


Executive Summary

The world is getting richer, healthier, better educated, more peaceful, and better connected and people are living longer, yet half the world is potentially unstable. Food prices are rising, water tables are falling, corruption and organized crime are increasing, environmental viability for our life support is diminishing, debt and economic insecurity are increasing, climate change continues, and the gap between the rich and poor continues to widen dangerously.

There is no question that the world can be far better than it is—IF we make the right decisions. When you consider the many wrong decisions and good decisions not taken—day after day and year after year around the world—it is amazing that we are still making as much progress as we are. Hence, if we can improve our decisionmaking as individuals, groups, nations, and institutions, then the world could be surprisingly better than it is today.

Now that the Cold War seems truly cold, it is time to create a multifaceted compellingly positive view of the future toward which humanity can work. Regardless of the social divisions accentuated by the media, the awareness that we are one species, on one planet, and that it is wise to learn to live with each other is growing, as evidenced by the compassion and aid for Haiti, Pakistan, and Japan; the solidarity with democracy movements across the Arab world; the constant global communications that connect 30% of humanity via the Internet; and the growing awareness that global climate change is everyone's problem to solve.

Fifty years ago, people argued that poverty elimination was an idealistic fantasy and a waste of money; today people argue about the best ways to achieve that goal within 50 years. Twenty-five years ago, people thought that civilization would end in a nuclear World War III; today people think everyone should have access to the world's knowledge via the Internet, regardless of income or ideology.

The *2011 State of the Future* offers no guarantee of a rosy future. It documents potentials for many serious nightmares, but it also points to a range of solutions for each. If current trends in population growth, resource depletion, climate change, terrorism, organized crime, and disease continue and converge over the next 50–100 years, it is easy to imagine an unstable world with catastrophic results. If current trends in self-organization via future Internets, transnational cooperation, materials science, alternative energy, cognitive science, inter-religious dialogues, synthetic biology, and nanotechnology continue and converge over the next 50–100 years, it is easy to imagine a world that works for all.

The coming biological revolution may change civilization more profoundly than did the industrial or information revolutions. The world has not come to grips with the implications of writing genetic code to create new lifeforms. Thirteen years ago, the concept of being dependent on Google searches was unknown to the world; today we consider it quite normal. Thirteen years from today, the concept of being dependent on synthetic life forms for medicine, food, water, and energy could also be quite normal.

Computational biophysics can simulate the physical forces among atoms, making medical diagnostics and treatment more individually accurate. Computational biology can create computer matching programs to quickly reduce the number of possible cures for specific diseases, with millions of people donating their unused computer capacity to run the matching programs (grid computing). Computational media allows extraordinary pixel and voxel detail when zooming in and out of 3D images. Computational engineering brings together the world's available information and computer models to rapidly accelerate efficiencies in design. All these are changing the nature of science, medicine, and engineering, and their acceleration is attached to Moore's law; hence, computational everything will continue to accelerate the knowledge explosion. Tele-medicine, tele-education, and tele-everything will connect humanity, the built environment, and computational everything to address our global challenges.

The earthquakes, tsunamis, and nuclear disasters in Japan exposed the need for global, national, and

local systems for resilience—the capacity to anticipate, respond to, and recover from disasters while identifying future technological and social innovations and opportunities. Related to resilience is the concept of collective intelligence—maybe the “next big thing” to help us make better decisions (see CD Chapter 6).

After 15 years of The Millennium Project's global futures research, it is increasingly clear that the world has the resources to address its challenges. What is not clear is whether the world will make good decisions fast enough and on the scale necessary to really address the global challenges. Hence, the world is in a race between implementing ever-increasing ways to improve the human condition and the seemingly ever-increasing complexity and scale of global problems.

So, how is the world doing in this race? What's the score so far? A review of the trends of the 28 variables used in The Millennium Project's global State of the Future Index provides a score card on humanity's performance in addressing the most important challenges; see Box 2 and Figures 1 and 2.

