



Executive Summary

The future continues to get better for most of the world, but a series of tipping points could drastically alter global prospects.

Half the world is vulnerable to social instability and violence due to rising food and energy prices, failing states, falling water tables, climate change, decreasing water-food-energy supply per person, desertification, and increasing migrations due to political, environmental, and economic conditions.

International Alert in the U.K. lists 102 vulnerable countries. The Center for Naval Analyses in the U.S. identifies 46 countries (2.7 billion people) at high risk of armed conflict, and an additional 56 states (1.2 billion people) at risk of political instability. By mid-2008 there were 14 wars (conflicts with 1,000 or more deaths)—one fewer than in 2007. These wars were in Africa (5), Asia (4), the Americas (2), the Middle East (2), and worldwide anti-extremism (1).

FAO estimates that 37 countries face a crisis over food due to increased demand from rapidly developing nations, high oil prices, the use of crops for biofuels, high fertilizer costs, global stocks at 25-year lows, and market speculation. Basic food prices are doubling around the world. Prices of cereals, for example, including wheat and rice, are up 129% since 2006. With nearly 3 billion people making \$2 or less per day, long-term global social conflict seems inevitable without more serious food policies, useful scientific breakthroughs, and dietary changes.

However, advances in science, technology, education, economics, and management seem capable of making the world work far better than it does today. Consider the extraordinary waste of human talent through violence, neglect, poor education, corruption, and other forms of inhumanity. Consider the enormous waste of investments into entertainment and media focused on the worst behaviors of humanity, products that make us unhealthy, and actions that pit one group against another. Surely cutting back on such waste could release the resources and talent needed to make the world work better for all.

What if the world—led by the EU—pressured the U.S. and China to create a global energy R&D strategy with an Apollo-like goal to turn around greenhouse gas emissions in 10 years? What if governments declared increasing intelligence as a national educational goal? What if politicians

campaigns on how to answer the 15 Global Challenges in Chapter 1? What if we did not waste so much time and talent on trivia?

After 12 years of the Millennium Project's global futures research, it is increasingly clear that the world has the resources to address our common challenges. Coherence and direction are lacking. Ours is the first generation with the means for many to know the world as a whole, identify global improvement systems, and seek to improve such systems. We are the first people to act via Internet with like-minded individuals around the world. We have the ability to connect the right ideas to resources and people to help address our global and local challenges. This is a unique time in history. Mobile phones, the Internet, international trade, language translation, and jet planes are giving birth to an interdependent humanity that can create and implement global strategies to improve the prospects for humanity.

Climate change cannot be turned around without a global strategy. International organized crime cannot be stopped without a global strategy. Individuals creating designer diseases and causing massive deaths cannot be stopped without a global strategy. It is time for global strategic systems to be upgraded to help make important transitions such as from freshwater agriculture to saltwater agriculture, from gasoline cars to electric cars, from animal production to animal-less meat production, and from weapons expenditures to increased environment and health expenditures.

Government strategy units could be connected with their counterparts in UN agencies and augmented by counterparts in multinational corporations, universities, and NGOs to produce a global collective intelligence that can create, update, and coordinate global strategies. The potential loss of national sovereignty that such a system might create is outweighed by the potential loss of democracy to transnational organized crime, the costs of climate change, death and economic loss from single individuals deploying bioweapons, and mass migrations due to falling water tables and other causes. This does not mean world government; it means world governance—civilizations working better by cooperating with some common rules. Chapter 4 reviews government future strategy units and suggests that it is time to begin to connect such units in governments and UN systems to share information in order to develop more coherent policies to address the global challenges.

Many of the world's decisionmaking processes are inefficient, slow, and ill informed, especially when given the new demands from increasing complexity, globalization, and the acceleration of change. Transparent systems, democratization, and interactive media are involving more people in decisionmaking, which further increases complexity.

