EXECUTIVE SUMMARY

People around the world are becoming healthier, wealthier, better educated, more peaceful, and increasingly connected and they are living longer, but at the same time the world is more corrupt, congested, warmer, and increasingly dangerous. Although the digital divide is beginning to close, income gaps are still expanding around the world and unemployment continues to grow.

The global economy grew at 5.4% in 2006 to $66 trillion (PPP). The population grew 1.1%, increasing the average world per capita income by 4.3%. At this rate world poverty will be cut by more than half between 2000 and 2015, meeting the UN Millennium Development Goal for poverty reduction except in sub-Saharan Africa. Although the majority of the world is improving economically, income disparities are still enormous: 2% of the world's richest people own more than 50% of the world's wealth, while the poorest 50% of people own 1%. And the income of the 225 richest people in the world is equal to that of the poorest 2.7 billion, 40% of the world.

More than half the 6.6 billion people of the world live in urban environments. The foundations are being laid for cities to become augmented by ubiquitous computing for collective intelligence with just-in-time knowledge to better manage them. Nanosensors and transceivers in nearly everything will make it easier to manage a city as a whole—from transportation to security.

Although great human tragedies like Iraq and Darfur dominate the news, the vast majority of the world is living in peace, conflicts actually decreased over the past decade, dialogues among differing worldviews are growing, intra-state conflicts are increasingly being settled by international interventions, and the number of refugees is falling. The number of African conflicts fell from a peak of 16 in 2002 to 5 in 2005.

The prevalence of HIV/AIDS in Africa has begun to level off and could begin to actually decrease over the next few years. Meanwhile it continues to spread rapidly in Eastern Europe and in Central and South Asia. AIDS is the fourth leading cause of deaths in the world and the leading cause of death in sub-Saharan Africa.

According to WHO, the world's average life expectancy is increasing from 48 years for those born in 1955 to 73 years for those who will be born in 2025. Global population is changing from high mortality and high fertility to low mortality and low fertility. Population may increase by another 2.8 billion by 2050 before it begins to fall, according to the UN's lower forecast, after which it could be 5.5 billion by 2100—which is 1 billion fewer people than are alive today. However, technological breakthroughs are likely to change these forecasts over the next 50 years, giving people even longer and more productive lives than most would believe possible today.

According to UNESCO, in 1970 about 37% of all people over the age of 15 were illiterate. That has fallen to less than 18% today. Between 1999 and 2004 the number of children without primary education fell by around 21 million to 77 million.

The increasing and overwhelming evidence for global warming, the success of Al Gore's movie *An Inconvenient Truth*, and China's passing the United States in CO_2 emissions have put global climate change among the top issues in the world today. The IPCC reported that CO_2 emissions rose faster than its worst case scenario during 2000–04 and that without new government actions greenhouse gases will rise 25–90% over 2000 levels by 2030. Applying data from BP, the U.S. Geological Survey, and the International Energy Agency, the Netherlands Environmental Assessment Agency estimated that China passed the U.S. in carbon emissions in 2006 by 8%. China consumes 2 billion tons of coal each year, which could grow to 4 billion tons by 2016. There are 28,000 coal mines in China. The United States actually decreased its CO_2 emissions in 2006 by 1.4% from the previous year. Fossil CO_2 emissions of the EU-15 countries remained almost constant in 2006. Hence, there is some good news: the rate of increase of CO_2 emissions in 2006 from fossil fuel use was about 2.6%, while in 2005 it was 3.3%. But this good news could be short-lived as China builds more coal plants and purchases more cars.

Approximately 800–1,000 coal plants are in some stage of planning or construction around the world. If built, they will have expected production lives of 40 years. If these plants are completed, then reducing GHG emissions is less likely. One impact of continued global warming is raising sea levels that threaten more than 634 million people who live in coastal areas, according to NASA. The Secretary-General of the United Nations called climate change a "defining issue of our era." U.S. Vice Adm. Richard H. Truly said that global warming is a uniquely serious environmental security problem because it's not like "some hot spot we're trying to handle… It's going to happen to every country and every person in the whole world at the same time." According to the IPCC report *Climate Change 2007: Impacts, Adaptation and Vulnerability*, the most severe impacts of climate change will be experienced by people in the poorest regions who have emitted the least amount of greenhouse gases. Richard Branson has offered $25 million for a way to remove a billion tons of carbon dioxide a year from Earth's atmosphere, and he plans to invest $3 billion in fighting global warming.