Box 2. The world score card

Where we are winning

1. Improved water source (percent of population with access)
2. Literacy rate, adult total (percent of people age 15 and above)
3. School enrollment, secondary (percent gross)
4. Poverty headcount ratio at \$1.25 a day (PPP) (percent of population) (low- and mid-income countries)
5. Population growth (annual percent) (A drop is seen as good for some countries, bad for others)
6. GDP per capita (constant 2000 US\$)
7. Physicians (per 1,000 people) (surrogate for health care workers)
8. Internet users (per 1,000 people)
9. Infant mortality (deaths per 1,000 live births)
10. Life expectancy at birth (years)
11. Women in parliaments (percent of all members)
12. GDP per unit of energy use (constant 2000 PPP \$ per kg of oil equivalent)
13. Number of major armed conflicts (number of deaths >1,000)
14. Undernourishment (percent of population)
15. Prevalence of HIV (percent of population 15–49)
16. Countries having or thought to have plans for nuclear weapons (number)
17. Total debt service (percent of GNI) (low- and mid-income countries)
18. R&D expenditures (percent of national budget)

Where we are losing

19. Carbon dioxide emissions (kt)
20. Global surface temperature anomalies
21. People voting in elections (percent of population)
22. Levels of corruption (15 largest countries)
23. People killed or injured in terrorist attacks (number)
24. Number of refugees (per 100,000 total population)

Where there is uncertainty

25. Unemployment, total (percent of total labor force)
26. Non-fossil-fuel consumption (percent of total)
27. Population in countries that are free (percent of total global population)
28. Forestland (percent of all land area)

Some data in Figures 1–3 had to be adjusted for graphic illustration purposes; those adjustments are indicated in the respective labels in brackets.

Figure 1. Where we are winning

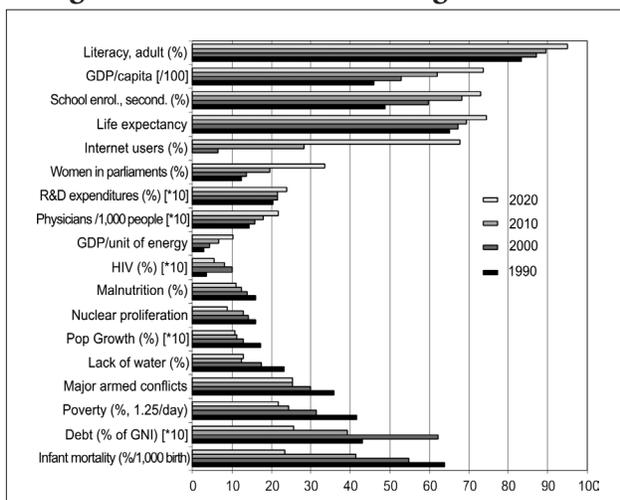


Figure 2. Where we are losing

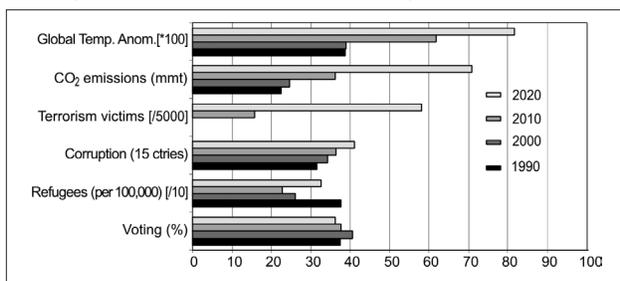


Figure 3. Where trends are not clear

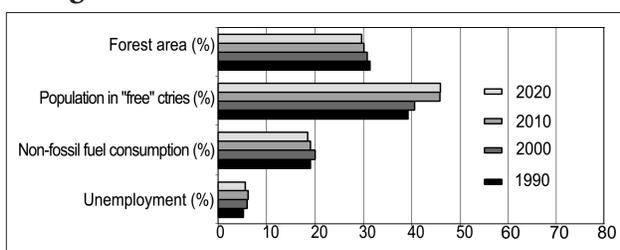
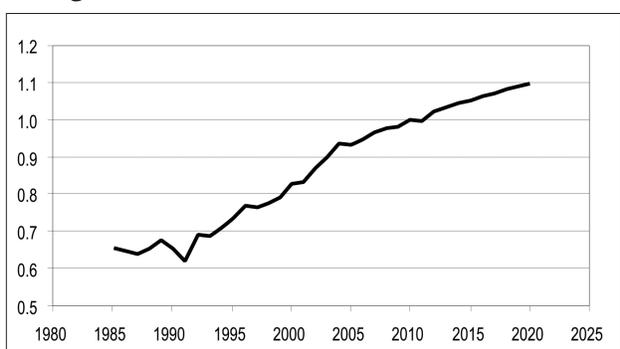


Figure 4. 2011 State of the Future



An international Delphi panel selected over a hundred indicators of progress or regress for the 15 Global Challenges in Chapter 1. Indicators were then chosen that had at least 20 years of reliable historical data and later, where possible, were matched with variables used in the International Futures model. The resulting 28 variables shown in Box 3 were integrated into the State of the Future Index with a 10-year projection. Chapter 2 in this print section presents a summary of this exercise, while full details are in Chapter 2 on the attached CD. SOFIs have also been computed for countries and could be applied to sectors like communications, health, water, and so forth.