Fortunately, the world is moving toward ubiquitous computing with collective intelligence for just-in-time knowledge to inform decisions. Arguably, creating collective intelligences for subjects like energy, water, even whole countries, and eventually the world is far too difficult or maybe impossible, yet it can also be argued that it will be increasingly difficult to improve the world without collective intelligence. The world food crisis and climate change have focused international attention on creating global long-term and short-term strategies to address hunger and global warming. So the time may be ripe to upgrade global policy and decisionmaking systems.

Some Factors to Consider

World population was 6.677 billion as of July 2008 and growing at 1.16% per year. The economy grew 4.9% in 2007 to \$66 trillion (PPP—the IMF has recalculated the measures of PPP, purchasing power parity) or to \$55 trillion at official exchange rates; hence, world per capita income increased just under 4%.

China has made extraordinary gains this year. It passed the United States to become the world leader in Internet users, passed Japan to become the second largest economy and second largest auto producer in the world, passed the United States to become the second largest trader behind Germany, and continues to have the largest number of mobile phones in the world. (Note that China changed the definition of an Internet user from someone who uses the Internet an hour per week to someone who uses the Internet once per six months.) However, China's water pollution and water scarcity, inadequate energy supply, separatist movements, and growing income gaps present serious impediments to its future development and perhaps stability.

The digital gap continues to close around the world. The Internet is evolving from a passive information repository (Web 1.0), to a user-generated and participatory system (Web 2.0), and eventually to a more intelligent partner with collective intelligence and just-in-time knowledge (Web 3.0), eventually connecting humanity with much of the built environment. About 1.4 billion people (21% of the world) are connected to the Internet, with 37.6% of them in Asia, 27.1% in Europe, and 17.5% in North America. The Internet and mobile phones are merging, increasing access to the world's knowledge. There are 3.3 billion mobile phones active around the world as of 2008. However, the deluge of video applications on the Internet has grown to 60% of all traffic and is growing so rapidly that the Internet will slow and may force many to eventually skip it entirely and use direct computer-to-computer video file transfers, or it may force a complete redesign of the Internet's infrastructure to accommodate this new traffic profile.

The incidence of HIV/AIDS has begun to decline in Africa. World data continue to show that HIV prevalence has leveled off (peaking in the late 1990s at over 3 million per year) and that the number of new infections has fallen. (Measurement definitions have changed for HIV/AIDS, however, explaining some of the lowered numbers during 2007.) But there are still serious concerns about the infection rates in Eastern Europe and Asia.

The economies of developing countries have grown an average of over 7% annually for the past five years. At these rates, world poverty will be cut by more than half between 2000 and 2015, meeting the Millennium Development Goal, except in sub-Saharan Africa. The number of extreme poor—those living under \$1 a day—in the developing world declined by 278 million between 1990 and 2004 and by a stunning 150 million in the last five years, at the same time that the developing world's population increased by 1 billion. Nevertheless, this still leaves nearly 3 billion people living on \$2 or less per day—which is twice the entire population of the world in 1900. A strategic plan for a global partnership between rich and poor could use the strength of free markets and rules based on global ethics to reduce the disparities that otherwise might grow enough to accelerate economic migrations.

Nearly 40 new diseases have appeared in the last generation; 1,100 epidemic events were verified by WHO over the past five years; we face 20 drug-resistant diseases today; and old diseases have reemerged, such as cholera and yellow fever. More than one-third of all child deaths occur during the first 28 days of life, and most of them are due to preventable causes related to water quality.

Some 700 million people face water scarcity today. Without major interventions, this number could grow to 3 billion by 2025. Water tables are falling on all continents, and 40% of humanity depends on watersheds controlled by two or more countries. The world will need 50% more food by 2013 and twice as much within 30 years. This means more water, land, and fertilizer—yet for the past several years we have been consuming more than was being produced, and the factors increasing food prices seem long-term. New agricultural approaches should be considered, such as better rain-fed agriculture and irrigation management, genetic engineering for higher-yielding crops, precision agriculture and aquaculture, drought-tolerant crop varieties, and saltwater agriculture on coastlines to produce food for humans and animals, biofuels, and pulp for the paper industry and to absorb CO₂ while reducing the drain on freshwater agriculture and land. The majority of agricultural water and land is used to grow animals. It is scientifically possible to produce meat without growing animals; an animal rights group has offered \$1 million to the first producers of commercially viable animal meat without growing animals.

