria's total production, has been a common occurrence for the past decade. When Alhaji Dokubo Asari, leader of a powerful gang in the oil-rich Niger Delta, threatened to declare war in September 2004, oil prices hit record highs of more than $50 a barrel. At the end of 2005, when Ukraine refused to agree to a four-fold price hike in natural gas from Russia, their supply was temporarily cut off. Since Western Europe gets 25 percent of its gas from Russia (80 percent of it via Ukraine), these threats illustrate how a purely local conflict over relatively small amounts of oil can have immediate global consequences.

Despite significant reserves in fossil fuels like coal, oil, and natural gas, companies and governments still struggle to meet the energy demands of many growing urban populations. During the summer of 2003, power outages struck cities in the northeastern United States and Canada, including Toronto, New York, Cleveland, and Detroit. The blackout resulted in some sporadic looting and significant financial losses. The loss of electricity in these urban areas revealed the effects of aging energy infrastructures coupled with an increasing demand.

To achieve energy sustainability, governments and companies must be prepared to adapt to the changing landscape. The way companies respond to these changing and challenging

dynamics can either provide them with a strategic advantage or result in their downfall.

The governments of the leading developed nations are already creating legislation to cope with the changing energy landscape, setting the stage for diversity in the nation's energy mix for years to come by creating markets for emerging energy sources like ethanol, wind, and biomass.

Conclusion

In the future, the availability and regulation of water, food, and energy will present many challenges and opportunities for businesses and governments around the world. Good management techniques and governance systems will allow these critical resources to be accessible, and technological innovation will help improve food and water security.

Businesses must invest in strategic resources to position themselves to succeed as these tectonics unfold in the years ahead. The stability and security of the broader macroeconomic environment will depend on the success with which companies and countries across the world can provide food and water to populations that are relentlessly expanding. The viability of commercial operations across the globe will depend on energy intensity, the price and efficiency of energy supplies, and the stability of energy supplies and prices. And technological innovation propelled by the private sector will play an extremely important role in the degree to which humanity can improve its stewardship of food, water, and energy. The businesses that strategically prepare and effectively respond to these changing tectonic forces will thrive in the future. ❖

Million-dollar challenge

The National Academy of Engineering is on track to award $1 million for a practical technology that can prevent the slow poisoning of people throughout the world as a result of arsenic contamination of drinking water.

Arsenic-containing drinking water affects tens of millions of people, especially in developing countries where existing treatment technologies are too expensive for widespread use. The Grainger Challenge Prize for Sustainability will be awarded for the development of a small-scale, inexpensive technique for reducing arsenic levels in drinking water.

The goal of the challenge is the development of a household- or community-scale water treatment system to remove arsenic from contaminated groundwater. The system must have a low life cycle cost and must be robust, reliable, easily maintainable, socially acceptable, and affordable. As a sustainable technology, the system must also be within the manufacturing capabilities of a developing country.

More information about the challenge is available at *www.graingerchallenge.org*.

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