The 2011 SOFI in Figure 4 shows that the 10-year future for the world is getting better. However, in many of the areas where we are winning we are not winning fast enough, such as reductions in HIV, malnutrition, and debt. And areas of uncertainty represent serious problems: unemployment, fossil fuel consumption, political freedom, and forest cover.

Some of the areas where we are losing could have quite serious impacts, such as corruption, climate change, and terrorism. Nevertheless, this selection of data indicated that 10 years from now, on balance, will be better than today.

Some Factors to Consider

Atmospheric CO₂ is at 394.35 ppm as of May 2011, the highest in at least 2 million years. Each decade since 1970 has been warmer than the preceding one; 2010 tied 2005 as the warmest year on record. The world is warming faster than the latest IPCC projections. Even the most recent estimates may understate reality, since they do not take into account permafrost melting.

According to FAO's *Livestock's Long Shadow* report, the meat industry adds 18% of human-related greenhouse gases, measured in CO₂ equivalent, which is higher than the transportation industry. A large reinsurance company found that 90% of 950 natural disasters in 2010 were weather-related and fit climate change models; these disasters killed 295,000 people and cost approximately \$130 billion.

Humanity's material extraction increased eight times during the twentieth century. Today our consumption of renewable natural resources is 50% larger than nature's capacity to regenerate. In

just 39 years, humanity may add an additional 2.3 billion people to world population. There were 1 billion humans in 1804; 2 billion in 1927; 6 billion in 1999; and 7 billion today. China is trying to become the green-growth giant of the world; it is too big to achieve reasonable standards of living for all its people first and then clean up later. Its next Five Year Plan (2011–15) allocated \$600 billion for green growth initiatives.

Some believe the global ecosystem is crashing due to climate change, drying rivers and lakes, biodiversity loss, soil erosion, coastal dead zones, and collapsing bee populations unable to fertilize the food chain. Lester Brown in *Plan B 4.0* argues that nothing less than cutting CO₂ by 80% by 2020, keeping population to no more than 8 billion by 2050, restoring natural ecosystems, and eradicating poverty will save the ecosystem, and he proposes lowering income taxes as carbon taxes go up.

Since half of the largest 100 economies in the world are corporations, the former executive secretary of the UNFCCC argues that political leaders must give the business community a more central role in the transition to the green economy.

Falling water tables worldwide and increasing depletion of sustainably managed water have led some people to introduce the concept of “peak water,” similar to peak oil. Fossil water – fossil fuels: both will peak, then what? It takes 2,400 liters of water to make a hamburger. Since 1990, an additional 1.3 billion people gained access to improved drinking water and 500 million got better sanitation. Yet 884 million people still lack access to clean water today (down from 900 million in 2009), and 2.6 billion people still lack access to safe sanitation. Half of all hospital patients in the developing world are there for water-related diseases.

As fertility rates fall and longevity increases, the ability to meet financial requirements for the elderly will diminish; the concept of retirement and social structures will have to change to avoid intergenerational conflicts. There were 12 persons working for every person 65 or older in 1950; by 2010, there were 9; and by 2050, the elderly support ratio is projected to drop to 4. There could be 150 million people with age-related dementia by 2050. Advances in brain research and applications to improve brain functioning and maintenance could lead to healthy long life, instead of an infirmed long life.

Food prices are the highest in history and are likely to continue a long-term trend of increases if there are no major innovations in production and changes in consumption, due to the combination of population growth, rising affluence (especially in India and China), the diversion of corn and other grains for biofuels, soil erosion, aquifer depletion, loss of cropland, falling water tables and water pollution, increasing fertilizer costs (high oil prices), market speculation, the diversion of water from rural to urban areas, increasing meat consumption, global food reserves at 25-year lows, and climate change’s increasing droughts and flooding, melting mountain glaciers that reduce water flows, and eventually saltwater invading croplands. New approaches like saltwater agriculture, growing pure meat without growing animals, various forms of agro-ecology to reduce cost of inputs, and increasing vegetarianism would help.