Meanwhile, CO₂ emissions are increasing even faster—and the world is warming faster—than the IPCC reported in 2007. Arctic sea ice has declined by about 10% in the past decade, and the Arctic may be ice-free by 2030. Global warming continues to increase the acidity of the oceans, creating dead zones and reducing its ability to absorb CO₂. World leaders seem ready to create a global compact to cut greenhouse gas emissions while maintaining economic growth.

The current world population of 6.7 billion is expected to reach 9.2 billion by 2050, peaking soon afterward at 9.8 billion before falling to 5.5 billion by 2100, according to the UN's lower forecast. Scientific breakthroughs over the next 50 years are likely to change these forecasts, giving people longer and more productive lives than most would believe possible today. Nevertheless, global population is changing from high mortality and high fertility to low mortality and low fertility, requiring changes in retirement and medical systems. Richer populations are aging more rapidly than poorer regions, although poorer regions are also aging. There are fewer Europeans today than last year; its working-age population is shrinking, immigrant populations are increasing, and cultural conflicts continue. African and Arab states have the highest population growth rates at 2.1%. China's one-child policy will lead to an aging society in the next generation. The China National Committee on Aging forecasts that between 2030 and 2050 there will be only two workers for every retiree—down from the current ratio of six workers to one retiree. Japan expects robots to help it deal with a shrinking and aging population.

Freedom House's world review found that democracy and freedom declined over the last two years in one-fifth of the world's countries. Four times as many countries showed declines in this measure during 2007 as showed improvements, and press freedom continued a six-year negative trend across the world, with increased intimidation of journalists and rising control of media in the hands of a few in business or government.

Total military expenditures are about \$1.3 trillion per year. There are an estimated 20,000 active nuclear weapons in the world, approximately 1,700 tons of highly enriched uranium, and 500 tons of separated plutonium that could produce nuclear weapons. Links between terrorists and organized crime are worrisome, especially considering that on average there were 150 reports of unauthorized use of nuclear or radioactive materials to IAEA per year between 2004 and 2007.

Illicit trade is estimated to be over \$1 trillion per year. McAfee puts cybercrime at \$105 billion. These figures do not include extortion or organized crime's part of the \$1 trillion in bribes that the World Bank estimates are paid annually or its part of the estimated \$1.5–6.5 trillion annually in laundered money. Hence the total income could be well over \$2 trillion—about twice all the military budgets in the world. Governments can be understood as a series of decision points, with some people in those points vulnerable to very large bribes. Decisions could be bought and sold like heroin, making democracy an illusion. Organized crime continues to grow in the absence of a comprehensive, integrated global counter-strategy. The United Nations Office on Drugs and Crime says, “The links between drug trafficking and other forms of transnational organized crime call for a more integrated approach to address this nexus.”

In parallel to all these social and economic pressures, science and technology continue to make extraordinary advances. Glycerol nucleic acid, the synthetic analog of DNA, was created by self-assembled nanostructures to help make future forms of life; the brain activity from a monkey in North Carolina made a humanoid robot walk on a treadmill in Japan; brain-computer interfaces now let people move artificial and robotic limbs, steer wheelchairs, and act in virtual realities around the world; over a million industrial robots are working today; a cloned human embryo has been produced from a skin cell, which could one day lead to creating our own replacement body parts. A baby was born from a frozen egg, fertilized by a frozen sperm, forming an embryo that was also frozen before being transferred to the mother. Electrochemical separation of carbon from the air to produce fuel is being explored.

