

## EXECUTIVE SUMMARY

After seven years of cumulative global futures research by the Millennium Project, it has become increasingly clear that humanity has the resources to address its global challenges; what is less clear is how much wisdom, good will, and intelligence will be focused on these challenges.

Dramatic increases in collective human-machine intelligence are possible within 25 years. It is also possible that within the next 25 years single individuals acting alone might use advances in science and technology (S&T) to create and use weapons of mass destruction (WMD).

The increasing number of women with formal education or participation in the cash economy has substantially improved the nutrition condition of the world, reduced infant mortality and birth rates, and improved general welfare. Yet violence against women who are between 15 and 44 years old causes more death and disability than cancer, malaria, traffic accidents, and even war.

Previous moral campaigns by one religion or ideology tend to give rise to “we-they” splits, making it difficult to solve world problems. Collaboration across national and institutional boundaries, as well as religious and ideological ones, seems necessary to address the global challenges described in this book. Globalization and advanced technology allow fewer people to do more damage, in less time, than ever before; hence, the welfare of anyone should be the concern of everyone. Such platitudes are not new, but the consequences of their failure will be quite different in the future than in the past. As the collective intelligence of humanity increases by responding to feedback from the “global electronic nervous system,” far more serious efforts are needed to make sure that global ethics are also improved in parallel with advances in mental capacity.

Most people do not appreciate how fast science and technology will change over the next 25 years. The synergies and confluence of nanotechnology, biotechnology, information technology, and cognitive science (NBIC) are a particularly important new merger of science and engineering supported by both government and venture capitalists. NBIC tools will dramatically increase individual and group performance and the support systems of civilization. NBIC products will range from biometrics to counterterrorism systems, from restoring brain functioning and eyesight to increased longevity.

The unprecedented speed of change makes people unsure about the future. Globalization is challenging philosophical and religious certainty. People are unsure of the basis on which to make decisions. As decisionmaking to address global challenges becomes too complex, it will appear chaotic until new decisionmaking systems emerge. New kinds of global institutions might appear to be massively complex games capable of matching solutions and problems. With the merger of Internet capabilities and mobile phones, swarms of people can quickly form, share information, coordinate actions, and disband. E-government systems are growing rapidly to help automate administrivia and to facilitate public participation, but they also create new vulnerabilities to manipulation by organized crime and to cyber-terrorism.

The leadership necessary for sustainable development has not yet emerged. Even with spectacular growth in alternative renewable energy sources, total fossil fuel use over the next 50 years is expected to triple the amount used over the last 50. Unless carbon sequestration or other methods to prevent or recycle greenhouse gas emissions are developed, the environmental movement may try to close down the fossil fuel industries, just as they stopped the growth of nuclear power 30 years ago.

International responses to SARS, the September 11th attacks, and the Space Shuttle Columbia explosion have increased global long-term thinking, but their impacts seem short-lived. Nevertheless, long-range goals like landing on the moon or eradicating smallpox that were considered impossible did excite many people who went beyond selfish, short-term interests to great achievements. The eight UN Millennium Development Goals could be the basis for eight international coalitions—each composed of the governments, corporations, nongovernmental organizations (NGOs), universities, and international organizations that are really willing to commit the resources and talent to address the goal.

Meanwhile, water tables are continuing to fall on every continent. About 40% of humanity lives in the 260 major international water basins shared by more than two countries. Nearly half the world lives in cities, on just 2% of the world's land. People are living longer, the world is increasingly urban, and population is growing fastest where people can least afford the necessities of life. By 2050 there may be more people over 60 than under 15 years old. Within the next two decades, hundreds of millions of people could be added to the 1.3 billion people who are living on \$1 per day.

The digital divide between the industrial and developing worlds is closing rapidly. It fell from 40 to 1 users of the Internet in 1995 to 17 to 1 in 2001, and by mid-2003 it had fallen to about 4 to 1. In 2002, there were more Internet users in Asia and the Pacific than in the United States and Canada (187 million to 183 million). By the end of 2003, China could have 120 million users. The majority of the world may be connected to the Internet within 15 years, making cyberspace an unprecedented medium for civilization. This new distribution of the means of production in the knowledge economy is cutting through old hierarchical controls in politics, economics, and finance. It is becoming a self-organizing mechanism that could lead to dramatic increases in humanity's ability to invent its future.