Nearly 30% of the population in Moslem-majority countries is between 15 and 29 years old. Many who are without work and tired of older hierarchies, feeling left behind, and wanting to join the modern world brought change across North Africa and the Middle East this year. This demographic pattern is expected to continue for another generation, leading to both innovation and the potential for continued social unrest and migration.

The social media that helped the Arab Spring Awakening is part of a historic transition from many pockets of civilizations barely aware of each other’s existence to a world totally connected via the current and future forms of the Internet. More data went through the Internet in 2010 than in all the previous years combined, and more electronic than paper books were sold by Amazon. Humanity, the built environment, and ubiquitous computing are becoming a continuum of consciousness and technology reflecting the full range of human behavior, from individual philanthropy to organized crime. New forms of civilization will emerge from this convergence of minds, information, and technology worldwide.



The number and percent in extreme poverty is falling. The world economy grew 4.9% in 2010 while the population grew 1.2%; hence, the world GDP per capita grew 3.7%. Nearly half a billion people rose out of extreme poverty (\$1.25 a day) between 2005 and 2010. Currently this figure is about 900 million or 13% of the world. The World Bank forecasts this to fall to 883 million by 2015 (down from 1.37 billion in 2005). UNDP's new Multidimensional Poverty Index finds 1.75 billion people in poverty. In either case, the number of countries classified as low-income has fallen from 66 to 40. However, the gap between rich and poor within and among countries continues to widen. According to Forbes, the BRICs produced 108 of the 214 new billionaires in 2011. There are a total of 1,210 billionaires in the world now, of which 115 are citizens of China and 101 are Russian. The factors that increase the price of food, water, and energy are increasing; this has to be countered to address world poverty.

The world financial crisis and European sovereign debt emergencies continue to shift power to Asia, yet its leadership has not yet begun to help create that multifaceted general view of the future that humanity can work toward together. China became the second largest economy, passing Japan in 2010, and has more Internet users than the entire population of the United States. By 2030 India is expected to pass China as most populous country in the world. Together these two account for nearly 40% of humanity and are increasingly becoming the driving force for world economic growth.

World health is improving, the incidence of diseases is falling, and people are living longer, yet many old challenges remain and future threats are serious. During 2011 there were six potential epidemics. The most dangerous may be the NDM-1 enzyme that can make a variety of bacteria resistant to most drugs. New HIV infections declined 19% over the past decade; the median cost of antiretroviral medicine per person in low-income countries has dropped to \$137 per year; and 45% of the estimated 9.7 million people in need of antiretroviral therapy received it by the end of 2010. Yet two new HIV infections occur for every person starting treatment. Over 30% fewer children under five died in 2010 than in 1990, and total mortality from infectious disease fell from 25% in 1998 to less than 16% in 2010. People are living longer, health care costs are increasing, and the shortage of health workers is growing, making tele-medicine and self-diagnosis

via biochip sensors and online expert systems increasingly necessary.

Advances in synthetic biology, mail-order DNA, and future desktop molecular and pharmaceutical manufacturing could one day give single individuals the ability to make and deploy biological weapons of mass destruction. To counter this, advances in sensors to detect molecular changes in public spaces will be needed, along with advances in human development and social engagement to reduce the number of people who might be inclined to use these technologies for mass murder.



Another troubling area is the emerging problem of information and cyber warfare. Governments and military contractors are engaged in an intellectual arms race to defend themselves from cyberattacks from other governments and their surrogates. Because society's vital systems now depend on the Internet, cyberweapons to bring it down can be thought of as weapons of mass destruction. Information warfare's manipulation of media can lead to the increasing mistrust of all information.

Meanwhile, old style wars have decreased over the past two decades, cross-cultural dialogues are flourishing, and intra-state conflicts are increasingly being settled by international interventions. Today, there are 10 conflicts with at least 1,000 deaths per year (down from 14 last year): Afghanistan, Iraq, Somalia, Yemen, NW Pakistan, Naxalites in India, Mexican cartels, Sudan, Libya, and one classified as international extremism. The U.S. and Russia continue to reduce nuclear weapons while China, India, and Pakistan are increasing them. According to the Federation of American Scientists, by February 2011 there were 22,000 nuclear warheads, of which 2,000 are ready for use by the U.S. and Russia. The number and area of nuclear-free zones is increasing, but the number of unstable states grew from 28 to 37 between 2006 and 2011. Much of Central America could be called a failed or failing state in that organized crime controls people's lives more than governments do. Africa's

population could double by 2050, with a growing number of unemployed youth and over 13 million AIDS orphans, increasing the likelihood of social instabilities and future conflicts.