A computer can now perform 1.144 thousand trillion floating point operations per second, supporting computational science's new simulations to improve medicine, materials, climate predictions, and other insights into nature. Scanning electron microscopes can see 0.01 nanometers (the distance between a hydrogen nucleus and its electron). Photons have been slowed and accelerated to learn how to create optical computers; synthetic chromosomes have been created from laboratory chemicals; quantum phenomena and entanglement are being probed; experiments to teleport individual photons are being conducted; the relationship of dark energy to gravity is being explored; and a 15-millimeter-diameter, femtosecond laser “microscalpel” can remove single cells without damaging nearby cells. The acceleration of S&T innovations, improved communications among scientists, and future synergies among nanotechnology, biotechnology, information technology, and cognitive science will fundamentally change the prospects for civilization.

World energy demand could double in just 20 years. Without major technological changes, fossil fuels will provide 81% of primary energy demand by 2030. If so, then large-scale carbon capture, storage, and reuse should become a top priority. The IEA projects oil demand to grow nearly 40% from 2006 to 2030. Some argue that oil production is peaking and will end in 40–70

years. The dramatic jump in oil, gas, and coal prices is making renewable sources more competitive.

Vast improvements in efficiencies, conservation, and tele-everything will help, but substitutes for the current energy sources still have to be constructed, and the economic and population growth of the next 50 years will still require increasing energy supplies. Since the major energy sources eventually will run out and threaten future climate stability, massive investments into safe and sustainable sources such as wind, geothermal, ground solar and space solar, and saltwater-based biofuels are essential. Increasing nuclear power plants without solving waste problems is an invitation to nuclear terrorism and could lead to environmental disasters. Building some 850 new coal-fired power plants without carbon sequestration planned for operation by 2012 by the U.S., China, and India will accelerate global warming. Resistance to building coal power plants is growing; 60 of 151 coal plant proposals in the U.S. were stopped by local or state governments during 2007. Coal has doubled in price over the past year, and future carbon taxes will make it less competitive with more sustainable sources.

December 2008 marks the sixtieth anniversary of the UN's Universal Declaration of Human Rights, which has stimulated more than 60 treaties to protect individual freedom and dignity and has inspired countless discussions about global ethics and human rights. The evidence is now overwhelming that increasing government respect for human rights correlates with economic development and that unethical business practices ultimately lower stock prices, productivity, and profits. Unethical decisions and corrupt practices are increasingly exposed via news media, blogs, mobile phone cameras, ethics commissions, and NGOs.

Collective responsibility for global ethics in decisionmaking is embryonic but growing. Global ethics are also emerging around the world through the evolution of ISO standards and international treaties that are defining the norms of civilization.

Closing the gap between rhetoric and reality of how women are treated by men around the world is not yet a top priority. Although many of the norms on gender relations have found official endorsement in the Convention on the Elimination of All Forms of Discrimination Against Women and the Beijing Plan of Action, many countries still have laws and cultures that make women second-class citizens and expose them to violence. Progress on women getting good jobs in politics and business and equal salaries has been slow. Women in legislatures have increased from 13.8% in 2000 to 18% in 2008. Women account for over 40% of the world's workforce but earn only 25% of the global income.

So is the future getting better or worse? And what areas should get more attention, investment, and wise decisionmaking to improve the prospects for the world as a whole?



State of the Future Index

The State of the Future Index is a measure of the 10-year outlook for the future based on the previous 20 years of historical data. It is constructed with key variables and forecasts that, in the aggregate, depict whether the future promises to be better or worse. A set of 29 variables was identified by an international panel of experts selected by the Millennium Project Nodes around the world during a study conducted in 2006–07. Participants were asked to rate the variables, give worst- and best-scenario estimates, suggest new variables to be included in the SOFI, and suggest sources that could provide at least 20 years of historical data. Chapter 2 provides the full list of variables and an explanation of the evolution and uses of SOFI.