Democratization is a global long-term trend, even though the pace of democratization has not progressed for the past two years. Since democracies tend not to fight each other, the trend toward democracy should lead to a more peaceful future. Yet humanitarian crises within authoritarian regimes from North Korea to the Congo need far better international anticipation and response.

The world economy has grown from \$5 trillion to \$35 trillion during the last 50 years. Although significant growth has occurred for many in the developing world (especially in India and China), income per capita has been dropping steadily over the past 30 years in poorer countries. Yet the number of Asians earning more than \$7,000 annually exceeds the total population of the United States, Canada, and Europe—laying the foundation for unprecedented middle-class growth and consumption.

Transnational organized crime has grown to the point where it is increasingly interfering with the ability of governments to act. Nation-states can be understood as a series of decision points. People in these decision points are vulnerable to influence from the vast amounts of money available to crime groups; hence, a new line of business for organized crime could be buying and selling government controls, decisions, and departments, just as they buy and sell heroin.

Since hospitals, food storage, water supply, and other support systems of civilization increasingly depend on the Internet, cyber weapons can now be considered weapons of mass destruction. Because cyber and other WMDs may be available to single individuals over the next generation, we should begin to explore how to connect education and security systems in a healthy way to prevent their use.

New biological and technological sensory technologies will make detection and enforcement of tougher environmental regulations possible. Many environmental impacts that were tolerated 10 years ago will not be allowed 10 years from now. The cost of military operations to comply with environmental regulations may become so high that the nature of conflict and military operations could change.

The rapid and unprecedented international cooperation to control SARS is a step in the evolution of global systems necessary to reduce the threat of new and reemerging diseases and immune microorganisms. In the meantime, AIDS still looms as a global catastrophe: by 2012 the number of people dying early of AIDS could double or triple. Today, nurses and teachers in Africa are dying faster of AIDS than they can be replaced.

State of the Future Index (SOFI) software can be created to help countries, industries, and sectors assess their future on a more objective basis.

## **State of the Future Index**

The State of the Future Index was created by the Millennium Project to quantify progress related to 15 Global Challenges as a whole and to assess whether the future is improving or getting worse. The future cannot be reduced to a number, but the process of developing this index forces people to consider what they mean when they say the future is getting better or worse. According to the studies of the SOFI discussed in Chapter 2, the outlook for the future is getting better due to the past 20 years of improvements in:

- the infant mortality rate,
- food availability in low-income countries,
- the gross domestic product per capita,
- the share of households with access to safe water,
- the adult literacy rate,
- life expectancy,
- the percent of world population living in countries that are free,

- secondary school enrollment, and
- the share of the population with access to local health care in the 15 most populated countries.

At the same time, the forces that impede improvement include:

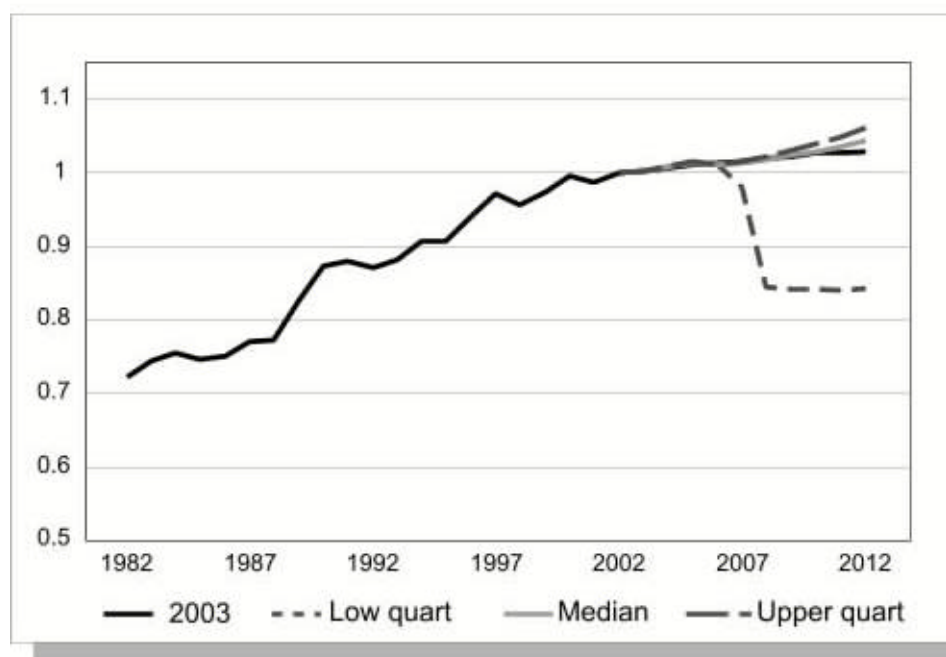
- carbon emissions,
- the share of the population unemployed,
- loss of forestlands,
- the ratio of global average income of the top 5% to the bottom 5%,
- annual AIDS deaths, and
- developing-country debt.

