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2030: The “Perfect Storm” Scenario

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Welcome to the “perfect storm” scenario for 2030. You are about to take a look into the future and the challenges that lie ahead. Making predictions about the future is hazardous. As Yogi Berra famously quipped, “It’s tough to make predictions, especially about the future.” Trends, however, can tell us a lot about the future, even in a 20-year timeframe.

We know with a high degree of confidence that global population will continue to grow in the near term. Demographers project that fertility rates will continue to decline, but that the world’s population will increase from 6.8 billion to 8.3 billion by 2030. We can also anticipate that the demand for grain will continue to rise as global population grows and a rising middle class desires more meat and dairy products. Similarly, we can project today that the total demand for energy will increase as a result of economic growth in China, India, and other rapidly developing nations. We also know that more people, more agriculture, and more industry will increase the demand for fresh water. Finally, we know that the world’s climate will continue to change in ways that could hamper food production and dislocate people. What we don’t know is how disruptive these trends will be.

The “Perfect Storm”

John Beddington, England’s chief scientific advisor, warned last year that these trends may constitute a “perfect storm.” He said,

It is predicted that by 2030 the world will need to produce around 50 per cent more food and energy, together with 30 per cent more fresh water, whilst mitigating and adapting to climate change. This threatens to create a ‘perfect storm’ of global events... There's not going to be a complete collapse, but things will start getting really worrying if we don't tackle these problems.

The scenario outlined below peers into the future and sketches out in more detail what that “perfect storm” might look like. This scenario is neither a “best case” nor a “worst case” scenario. It assumes, for example, that global efforts to reduce greenhouse gas emissions intensify, but fall short of the targets that many believe are necessary to avoid the worst effects of climate change. It hypothesizes that global oil production has not peaked yet, as some experts insist, but it assumes that production will fall short of the projections made by the International Energy Agency. In this scenario the effects of climate change grow more serious, but stop short of the doomsday forecasts made by many. Finally, it assumes that agriculture production continues to expand, despite the challenges posed by climate change and high energy prices, but that it does not fully keep pace with population growth.

This scenario further assumes that the dangers posed by Beddington's "perfect storm" don't materialize much before 2030. The world, in other words, is able to cope for the next twenty years, albeit with increasing difficulty, with the challenges posed by population growth, climate change and the growing competition for scarce resources. In this scenario, the world economy continues to expand in the near-term, major conflict is avoided, and the current day situations in Iran, North Korea, and Pakistan do not escalate out of control.

The 2030 "Perfect Storm" Scenario

The year is 2030 and the "perfect storm" forecast by John Beddington, England's chief scientific advisor, has arrived. These are the key developments:

- Consistent with earlier demographic projections, global population has increased from 6.8 billion to 8.3 billion.
- Demand for food has grown by 40 percent, but supplies have not kept up with demand. World grain reserves are empty. The FAO warns that bad harvests and grain export embargoes are pushing 200 million people to "the brink of starvation."
- Demand for energy has grown by 45 percent, but supplies in recent years have not kept up, and the resulting scarcity has pushed energy prices to record highs.
- Global demand for water has grown by close to 30 percent. Water conservation measures have helped, but close to four billion people are now living in an area of high water stress.
- Efforts to reduce greenhouse gas emissions have fallen far short of the pledges made in 2010. Climate change is more evident, and the concentration of greenhouse gas emissions is dangerously close to the 450 ppm level that could trigger the worst effects of climate change.
- Shortages of food, energy and water are increasing the number of failed states and ratcheting up international tensions.

At the behest of U.S. and the European Community, a global summit has been convened to address these issues, but world leaders are deeply divided over the proposed solutions. Here's the situation they confront:

Population



Credit: Stock.exchng

Global population has grown to 8.3 billion. Most, though not all, of that growth has been concentrated in South Asia and sub-Saharan Africa. As expected, China's population, 1.3

billion in 2009, has finally stabilized at 1.5 billion. India's population, which recently surpassed China's, is projected to reach 1.65 billion by 2050. The populations of Afghanistan and Iraq have increased by 50 percent, and Pakistan's population is now 231 million, up from 174 million in 2009. The populations of Germany, Japan and Russia are now in decline, but the United States is still experiencing rapid population growth. Its population has increased by nearly 60 million people in the past 20 years.