With the potential collapse of Yemen, oil piracy along the Somali coast could increase. Ninety percent of international trade is carried by sea; 489 acts of piracy and armed robbery against ships were reported to IMO in 2010, up from 406 in 2009.

Investments into alternatives to fossil fuels are rapidly accelerating around the world to meet the projected 40–50% increase in demand by 2035. China has become the largest investor in “low-carbon energy,” with a 2010 budget of \$51 billion. Three Mile Island, Chernobyl, and now Japan’s Fukushima nuclear disasters have left the future of that industry in doubt and strengthened the anti-nuclear movement in Japan and Europe.

Without major breakthroughs in technological and behavioral changes, the majority of the world’s energy in 2050 will still come from fossil fuels. Therefore, large-scale carbon capture and reuse has to become a top priority to reduce climate change. Energy efficiencies, conservation, electric cars, tele-work, and reduced meat consumption are near-term ways to reduce energy GHG production. Automakers around the world are in a race to make lower-cost plug-in hybrid and all electric cars. Engineering companies are exploring how to take CO₂ emissions from coal power plants to make carbonates for cement and grow algae for biofuels and fish food. China is exploring tele-work programs to reduce long commuting, energy, costs, and traffic congestion.



Empowerment of women has been one of the strongest drivers of social evolution over the past century, and many argue that it is the most efficient strategy for addressing the global challenges in Chapter 1. Only two countries allowed women to vote at the beginning of the twentieth century; today there is virtually universal suffrage, the average ratio of women legislators worldwide has reached 19.2%, and over 20 countries have a woman head of state or government. Patriarchal structures are increasingly challenged, and the movement toward gender equality is irreversible.

Although the world is waking up to the

enormity of the threat of transnational organized crime, the problem continues to grow, while a global strategy to address this global threat has not been adopted. World illicit trade is estimated at \$1.6 trillion per year (up \$500 billion from last year), with counterfeiting and intellectual property piracy accounting for \$300 billion to \$1 trillion, the global drug trade at \$404 billion, trade in environmental goods at \$63 billion, human trafficking and prostitution at \$220 billion, smuggling at \$94 billion, weapons trade at \$12 billion, and cybercrime costing billions annually in lost revenue. 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 in laundered money. Hence the total income could be \$2–3 trillion—about twice as big as all the military budgets in the world.

The increasing complexity of everything in much of the world is forcing humans to rely more and more on computers. In 1997 IBM’s Deep Blue beat the world chess champion. In 2011 IBM’s Watson beat top TV quiz show knowledge champions. What’s next? Just as the autonomic nervous system runs most biological decisionmaking, so too computer systems are increasingly making the day-to-day decisions for civilization.

The acceleration of S&T continues to fundamentally change the prospects for civilization, and access to its knowledge is becoming universal. Computing power and lowered costs predicted by Moore’s Law continues with the world’s first three-dimensional computer chip introduced by Intel for mass production. China currently holds the record for the fastest computer with Tianhe-1, which can perform 2.5 petaflops per second; IBM’s Mira, ready next year, will be four times faster.

Is it possible that the acceleration of change will grow beyond conventional means of ethical evaluation? Will we have time to understand what is right and wrong as one change after the next makes it difficult to just keep up? For example, is it ethical to clone ourselves, or bring dinosaurs back to life, or invent new life forms from synthetic biology? These are not remote possibilities in a distant future; the knowledge needed to do them is being developed now. Despite the extraordinary achievements of S&T, future risks from their continued acceleration and globalization needs to be better forecasted

and assessed. At the same time, new technologies also make it easier for more people to do more good at a faster pace than ever before. Single individuals initiate groups on the Internet, organizing actions worldwide around specific ethical issues. News media, blogs, mobile phone cameras, ethics commissions, and NGOs are

increasingly exposing unethical decisions and corrupt practices, creating an embryonic global conscience. Our failure to inculcate ethics into more of the business community contributed to the global financial crisis and resulting recession, employment stagnation, and widening rich-poor gap.