This year's analysis found that the SOFI was sensitive to several key uncertainties, including the possibility of extending the lives of people infected with HIV, large-scale increases in the number of deaths due to terrorism resulting from the advent of a single individual using a WMD, and the continuing possibility of nuclear proliferation. These factors lead to a plausible and significant drop in the future SOFI and suggest an agenda for global attention.

The results are summarized in Chapter 2 of the print version, and full details and the methodology are in the accompanying CD in Chapter 2. One graphic representation of the 2003 SOFI is shown in Figure 1.

Figure 1

**Modified 2003 State of the Future Index**  
2002=1



An exciting next step is the development of the Internet-based interactive SOFI software as a futures research and policy analysis tool supported over an open knowledge system. This initiative is already under way, spearheaded by the Millennium Project's Silicon Valley Node. The panel of leaders and senior members from the Silicon Valley software industry proposed an organic open-knowledge system architecture. Pending funding to complete the software development, it could be used to develop national SOFIs for country comparisons. Initial discussions have been held about creating a EuroSOFI.

Corporations could create their own SOFIs to help clarify what is important to measure about their future, and what success would look like in more than just financial measures. The SOFI software system comprises "server" software components that run on an Internet Server and a "client" software that runs on users' personal computers. The application is designed to support multiple types of clients.

### **Future S&T Management Policy Issues—2025 Global Scenarios**

Over the past three years the Millennium Project has conducted a study of futures issues in science and technology management and policy. The full results and methods are in the CD Chapter 3. This third year produced four scenarios based on the previous research and a two-round questionnaire on the scenarios' construction.

In preparation to write the scenarios, an international panel of futurists, scientists, research and development (R&D) managers, and S&T policymakers were asked about potential future developments and scenario content. Over half of the international panel believed it was plausible that within the next 25 years:

- there will be dramatic increases in collective human-machine intelligence;
- organizations designed to regulate the course of S&T will generally fail to keep pace with accelerated advances of S&T;
- weapons of mass destruction will be available to single individuals;
- international S&T treaties and regulations will have provisions for enforcement by police or military intervention;
- international systems (like the International Atomic Energy Agency) will be established to monitor and regulate biotechnology, nanotechnology, and other areas of scientific R&D with enforcement powers;
- advances in cognitive science, information technology, and new educational systems and/or changes in older ones will be able to significantly improve tolerance for diversity;
- S&T regulators and commissions will not be free from corruption;
- an anti-science movement will not be as powerful or more powerful than the environmental movement;

- cost-benefit trade-offs cannot be logically made when extreme unintended consequences are involved;
- scientists will not unite into a global labor organization; and
- science disciplines will not be able to effectively self-regulate.

The alternative scenarios produced seven different S&T management approaches, many of which can exist in combination with others:

- national regulation on a case-by-case basis;
- a global organization dedicated to the collection and dissemination of S&T information on risk and opportunities;
- a global organization that has power to enforce regulations that limit and direct S&T;
- a global commission to establish S&T guidelines;
- a global commission to assign priorities;
- self-regulation of each field by organizations with the disciplines themselves; and
- international treaties and sanctions.

The following are brief abstracts of the 2025 scenarios; the full text can be found in Chapter 3:

### **Scenario 1: S&T Develops a Mind of Its Own**

The rate of scientific discoveries and advanced technological applications exploded. A global science/social feedback system was at work: science made people smarter, and smarter people made better and faster science. Better and faster science opened new doors to discovery, and new doors led to synergies solving problems and creating new opportunities that created new science that made people smarter. S&T moved so fast government and international regulations were left in the dust. Science and technology appeared to be taking on a mind of its own.