There are increasing calls for an "Apollo-like" R&D program to solve the long-term problems of energy and climate change. The world should pressure the United States and China to create and lead a global strategy to create safer energy with fewer GHG emissions, which would reduce climate change and continue economic growth. Initial U.S.-China cooperation has begun on cleaner coal processing and biofuels. The energy alternatives to those that produce nuclear waste or CO_2 emissions are proliferating. The options to create and update global energy strategies seem too complex and rapidly changing for decisionmakers to make coherent policy. Yet the environmental and social consequences of incoherent policy are so serious that a new global system for the identification, analysis, possible consequence assessment, and synthesis of energy options is justified. Such a system has to be designed so that it can be understood and used by

the general public, politicians, and non-scientists, as well as by leading scientists and engineers around the world.

When humans used up natural resources in the past, they just migrated to new areas with more resources. This strategy will not work as well for the 40% of humanity who live in India and China, as their water and soil resources are depleted. By 2025, 1.8 billion people could be living in water-scarce areas desperate enough for mass migrations. We have to create more water, not just pricing polices to redistribute resources. Massive desalinization will be needed as well as seawater agriculture programs along 24,000 kilometers of desert coast lines to produce biofuels, food for humans and animals, and pulp for paper industries—all of which would free up fresh water for other purposes while absorbing CO_2.

According to Freedom House, the number of free countries grew from 46 to 90 over the past 30 years, accounting for 46% of the world's population, and for the past several years 64% of countries have been electoral democracies. Since democracies tend not to fight each other and since humanitarian crises are far more likely under authoritarian than democratic regimes, the trend toward democracy should lead to a more peaceful future among nation states. Unfortunately, massively destructive powers will be more available to individuals. Future desktop molecular and pharmaceutical manufacturing and organized crime's access to nuclear materials give single individuals the ability to make and use weapons of mass destruction—from biological weapons to low-level nuclear ("dirty") bombs. The IAEA reported 149 confirmed incidents of illicit use of radioactive materials in 2006. Only 10% of the 220 million sea containers that transport 90% of the world's trade are inspected, giving organized crime and terrorism easier supply lines.

Transnational organized crime continues to grow in the absence of a comprehensive, integrated global counter strategy. Its total annual income could be well over $2 trillion, giving it more financial resources than all the military budgets worldwide. The 13–15 million AIDS orphans, with potentially another 10 million by 2010, constitute a gigantic pool of new talent for organized crime.

According to the International Federation of the Red Cross and Red Crescent Societies, the total number of people affected by natural disasters has tripled over the past decade to 2 billion people, with the accumulated impact of natural disasters resulting in on average 211 million people directly affected each year. This is approximately five times the number of people thought to have been affected by conflict over the past decade.

Increased acknowledgement of climate change and other forms of global interdependence, such as financial links and communicable diseases, demonstrates the need for global systems for resilience—the capacity to anticipate, respond, and recover from disasters such as tsunamis, massive migrations due to water shortages, prolonged electric or Internet outages, financial crashes, and conflicts. If much of the global complexity cannot be managed efficiently by current systems, then new decisionmaking systems may emerge. The International Organization for Standardization (with more than 16,000 ISO standards) and the Internet have proved effective mediums for self-organized decisionmaking. Hence it would be wise to create self-organizing global systems for resilience. Maybe countries should have a National Resilience Office as a focal point for integration of diverse factors for improved national resilience. A different transinstitution could be created for each of the 15 global challenges in Chapter 1 or for other needs of society. Each transinstitution could improve global resilience as coalitions of the willing composed of national resilience officers and their counterparts in corporations, NGOs, universities, and international organizations.