Egypt 2020

The world cheered the Egyptian Revolution; now it wonders what's next. Will Egypt invent the first new form of democracy in the twenty-first century, taking into account the role of cyberspace, international interdependency, and a rapidly changing world? Will it become a centrally controlled political system with a decentralized local economic system? Or will it create a participatory democracy using the power of the Internet to constantly identify new approaches through a national collective intelligence system to address the persistent problems of poverty, water, education, and public health? It remains to be seen if the Arab Spring Awakening may eventually trigger a renaissance of Arabic and Islamic culture as they distinguish westernization from modernization. The Egyptian Node of The Millennium Project, together with the Egypt Arab Futures Research Association and its Collaborative Partners, created a Real-Time Delphi on the future of Egypt. Some highlights of the results are in Chapter 3, and the full study is available on the CD.



Future Arts, Media, and Entertainment

The explosive, accelerating growth of knowledge in a rapidly changing and increasingly interdependent world gives us so much to know about so many things that it seems impossible to keep up. At the same time, we are flooded with so much trivial news that serious attention to serious issues gets little interest, and too much time is wasted going through useless information. How can we learn what is important to know in order to make sure that there is a good future for civilization? Traditionally, the world has learned through education systems, art, media, and entertainment—and now with advances of communication and entertainment technologies, we have even more information and media at our fingertips on any number of ever-growing delivery systems.

Inspired by the Florentine Camerata Society, a sixteenth-century “think tank” responsible for the creation of the art form we know today as the European opera, The Millennium Project created the Arts and Media Node. The Node invited futuristic artists, media, and entertainment professionals and other innovators around the world to suggest and discuss future elements or seeds of the future of arts, media, and entertainment. After a month of online discussions, 34 elements were chosen and put into a Real-Time Delphi for an online international assessment. Writers, producers, performing artists, arts/media educators, and other professionals in entertainment, gaming, and communications were nominated by the 40 Millennium Project Nodes around the world to share their views. One distillation of the views of the participants shows

that the future of arts, media, and entertainment will be a global, participatory, tele-present, holographic, augmented reality conducted on future versions of mobile smart phones that engage new audiences in the ways they prefer to be reached and involved. See Chapter 4 for a distillation of the results.

Latin America 2030

Between 2010 and 2030, most countries of Latin America will celebrate 200 years of independence in multiple bicentennial celebrations. Most countries in the region became independent following the French invasions of Portugal and Spain by Napoleon I in the early 1800s. As these countries look back over their first two centuries, it seemed appropriate to take this opportunity to explore future possibilities for Latin America. The Chairs of The Millennium

Project Nodes in Latin America used a Real-Time Delphi that collected the judgments of 552 knowledgeable individuals about the likelihood and impacts of developments in Latin America over the next 20 years and the potential course of variables important to the region.

The results were used by four teams of Latin American Node Chairs to construct four scenarios: “Mañana” is Today: Latin American Success; Technology as Ideology: Believers and Skeptics; Region in Flames: This report is SECRET; and The Network: Death and Rebirth. Drafts of these four scenarios were shared via a Real-Time Delphi to collect feedback. The scenarios were then redrafted and are presented in Chapter 5. The full details of all the research that lead to the scenarios are available in the CD. All four scenarios are powerful resources for understanding the threats to and opportunities in the future of Latin America.



Environmental Security

Environmental security is increasingly dominating national and international agendas, shifting defense and geopolitical paradigms because it is increasingly understood that conflict and environmental degradation exacerbate each other. The traditional nation-centered security focus is expanding to a more global one due to geopolitical shifts, the effects of climate change, environmental and energy security, and growing global interdependencies.

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 6 presents a summary of recent events and emerging environmental security-related issues organized around this definition. Over the past several years, with support from the U.S. Army Environmental Policy Institute, The Millennium Project has been scanning a variety of sources to produce monthly reports on emerging environmental issues with potential security or treaty implications.

More than 300 items have been identified during the past year and about 2,500 items since this work began in August 2002. The full text of the items and their sources, as well as other Millennium Project studies related to environmental security, are included in Chapter 9 on the CD and are available on The Millennium Project’s Web site, www.millennium-project.org.



The *2011 State of the Future* ends with some brief conclusions. The readers are invited to draw their own conclusions and share them at mp-public@mp.cim3.net (after signing up at <http://www.millennium-project.org/millennium/mp-public.html>), The Millennium Project list on LinkedIn, or Twitter @MillenniumProj.

This year's *State of the Future* is an extraordinarily rich distillation of information for those who care about the world and its future. 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 fifteenth year of The Millennium Project's work can help decisionmakers, opinion leaders, 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.