### **Scenario 2: The World Wakes Up**

The murder of 25 million people in 2021 by a self-proclaimed Agent of God who created the genetically modified Congo virus finally woke the world up to the realization that an individual acting alone could create and use a weapon of mass destruction. This phenomenon became known as SIMAD—Single Individual Massively Destructive. Regulatory agencies and mechanisms were put into place to control the science- and technology-related dangers that became apparent. Education was a big part of the answer, but connecting the educational systems with the security systems was disturbing to some people. Nevertheless, further individual acts of mass destruction were prevented. International and government regulations did manage the S&T enterprise for the public good.

### **Scenario 3: Please Turn off the Spigot**

Science was attacked as pompous and self-aggrandizing, as encouraging excesses in consumption, raising false hopes and—worse—unexpected consequences that could destroy us

all. Particularly worrisome was accidentally or intentionally released genetically modified organisms and the potential for weapons of mass destruction. The poor were ignored. A science guru arose to galvanize the public. A global commission was established but failed because of corruption. But a new commission with built-in safeguards seemed to be working.

#### **Scenario 4: Backlash**

Control was low and science moved fast, but negative consequences caused public alarm. The golden age of science was hyped by the media, but it all proved to be a chimera. Some of the most valued discoveries and new capabilities had a downside and surprises abounded. Rogue nations took advantage of some of these shortcomings. The level of concern rose. Mobs protested. Regulation failed. Progress stalled. And corporate (or government) scientists frequently felt pressure from within their organizations. Both corporate and government organizations could not be counted on to self-regulate.

### **Middle East Peace Scenarios Study**

Although the Israeli-Palestinian conflict is one of the most analyzed issues today, there are no well researched, objective, plausible peace scenarios for the Middle East—not frameworks, proposals, treaties, or road maps, but scenarios—stories with causal links connecting the future and present. At the request of its Cairo Node, the Millennium Project has begun a study to “backcast” from peace to how it was achieved.

Seven preconditions were identified:

- secure borders for Israel,
- establishment of a viable and independent Palestinian state,
- resolution of the Jerusalem question,
- end violence by both sides and build confidence,
- social and economic development,
- education, and
- resolution of Palestinian refugee status.

A set of actions to help achieve each of the seven preconditions was given, additional actions were requested, and all were rated by an international panel as to their importance to achieving the precondition, the likelihood that it could be done, and the backfire potential (the ability to make things worse). The highest combined score (importance, likelihood, and low backfire) from the two-round questionnaire was “successful regional water negotiations in the Middle East.”

Hence, peace scenarios should have this as an essential element, and those working on the peace process in the Middle East should initiate regional water negotiations as soon as possible. The responses of the international panel composed of more than 180 futurists, social scientists,

representatives of involved institutions, and decisionmakers in the Middle East and elsewhere to the two-round questionnaire are discussed in Chapter 4 and the complete results are in the CD Chapter 4.

The study is now half completed. Draft scenarios will be constructed. To improve their plausibility, they will be used as a basis for interviews with opinion leaders in the Israeli-Palestinian situation. The rewritten scenarios will be published and offered for discussion among the interested parties.

## **Emerging Environmental Security Issues and International Treaties**

Over the past year the Millennium Project's scanning of the Internet and other sources has identified over 80 items that show emerging environmental security issues that may lead to changes in international agreements. These items are discussed in Chapter 5 and the full text of the items is in the enclosed CD in Chapter 9.1 on environmental security. It is clear from these items that environmental issues are moving higher on the agenda of governments, corporations, international organizations, NGOs, universities, the media, private institutions, and individuals around the world. Environmental regulations are increasing in scope, depth, and enforcement. New and much more sensitive chemical and biological detection techniques will provide faster and more accurate monitoring of possible environmental violations. Many actions acceptable 10 years ago will not be tolerated 10 years from today. Because the international trade requirements about the content and production of products is becoming tougher, the countries and companies that cannot keep track of chemicals in their products and production could lose business to those who can.

Frameworks are needed for systematic exchange and analysis of information among law enforcement agencies, customs services, environmental regulatory agencies, trade agencies, and intelligence organizations in order to prevent and repair military damage to the environment as well as to prevent and respond to environmentally caused conflicts. As a result, new agreements are needed for data standards for better information sharing and integration to enforce compliance to current and coming international agreements related to environmental security issues. Environmental security and full national sovereignty may be a contradiction.