If Moore's Law continues, within 25 years a computer could possess the processing power of the human brain; 25 years after that, it could have the total processing power of all human brains. Imagine every individual having computer capability equal to all the human brains on Earth! In the meantime, over a billion people (17.5% of the world)

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are connected to the Internet. The digital divide is closing and may continue to do so as orders for the (XO-1) MIT-inspired $100 laptops (actually $178) have been requested in lots of 250,000 by Argentina, Uruguay, Brazil, Nigeria, Libya, Pakistan, and Thailand. As the integration of cell phones, video, and the Internet grows, prices will fall, accelerating globalization and allowing swarms of people to quickly form and disband, coordinate actions, and share information ranging from stock market tips to bold new contagious ideas.

As the world moves toward ubiquitous computing with collective intelligence for just-in-time knowledge, decisions should improve. Decisionmaking will increasingly be augmented by the integration of ubiquitous sensors, a more intelligent Web, and institutional and personal intelligence software that helps us receive and respond to feedback for improving decisions.

The world is expected to produce more data in 2007 than it can store. According to the IDC, the world produced 161 exabytes (billion gigabytes) in 2006 and had 185 exabytes of storage capacity. With the increased use of multimedia systems like YouTube, the profusion of surveillance cameras, and regulatory rules for corporate data retention, 988 exabytes (nearly 1 zettabyte) could be produced in 2010, but only 601 exabytes are expected to be available for storage by 2010.

World trade grew 15% in 2006, according to the WTO. Higher oil and commodity prices contributed to the 30% trade growth for the least-developed countries—a world record—and their economies continued to exceed 6% for the third year in a row. The debt-to-GDP ratios decreased in all developing regions, partly due to debt forgiveness. Excluding South Africa, sub-Saharan Africa averaged 4.5% growth, but poverty continues to grow due to high birth rates, corruption, armed conflicts, poor governance, environmental degradation, poor health conditions, and lack of education.

Since the world is short 2.4 million doctors, nurses, and midwives, according to WHO, telemedicine, biochip sensors for self-diagnosis, and other automated systems may be increasingly necessary as people live longer. The threat of SARS has been eliminated by a well-managed coherent human response. Now the world is preparing for genetic variations that could occur in the avian flu H5N1 virus that could kill 25 million people, bringing air transportation to a halt and throwing the world into a depression.

It is estimated that achieving the UN Millennium Development Goals could cost $135 billion; by comparison, $600 billion has been spent and approved by the U.S. Congress for the war in Iraq and another $140 billion may be requested for 2008.

The ILO reports that the legislative, senior official, or managerial positions held by women have grown slowly from 25.6% in 1995 to 28.3% today. Although condemnation of any form of discrimination against women is almost universal, progress is mixed. About 57% of women work in the cash economy, but only 17% are national legislators. There are now 94 girls in primary school for every 100 boys, up from 92 in 1999. Of the 181 countries with data for 2004 available, about two-thirds have achieved gender parity in primary education. However, only one-third of the 177 countries with data available have achieved parity on secondary education. Some 781 million adults lack minimum literacy skills; two-thirds are women. Violence against women by men continues to cause more casualties than wars do today.

There are more slaves in the world now than at the highest point of the African slave trade. Estimates vary from 12.3 million to 27 million, with the majority being women in Asia. The World Bank estimates that more than $1 trillion is paid each year in political bribes, of which $20–40 billion is received by public officials from developing and transition countries and $60–80 billion in more developed countries. However, unethical decisions are increasingly exposed via news media, blogs, mobile phone cameras, ethics commissions, and organizations like Transparency International. Yet trivial news and entertainment floods our minds with unethical behavior, and far too many seem more interested in winning debating points than seeking truth to achieve integrity to improve our future.