The highest population growth rates, however, are found in sub-Saharan Africa, where fertility rates, though declining, remain high. The populations of Uganda and Niger have doubled in just two decades. Somalia's has jumped by 75 percent. The population in Nigeria, Africa's most populous country, has climbed from 150 million to 212 million.

Disease and malnutrition, however, are beginning to take a substantial human toll, creating what the World Health Organization is calling "an unprecedented global health crisis." Rising global temperatures have led to an increase in tropical diseases. Malaria and dengue fever, in particular, are spreading to previously temperate climates in South America, sub-Saharan Africa and parts of South Asia; WHO warns that tens of millions of people could die in the decade ahead. In several of the least developed countries, child and infant mortality rates have doubled in the past five years. Maternal deaths rates are also up sharply, and life expectancy in some African countries is beginning to fall.

The world's age distribution is changing dramatically. Average ages in Europe in Japan have risen substantially in the past few decades, but in many parts of the developing world 50-60 percent of the population is under the age of 30. In many of the least developed countries, educational attainment levels are falling, and the unemployment rate for youth people between 15 and 30 years of age is well over 50 percent. Security experts warn that unless more is done to boost employment prospects for these young people, many governments in the developing world will be destabilized.

Greenhouse Gas Emissions



Credit: USAID

Conservation measures, increased energy efficiency and growth of renewable energy sources have curbed the projected growth in greenhouse gas (GHG) emissions by nearly a third, but in the absence of a binding international agreement energy-related carbon emissions are still rising slowly, and are now 17 percent above the 2010 level. As a

consequence, the concentration of carbon dioxide in the atmosphere has risen close to the 450ppm level that scientists say could trigger the worst effects of climate change.

Industrialized countries have reduced their emissions by 15 percent below 1990 levels, but that is substantially below the 25 percent to 40 percent reduction that scientists were recommending at the time of the Copenhagen conference twenty years ago. Most of the decrease is attributable to a peak in global oil production, a large shift from coal to gas-fired electrical plants in the U.S., a jump in wind energy output and increased energy efficiency.

China and India have slowed their projected growth, but have also fallen short of the internationally agreed upon targets. China has reduced its “emissions intensity” (the level of GHG emissions per unit of economic activity) by 40 percent and India by 25 percent, but total emissions continue to climb. With international support, deforestation in Indonesia and Brazil has been curbed, but deforestation continues unabated in many other parts of the developing world, and many developing countries, citing food shortages and severe economic hardship, have refused to limit their GHG emissions.

Climate Change



Credit: Sue McIntyre/USAID

Global temperatures continue to rise. Between 2000 and 2030, temperatures have risen by 0.55°C (1°F) and by the end of the 21st Century global temperatures will be at least 2.0°C (3.5°F) higher than at the beginning of the century. Unless drastic measures are adopted, scientists are warning that the aggregate rise in temperatures could still exceed 4.0°C (7.0°F). Meanwhile, the loss of ice in Greenland and Antarctica is steadily increasing. More than ever, scientists are convinced that “positive feedback” effects will trigger large and sudden increases in global temperatures.

Rising temperatures and melting ice have accelerated and contributed to a sea level rise of nearly 12 centimeters. The deltas of major rivers, including the Mississippi, the Nile, the Niger and the Euphrates/Tigris have experienced significant flooding. Rising seas and typhoons have already dislocated 10 million people in South Asia, with India, Pakistan, Bangladesh, Sri Lanka and Indonesia experiencing the worst effects. Already, a number of major cities have suffered severe flooding. The rate of sea rise, however, is accelerating. Experts are predicting that oceans could rise 2-3 meters by 2130. In the next two decades alone, it’s expected that climate change will dislocate another 20-30

million people.

The worst effects of climate change are being felt in sub-Saharan Africa and Asia. Severe and prolonged drought is affecting the Sahel, the Horn of Africa and most of East Africa, and many parts of Western Africa are experiencing record floods. Drought and flooding are also affecting many areas in Asia. Several hundred islands in the Indian and Pacific Oceans have been inundated. Typhoons are causing extensive damage in Bangladesh, India, and much of Southeast Asia, where rice production has been severely impacted.