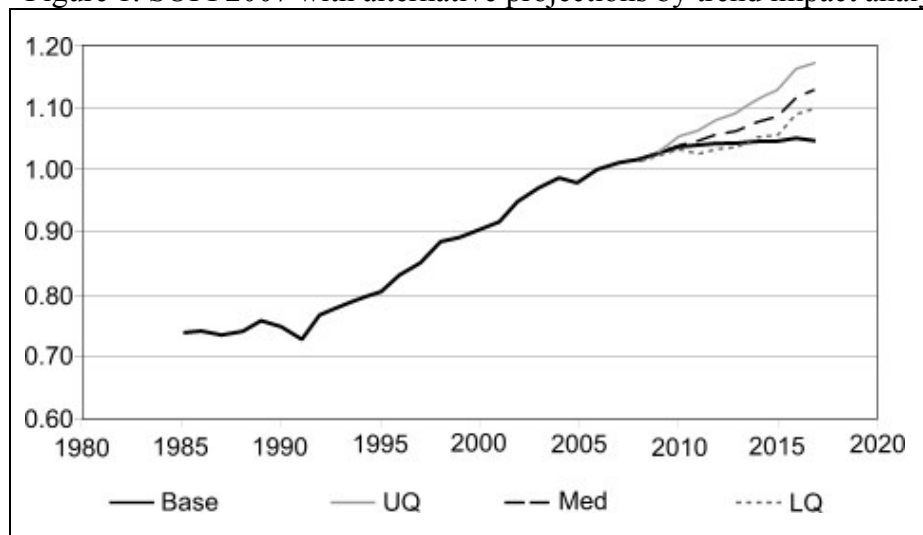
Assessing the world's key indicators over the past 20 years and projecting them for the next 10 gives us the basis for a report card for humanity's future, showing where we are winning or losing.

Box 1. Where Is Humanity Winning and Losing

Where we are winning:	Where we are losing:
• Life expectancy	• CO ₂ emissions
• Infant mortality	• Terrorism
• Literacy	• Corruption
• GDP/capita	• Global warming
• Conflict	• Voting population
• Internet users	• Unemployment

The global SOFI indicates that the future over the next 10 years is still getting better, although not as rapidly as it did over the past 20 years. The alternative projections are based on the potential occurrences of events that can alter the trends explained in Chapter 2.

Figure 1. SOFI 2007 with alternative projections by trend impact analysis



SOFIs can also be constructed for countries, cities, industries, or issues. An experiment was conducted using the International Futures model of the University of Denver to demonstrate that SOFIs could be computed for almost any country and compared periodically, country to country, and across time in a given country as a gauge of performance and expectations. A tutorial on how to construct a SOFI is available at www.mpcollab.org/learning/course/view.php?id=3.

Real-Time Delphi

Chapter 3 presents a relatively new and efficient method for collecting and synthesizing expert opinions, called the Real-Time Delphi. The original Delphi method involved a series of questionnaires, each building on the results of the previous questionnaire to identify consensus among a panel of experts. Multiple rounds of questionnaires can take months to complete. The RTD is designed to speed up the process while still maintaining the principle of anonymous group feedback to bring forth the best thinking of the group.

The respondents participate by filling out an online questionnaire—both numerical and qualitative—that is updated as responses are recorded. The respondents can—and are encouraged to—revisit the questionnaire as many times as they want within a specific time period. If a leader wanted to know the best thinking on an issue, top experts could be invited to sign on the RTD Web site, add their judgments, and edit them on a continuous basis within a deadline in response to other comments. The distribution of the group’s responses and the reasons they have provided for their answers can be available immediately to the leader. The process can be synchronous or asynchronous and, if implemented on an Internet site, can involve a worldwide panel. A tutorial on how to use a Real-Time Delphi questionnaire was developed and is available at www.mpcollab.org/learning/course/view.php?id=3.



Government Future Strategy Units and Potential Coordination

In order to make good national decisions, heads of state and government have to consider global changes that are beyond their control. The acceleration of change makes this increasingly difficult. As a result, presidents and prime ministers are creating future strategy or foresight units to contribute to their national policy process. Chapter 4 presents brief overviews of 10 such units (brief overviews of 30 governments future strategy systems are available in Chapter 4 of the CD). Typically, the future strategy unit is placed within the office of the prime minister or president of the country to integrate the futures research from other government sections and external institutions. These units often manage a network of other executive councils and future strategy units within ministries to provide inputs to national strategy.