The extraordinary impacts of S&T over the past 25 years will seem slight compared with what is likely to happen in the next 25 years. The factors that accelerated the rate of innovation are themselves changing at accelerating rates. Transistors are now smaller than light waves (65 nanometers). Intel has created the first programmable 1 Teraflop chip able to perform more than 1 trillion floating point operations per second. The brain-computer interface now lets thoughts move software, nanoparticles and fibers stimulate neural growth, and mini-biocomputers help treat specific individual cells. Photons have been slowed and accelerated, adult stem cells have been regressed to repair damaged tissue, and microbial fuel cells have been demonstrated. China plans to be the fourth country (after the U.S., Russia, and Japan) to orbit the moon later this year. Some forecast that molecular manufacturing and 3D printing will eventually evolve to the point when people can print high-tech objects previously shipped around the world. If that day ever comes, then shipping bytes instead of atoms would dramatically alter industrial world trade. According to Lux Research, $12.4 billion was invested in nanotech R&D worldwide in 2006, and more than $50 billion worth of nano-enabled products were sold.

The world needs a process to focus government, corporate, and university scientific, engineering, and medical resources to achieve the eight UN Millennium Development Goals and address the 15 Global Challenges described in *State of the Future*. We need transinstitutional management and more serious public education through the media.

National decisionmakers have not been trained in the theory and practice of decisionmaking, and few know how advanced decision support software could help them. Formalized ethics and decision training for decisionmakers could result in a significant improvement in the quality of global decisions. In addition to policymakers needing training in how to make decisions, processes to set local, national, and international priorities need further development. We know the world is increasingly complex and that the most serious challenges are global in nature, yet we don't seem to know how to improve and deploy Internet-based management tools and concepts fast enough to get on top of the situation.

Drawing on his experience as Secretary-General of the UN, Kofi Annan has identified five principles to improve prospects for humanity: the security of everyone is the security of everyone else; we are responsible for each others' welfare (global solidarity); respect for each other should be reinforced by human rights and rule of law; governments must be accountable both internally and internationally (mutual accountability); and these four principles can be achieved through multilateral institutions like the UN.

Although many people criticize globalization's potential cultural impacts, it is increasingly clear that cultural change is necessary to address global challenges. The development of genuine democracy requires cultural change, preventing AIDS requires cultural change, sustainable development requires cultural change, ending violence against women requires cultural change, and ending ethnic violence requires cultural change. The tools of globalization, such as the Internet, global trade, international trade treaties, and international outsourcing, should be used to help cultures adapt in a way that preserves their unique contributions to humanity while improving the human condition.

State of the Future Index

People have always wanted to know if the future is getting better or worse, where we are winning and losing, and where resources should be focused to improve our prospects. It seemed impossible to do this on a global scale. The World Bank does this in economics, WHO does this for health, the International Energy Agency does this for energy, but how can it all be brought together to see the prospects for humanity as a whole? One approach is the State of the Future Index. This is a measure of the 10-year outlook for the future in general. It is constructed with key variables and forecasts related to the global challenges that have emerged from probably the largest on-going participatory futures process in history.
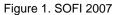
The State of the Future Index was first described in the Millennium Project's *2001 State of the Future*. Since then the SOFI chapter in *State of the Future* reports has focused on improvements in data sources and the method itself. This year Chapter 2 presents an overview of the SOFI study conducted in 2006–07. Participants selected by the 29 Millennium Project Nodes around the world were asked via an online Real Time Delphi 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. The results were used to construct a new global SOFI with 29 variables. It showed that the world is improving, but not as rapidly as it did over the past 20 years. SOFIs have also been constructed for countries—most recently in South Korea and Turkey—and could be put together for sectors, such as energy, or for individual organizations.
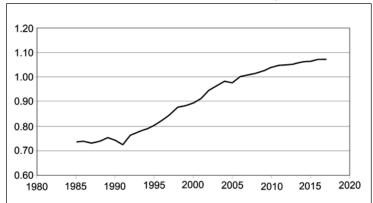
Chapter 2 also reviews the evolution of the SOFI concept and suggests research for its further development. Details on all six years of SOFIs and the analysis and supporting data of this year's SOFI are included in the CD Chapter 2.