Energy



Credit: Stock.exchng

Rising energy prices and greenhouse gas restrictions have reduced projected energy usage, but total energy consumption continues to rise. Global oil production, after reaching a peak of 93 million barrels per day in 2020, has declined to 80 million barrels per day. To fulfill the unmet demand for liquid fuels, biomass production has jumped dramatically. Coal consumption shows signs of peaking, but natural gas usage is up sharply, as new technologies have made it possible to exploit the extraction of natural gas from shale. Geologists, however, warn that natural gas production could peak within two decades or less. Wind energy production has jumped dramatically in the U.S. and Northern Europe, but increased reliance on natural gas for energy generation has slowed the anticipated expansion of solar energy in the U.S. and elsewhere. At the same time, the construction of new nuclear plants, particularly in the U.S., has been hampered by escalating costs, regulatory barriers, and a shortage of capital.

Higher prices have spurred significant energy efficiencies in buildings and appliances. As a result, electricity use has declined significantly in Europe, Japan and South Korea, and modestly in the U.S, but the gains have been more than offset by increased electricity generation in China, India, Southeast Asia and the Middle East. In total, developing countries have accounted for 75 percent of the global increase in electricity generation. Yet, despite that increase, more than 1.5 billion people in the world still do not have access to electricity and the number is growing.

Hybrids and electrical plug-ins are steadily increasing their market share, particularly in the U.S., but the number of cars and trucks on the world's roads has surged to nearly two billion, almost double the number in 2009. China now has nearly as many cars as the U.S., and India is now the fastest growing car market. A leading car industry analyst warns, however, that "the age of the automobile may be coming to an end." In response

to higher fuel prices and growing shortages of gasoline and diesel fuel, the average number of miles driven by car owners is falling, and car sales are plummeting.

China and India have emerged as major competitors for overseas energy supplies. As their share of the world's economic output has grown, both nations have been using their export earnings to purchase overseas energy companies and sign long-term contracts for the delivery of liquid natural gas (LNG) and biofuels. The extent of China's growing claim on overseas energy production is raising concerns about the energy security of other nations. Experts warn the U.S., despite its increased production of natural gas, is more dependent than ever on foreign sources of energy. A leading analyst has described the world energy situation as a "powder keg ready to be lit."

Water



Credit: PACT

As projected by Beddington, the world's demand for fresh water has jumped by 30 percent over the past two decades, with agriculture accounting for 70 percent of the increased demand. Supply, however, has not kept up with demand. Water conservation measures have helped, but close to four billion people, almost half the world's population, are now living in an area of high water stress. The livelihood of one-third of world's population is affected.

In Asia, increased water extraction and shrinking glaciers in the Himalayas and Tibetan Plateau have reduced the flow of major rivers in the summer months. The flow of the heavily-polluted Ganges has been reduced at times to a trickle. The Yellow River now dries up for several months a year, stopping at times nearly 600 kilometers from the ocean. Several other major river systems, including the Colorado, the Nile, the Murray, and the Tigris-Euphrates are severely depleted.

Climate change is not the only cause of increased water scarcity. After decades of pumping to support large scale irrigation of crops, the supply of water from underground aquifers in many parts of India, China and the central U.S. is declining. In some areas, fossil aquifers have been totally depleted. Sanaa, the capital of Yemen, has effectively run out of water. In Jordan and Egypt the water crisis has triggered a major out-migration.

Food Production

Three factors have combined to increase the world's appetite for grain by 45 percent since 2010. The first is population growth. The second is the world's growing use of biofuels to meet the demand for liquid fuels. The third is changing diets. Meat-intensive diets consume far more grain; it takes on average 2-5 pounds of grain to produce a pound of farm-raised meat. While the demand for meat continues to decline in the U.S. and Europe, demand is rising sharply in China and other rapidly developing nations.



Credit: USAID

The world's farmers, however, are fighting a losing battle. While new hybrid grains and expanded use of fertilizer have helped to boost food production, agricultural productivity began leveling off several years ago as water scarcity and the effects of climate change became more pronounced.

Efforts to boost production in Africa have been hampered by drought, flooding and rising temperatures. While production in Southern Africa has increased by more than 30 percent, food production in many parts of Africa--particularly in the Sahel and the Horn of Africa--is not keeping up with population growth. Per capita food production in many parts of Africa has been declining for over 40 years, steadily increasing the need for external aid.

Because of increasing water scarcity, India's "green revolution" is slowly being reversed; crop yields in northern India have fallen in some areas by 15-20 percent. Desertification and drought are hurting farmers in northern China, and both India and China are now significant importers of grain. Typhoons and rising seas are defeating efforts to boost rice production in Southeast Asia.