## **Some Findings from Previous Years' Research**

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.

The great paradox of our age is that while more and more people enjoy the benefits of technological and economic growth, growing numbers of people are poor, ignorant, and

unhealthy. World leaders are increasingly seeking a common platform among UN organizations, the World Bank, the International Monetary Fund, the World Trade Organization, multinational corporations, and other key actors of globalization to address this issue.

Creating global partnerships between the rich and poor to make the world work for all, which seemed like an idealistic slogan before September 11th, may prove to be the most pragmatic direction as the possibilities increase that individuals may one day have access to weapons of mass destruction.

Scientists have slowed, stopped, and accelerated photons in low-temperature gases and solid crystals. Construction of the International Space Station continues, and human genome research is changing the prospects for life. The factors that caused the acceleration of S&T innovation are themselves accelerating; hence, the acceleration of scientific and technological accomplishments over the past 25 years will appear slow compared with the rate of change in the next 25. The process of scientific R&D that uses peer-reviewed journals and government support is being challenged by those using venture capital to get products to the market more quickly. Since technology is growing so rapidly along several fronts, the possibility of it growing beyond human control must now be taken seriously.

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 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 priorities (local, national, and international) 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.

The hundreds of actions that were suggested over the years by the Millennium Project's Global Lookout Panels could be organized into 12 meta-strategies, which can also be used as a checklist to help identify a more complete set of specific strategies in other situations:

- establishing new alliances, agreements, and treaties;
- engaging in social marketing;
- creating standards and permits;
- enforcing or modifying laws and regulations;
- performing scientific R&D;
- engaging in meetings, dialogues, or workshops;
- creating and amending economic systems, sanctions, and incentives;
- improving planning, accounting, and forecasting;
- creating and improving new educational programs;
- developing and sharing information;

- modifying institutions, infrastructure, and priorities; and
- initiating new institutions, projects, and programs.

The role of the state is more important where there is little private sector; hence policies that make sense in western industrial countries that include leadership from the private sector are less applicable in poorer regions.

The extent of national sovereignty continues to be a key element in the analysis of environmental security, terrorism, climate change, the International Criminal Court, and management of future S&T risks.

Since education is one of the fundamental strategies to address most global challenges, it is important to identify the most effective educational materials, curricula, and distribution media for global education as well as institutional arrangements to accelerate learning.

The lack of ethical behavior and moral underpinnings has given rise to a new hunger for global ethics and the need to identify common ethical norms. Coupled with this is the extraordinary growth of global standards and those who seek to meet them through the International Organization for Standardization.

Environmental security is the 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 the moral value of the environment itself. Environmental security is rising on the military agenda of more nations due to new kinds of weapons and their ability to be used in asymmetrical conflicts; increasing demands on natural resources, with urbanization that is making more people dependent on vulnerable public utilities; continued advances in environmental law, with escalating environmental litigation; and globalization that is increasing interdependence.

Some military conflicts and many environmental problems are due to the lack of clean and abundant energy. Although the interdependence of economic growth and technological innovation made it possible for 3–4 billion people to have relatively good health and living conditions today, unless our financial, economic, environmental, and social behaviors are improved along with our industrial technologies, the long-term future could be more difficult.

The world is completing a convergence of information and telecommunications technologies to create a self-organizing mechanism to improve the collective intelligence of humanity. As mobile phones and the Internet merge, China is set to become a unique cyber phenomena: it has the largest number of mobile phone users in the world and by 2005 it will also have the most Internet users.

There is a growing awareness that nothing less than a declaration of information warfare against money laundering will be necessary to bring down transnational organized crime and political corruption.

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 and global trade, should be used to help cultures adapt in a way that preserves their unique contributions to humanity and yet helps improve the human condition.

The most important challenges are transnational in nature and transinstitutional in solution. They cannot be addressed by any government or institution acting alone. They require collaborative action among governments, international organizations, corporations, universities, and NGOs. Transinstitutional mechanisms to focus these global actors are missing. The 15 global challenges discussed in Chapter 1 provide a framework to assess the global and local prospects for humanity (sustainable development could be discussed as a global or a neighborhood objective). The challenges are interdependent: an improvement in one makes it easier to address others; deterioration in one makes it more difficult to address others. There is greater consensus about the global situation as expressed in these challenges and the actions to address them than is evident in the news media.