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/cap	• Global warming
• Conflict	• Voting population
• Internet users	• Unemployment

Figure 1. SOFI 2007

Future Education and Learning Possibilities by 2030

At the request of the Presidential Commission on Education and with support from the Ministry of Education of the Republic of Korea, the Millennium Project explored future possibilities for education and learning by the year 2030. A literature search produced a list of 19 possibilities. Each was assessed by more than 200 participants selected by the Millennium Project Nodes around the world in terms of the possibility of occurrence by 2030, what might make or prevent it from happening, and some positive and negative consequences if it were to occur. The possibilities were:

- National programs for improving collective intelligence
- Just-in-time knowledge and learning
- Individualized education
- Use of simulations
- Continuous evaluation of individual learning processes designed to prevent people from growing unstable or becoming mentally ill
- Improved individual nutrition
- Genetically increased intelligence
- Use of global on-line simulations as a primary social science research tool
- Use of public communications to reinforce pursuit of knowledge
- Portable artificial intelligence devices
- Complete mapping of human synapses to discover how learning occurs and thereby develop strategies for improvement of learning
- Means for keeping adult brains healthier for longer periods
- Chemistry for brain enhancement
- Web 17.0
- Integrated life-long learning systems
- Programs aimed at eliminating prejudice and hate
- E-Teaching
- Smarter than human computers
- Artificial microbes enhancing intelligence

The interrelation of these possibilities presents a dramatically different view of education than dominates today. As noted earlier, by 2030 portable intelligent devices could have the processing power of the human brain. Individuals would gain access to the world's knowledge that has been integrated by Web 17.0 for "just-in-time knowledge and learning," using simulations with virtual reality interfaces adapted to their unique needs throughout their lives. Continuous evaluation of individual learning processes designed to prevent people from growing unstable or becoming mentally ill, along with programs aimed at eliminating prejudice and hate, could bring about a more beautiful, loving world.

In parallel, brain function should also be dramatically increased by improved personal nutrition and brain enhancement pharmaceuticals. Insights from partial mapping of the human brain and other methods could dramatically increase personal intelligence and longevity by 2030. More remotely in the future, brains may be genetically enhanced, and designer micro-organisms could make brain cells work more efficiently. With the use of public communications to reinforce the pursuit of knowledge and the use of these learning innovations and educational concepts, individual and collective intelligence could be improved. Full details, text from participants, and additional suggestions are available in the CD Chapter 5.

Environmental Security

Environmental security continues to move up on the policy agenda around the world, even reaching the Security Council of the United Nations for the first time. 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, and protecting the environment due to its inherent moral value.

Chapter 4 presents a summary of more than 200 emerging international environmental security–related issues organized around this definition. The full text of the items and their sources can be found in the CD Chapter 9.1, "Emerging Environmental Security Issues," and in monthly updated reports on the Millennium Project's Web site, www.acunu.org (under "What's New," select "International Environmental Security Issues"). More details and other Millennium Project studies related to environmental security are included in Chapter 9 on the CD and are available at www.acunu.org under "Books and Reports" (select "Special Studies").

Although cooperation is increasing among a variety of institutions for better, more synergistic environmental policy and activities, many environmental conditions continue to deteriorate. Most conflicts are occurring in the least environmentally sustainable regions, thus reinforcing the idea that environment and conflict should be addressed simultaneously and that one aggravates the other.

There is no adequate international system or framework to cope with environmental refugees, estimated to reach 50 million by 2010 and 200 million by 2050.

The increasing ratification of multilateral environmental agreements and the adoption of ISO 14001 standards are improving environmental management globally. The time between the design of an MEA and its coming into force as well as the time it takes to reach a high ratification level are shortening considerably. International attention is shifting from designing new MEAs to improving the effectiveness of existing agreements.

MEAs often conflict with national economic or political interests, generating issues of noncompliance with international treaties, lack of cooperation with international organs, and deadlock in many international treaty–related negotiations. Matters of disagreement are mostly related to strategies for greenhouse gas emission cuts, nuclear proliferation, security aspects of environmental change, and outer-space security issues.

The costs are falling for nanotech environmental sensors, which can be connected to global information systems via satellite, potentially making environmentally damaging actions known instantaneously and worldwide.

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.

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 eleventh 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.