On the plus side, crop yields in Argentina, Canada and Russia have improved, dormant farm land has been brought back into production in Ukraine, and farm production has expanded in Brazil, but the global grain harvest has not kept pace with rising demand. Grain prices are soaring. Global grain stocks are exhausted and international relief efforts have been temporarily suspended, because there is no longer enough food in the world. Several grain exporting nations have stopped or limited grain exports in an effort to contain domestic food prices. In the past two years the ranks of the chronically hungry have grown by 500 million, bringing the total to over two billion people worldwide. At least 200 million people are on the verge of starvation. Hundreds of millions more are

just one bad harvest away from starvation.

Experts predict that the world will see some short-term relief as many cattle producers liquidate their herds and free up more grain for human consumption, but with the worst effects of climate change yet to be felt, and energy prices still rising, the long term picture is not promising. Leaders of some developing nations are calling for a ban on all meat exports.

The Global Economy



Credit: Stock.exchng

Over the past two decades, China and India have been the “twin engines” of the world economy. While China’s per capita income still lags behind the U.S., its GDP is on the verge of pulling even. Over the past decade, India’s growth rate has overtaken China’s, but growth in both countries has slowed dramatically in the past two years. Because of rising dependence on imports of grain and fossil fuels, the current account surpluses of both nations have shrunk and inflation is on the rise.

The economies of the United States, Japan and much of Europe are stagnant or modestly declining because of falling exports, high energy prices, and rising debt levels. A few countries, most notably Brazil, Canada, Saudi Arabia, Russia and Ukraine, continue to prosper, largely due to revenue from oil or grain exports.

Much of the developing world, however, is mired in a deep recession, and experts warn that the number of people living in severe poverty, particularly in urban centers, is escalating rapidly because of the rising costs of flour, rice and other food staples. The number of people living on less than \$2 a day is now estimated at 3.2 billion. Unemployment of young adults in many parts of sub-Saharan Africa and South Asia is over 50 percent and growing. Experts warn that a contraction of consumer spending in China and India, combined with trouble in the world’s financial markets, will further exacerbate the recession. According to one leading economist, “Food and energy prices are pushing everything to the brink. It’s hard to see how this has a good outcome.”

The Geopolitical Crisis

Climate change, food shortages, rising energy prices, and water scarcity are destabilizing the world. The number of “failed states” is growing rapidly. Civil unrest has toppled governments in more than a dozen countries in the past year and a dozen more are

fighting major insurgencies. As a consequence, the tide of refugees is expanding. Globally almost 50 million people have been displaced by conflict, water scarcity, food shortages and climate change, but their numbers could grow sharply in the years ahead if conditions worsen. By some estimates, another 100 to 150 million could be uprooted by mid-century.



Credit: A. Fazzina/UNHCR

The civil unrest is not confined to the poor developing nations. Two of the world's major powers, India and China, are battling internal uprisings. Faced with a growing Maoist-inspired insurgency along its eastern borders and threats from Islamic terrorists on its Western borders, India is now fighting a two-front war and trying, unsuccessfully, to slow the flow of environmental refugees from Bangladesh. In China, food shortages and rising energy prices have led to rioting in the extreme northern and western provinces. Both nations need to import more food and energy to meet consumer demand.

With the price of oil in excess of \$200 a barrel, the struggle over oil rights grows more intense. Renewed fighting between rival groups threatens to cut off all Nigerian production. Yemen's widening civil war has fueled a Shiite rebellion in Saudi Arabia that is threatening the oil fields. In Iraq, there is fighting between Kurds and the central government over the control of the Kirkuk oil fields. Experts warn that further disruptions could boost the price of oil to \$300 a barrel, and trigger a worldwide scramble for more oil supplies.

Disputes over water are destabilizing much of the Middle East, which continues to suffer from chronic droughts associated with climate change. The population of Israel, including Gaza and the West Bank, has grown by 5 million people over the past two decades, an increase of over 40 percent, while the populations of Jordan has grown by more than a third. Because of the increasing demands from farmers and residents, the Jordan River is often reduced to a trickle before it reaches the Dead Sea. Farmers on both sides of the Jordan are protesting the tightening water restrictions, and government-to-government negotiations have failed to reach any agreement.