The efficiency of these units might be improved by the use of the Real-Time Delphi to quickly collect and synthesize best judgments, create national SOFIs, develop collective intelligence for continuity between administrations, and better link these units with each other and their counterparts in UN organizations to improve international strategic coordination.

Global Energy Collective Intelligence

The options to create and update national, global, and corporate energy strategies are so complex and rapidly changing that it is almost impossible for decisionmakers to gather and understand the information required to make and implement coherent policy. At the same time, the environmental and social consequences of incoherent policies are so serious that a new global system for the identification, analysis, assessment of possible consequences, and synthesis of energy options for decisionmaking is urgently needed.

Chapter 5 presents the basic concepts and software ideas for a global energy collective intelligence to help politicians, energy experts, and the general public understand the whole energy picture and get “just-in-time” knowledge about specifics to lead to better questions and decisions. The proposed Global Energy Network and Information System, or GENIS, would be composed of two integrated elements:

- The Global Energy Network, providing communications and collaboration capabilities for a worldwide community of experts and others working on or concerned with energy issues
- The Global Energy Information System, a repository (knowledge base) and associated interactive access facility for as much of the world’s total knowledge about energy (actual content, pointers to external systems, and ability to mashup from other databases into one integrated set of outputs) as can be accumulated.

The two components would work together to support a variety of needs, such as those for politicians during energy hearings, for policy-makers creating national, bilateral, or multilateral energy strategies, for businesses and universities supporting R&D, for media fact-checking, and for the general public.



Environmental Security

The dramatic increase in world attention to climate change is helping more people understand that the world’s environment is a matter of national and global security. Half the world is vulnerable to social instability and violence due to numerous pressures. International environmental governance is improving, and the technological ability to identify environmental threats and crimes is becoming cost-effective through new sensors and communication systems. Environmental damages created by people and organizations in the past are less likely to escape detection and punishment in the future.

The Millennium Project defines environmental security as environmental viability for life support, with three sub-elements:

- preventing or repairing military damage to the environment
- preventing or responding to environmentally caused conflicts
- protecting the environment due to its inherent moral value

Chapter 6 presents a summary of more than 200 events and emerging environmental security–related issues organized around this definition that have been identified during the past year. Over 1,100 items have been identified since this work began in August 2002. The full text of the items and their sources can be found in the CD Chapter 9.1.

Environmental security analysis should include: the impacts of new kinds of weapons; asymmetrical conflicts; increasing demands on natural resources; urbanization (which makes more people dependent on vulnerable public utilities); impacts of environmental degradation and climate change; continued advances in environmental law, with escalating environmental litigation; and the globalization that is increasing interdependencies. In view of increased threats of conflicts triggered by environmental factors, enforcement of international multilateral agreements should be strengthened and more efforts should be oriented toward the implementation and respect of the regulations, as well as toward developing a global environmental consciousness.



It has been considered ridiculous to try and achieve health and security for all people. Equally ridiculous today is thinking that one day an individual acting alone will not be able to create and use a weapon of mass destruction or that there will not be serious pandemics as we crowd more people and animal habitats into urban concentrations while easy transborder travel exists and biodiversity is diminishing. The idealism of the welfare of one being the welfare of all could become a pragmatic long-range approach to countering terrorism, keeping airports open, and preventing destructive mass migrations and other potential threats to human security. Ridiculing idealism is shortsighted, but idealism without the rigors of pessimism is misleading. We need very hardheaded idealists who can look into the worse and best of humanity and can create and implement strategies of success.

There are many answers to many problems, but there is so much extraneous information that it is difficult to identify and concentrate on what is truly relevant. Since healthy democracies need relevant information, and since democracy is becoming more global, the public will need globally relevant information to sustain this trend. We hope the annual State of the Future reports can help provide such information.

The insights in this twelfth year of the Millennium Project’s work as reported in this year’s State of the Future can help decisionmakers and educators who fight against hopeless despair, blind confidence, and ignorant indifference—attitudes that too often have blocked efforts to improve the prospects for humanity.

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