Unable to import additional grain at today's prices, Egypt has suspended food subsidies, and major riots have broken out in Cairo. Egypt's population has grown by more than a third in the last 20 years, but the downstream flow of the Nile River, Egypt's primary source of water, has been shrinking as large commercial farming operations in Sudan and Ethiopia extract more water from the Nile. Egypt charges Sudan and Ethiopia with

violating multilateral water agreements.

The rapidly escalating food crisis has yet to escalate into a major international conflict, but the global scramble for food is ratcheting up international tensions all around the world. In sub-Saharan Africa, governments have been expropriating crops produced by foreign-owned farms and canceling long-term leases of farm land. South Korea urges world governments to withhold foreign assistance from any government that does not honor its long-term leases. Saudi Arabia has gone even further, hinting that military reprisals may be required.

For the third year in a row, rice production in South Asia has fallen as a result of typhoons, rising seas, and related flooding. Vietnam, the world's biggest rice exporters, has repudiated contracts for the delivery of rice to the Philippines and Indonesia. Severe riots have broken out in Manila, and insurgents, with support from Al Qaeda, now control large sections of Mindanao. The "rice crisis" is also undermining support for Indonesia's government, which is fighting a major insurgency that has spread to several islands.

The U.S. is better able than most nations to deal with climate change, energy shortages and the food crisis, but it too faces problems. Water scarcity, exacerbated by severe drought, has sharply reduced domestic crop yields in many parts of the U.S., including California's Central Valley. Meanwhile flooding and heavy spring rains in the Midwest have lowered corn production. China is demanding that the U.S. increase its grain exports, but agricultural experts warn that grain exports are threatening U.S. food security. Defense analysts warn that U.S. vulnerabilities, along with China's ascendancy, are weakening its defense posture, but beset by deficits, higher taxes, high unemployment, and rising inflation, American voters are becoming more isolationist and increasingly reluctant to respond to defense needs or humanitarian concerns.

The Challenge for World Leaders

World leaders are scheduled to meet in July of 2030 to discuss next steps, but optimism is waning. Climate change, energy, food, water, and conflict prevention are all on the agenda, but U.S. and world leaders confront three problems:

1. **Conflicting Advice:** Policymakers are receiving conflicting advice from the experts on how to respond. There is mounting concern that good faith efforts to address one problem could exacerbate one or more of the other problems. Policymakers everywhere find it difficult to ascertain, given limited resources and options, which policies will have the best outcomes.
2. **Domestic Political Opposition:** World leaders recognize the gravity of the international crisis and want to respond accordingly, but they face severe domestic pressures. Concerned about the global economy, including food and energy prices, people everywhere are increasingly resistant to policies that could lead to higher prices or taxes.

3. **Diminishing U.S. Clout and International Differences:** The U.S. leadership role has diminished. Strapped by foreign debt, a weak economy and continued pressure on the dollar, the U.S. finds itself unable to act unilaterally. It favors expanded international cooperation, but its influence has been diminished by the growing clout of the two Asian superpowers. It's not certain what position India or China will take in response to any U.S. proposals.

Discussion Guide

As a result of climate change, projected population growth, and rising demand for food, energy and water, the world faces some extraordinary challenges in the next couple of decades. The 2030 scenario outlined above is not a prediction. Nor is it a “worst case” or a “best case” scenario. It does suggest, however, that current trends, if not altered, could produce major shortages of food, energy, and water, and precipitate a global crisis. As such, it is designed to provoke thought and stimulate public discussion.

The 2030 scenario is designed for use in scenario planning exercises, similar to those used by governments and businesses to prepare for various contingencies (*see the 2030 Scenario Planning Guide* for sample exercises), but the scenario can also be used as a topic for discussion in classrooms, conferences, and community forums. Questions that can be debated include:

- Is the “perfect storm” a likely scenario for 2030? Is it too pessimistic? Too optimistic?
- Of all the various problems or challenges identified in the 2030 scenario, which ones pose the greatest threat to developing nations? To the U.S. and other developed nations? To the environment?
- What do we need to do to prevent the “perfect storm” from ever occurring? What are the consequences of delay?
- What are the security implications for the U.S. and the world?
- When the goals set for climate, energy, food and water conflict with one another, how do we reconcile those conflicts?
- How do we get Members of Congress and other policymakers to pay more attention to the serious challenges that lie ahead?

