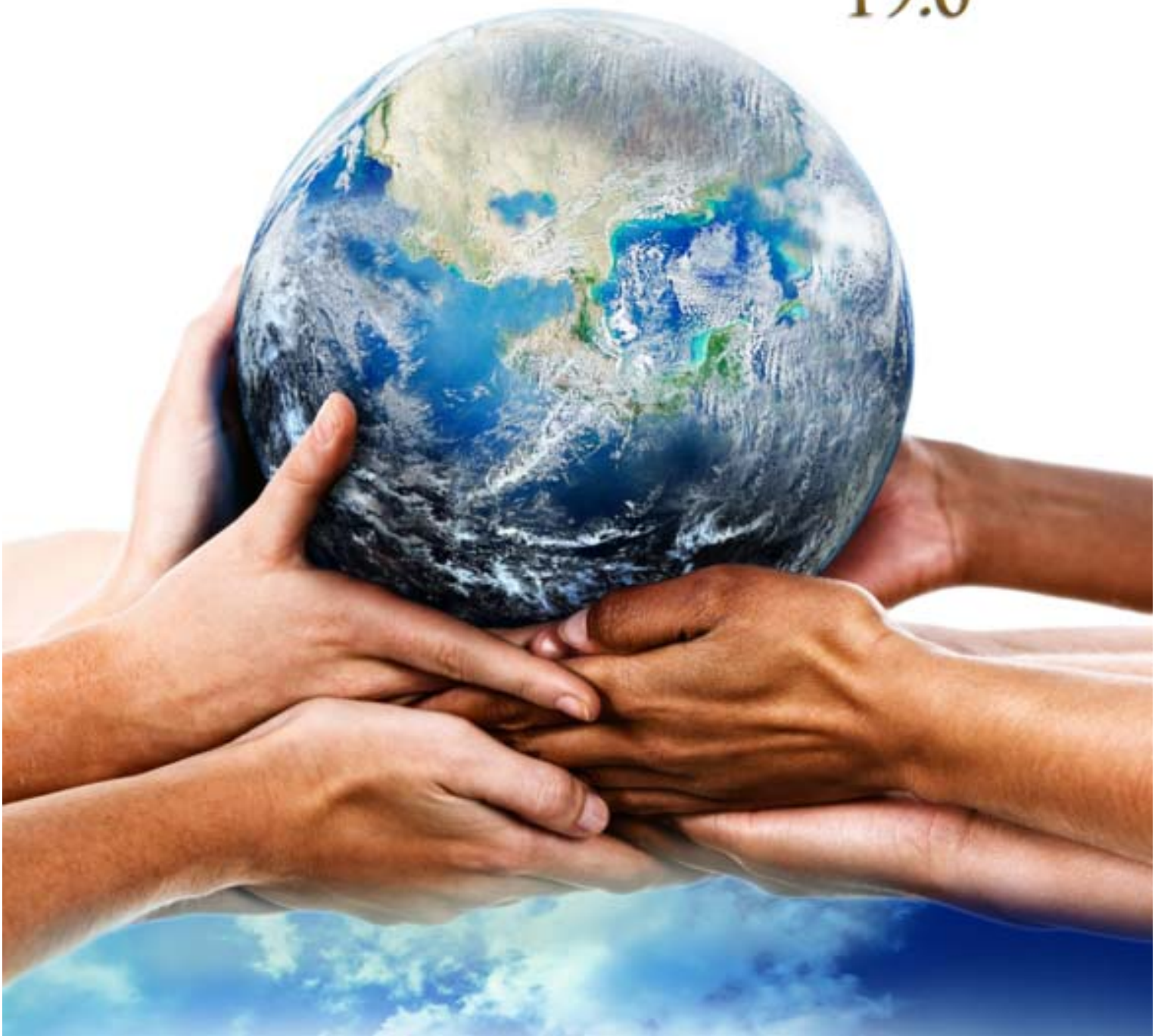
State of the Future

19.0



The Millennium Project

State of the Future

V. 19.0

Jerome C. Glenn, Elizabeth Florescu,
and The Millennium Project Team

RECOMMENDATIONS

An important example of using scientific methods and collective intelligence to help us understand and act better for the future.

Phil Mjwara, Director General, Ministry of Science & Technology, South Africa

Outstanding report!

Jim Spohrer, Director, Cognitive Opentech Group, IBM

A *high level, reliable intellectual compass for the conflict ridden, and uncertain world advancing toward the mid-century.*

Mihály Simai, former Chairman, United Nations University

One of the best studies of modern terrorism and what to do about it.

Jamie Shea, Deputy Asst. Secretary General, NATO

Strategic planning for the planet; must reading for world leaders.

William Halal, President, TechCast Global

The indispensable guide for futurists and aspiring global citizens everywhere.

Hazel Henderson, Futurist, author, CEO, Ethical Markets Media

Without this kind of guidance, many people would lose their way and get lost in their decision making process.

Julio Millan, President, Azteca Corporation, Mexico

*The **State of the Future** has proved useful for better addressing our resilience objectives.*

Lina Liakou, Thessaloniki Vice Mayor and Chief Resilience Officer

Great source of inspiration and focus to our organizations.

Michael Bodekaer, CEO, Learn-Technologies

*The **State of the Future** gives invaluable insights into the future.*

Ban Ki-moon, former Secretary-General, United Nations

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Jerome Glenn and Elizabeth Florescu were partners in the research and production of this volume. Jerome Glenn wrote the executive summary, provided the leadership on the cumulative research on the 15 Global Challenges in Chapter 1, conducted the three Real-Time Delphis on each of the Future Work/Technology 2050 Global Scenarios, wrote the initial and final drafts of these scenarios in Chapter 4, and oversaw the national workshops and their suggestions listed in Chapter 4. Elizabeth Florescu and Theodore Gordon computed the 2015 State of the Future Index in Chapter 2. Elizabeth Florescu managed the NATO Advanced Research Workshop on Emerging Technologies and New Counter-Terror Strategies and produced the final synthesis in Chapter 3 with inputs from Theodore Gordon, Yair Sharon, and Jerome Glenn.

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Linda Starke provided editing and proofreading. Elizabeth Florescu did the production and layout of this publication.

And special gratitude for donations from readers like you, who help our work continue. Contributions to The Millennium Project are tax-deductible for taxpayers in the United States, as it is a 501(c)(3) nonprofit organization.

PREFACE

Today's information overloaded world needs coherence, frameworks, and context to get a sense of the big picture of how we are doing and foreseeable prospects. Taken together, the very short overviews of the 15 Global Challenges offer a systemic framework for understanding global change.

A complete description of the global situation, prospects for the future, and strategies to achieve the best possible future is—of course—impossible, but enough is presented in the ***State of the Future*** to improve the readers' global foresight. Far greater information and intelligence is available in the Global Futures Intelligence System at www.themp.org, where the subscriber can also participate in updating and improving this collective intelligence system on the future of the world.

The ***State of the Future Version 19.0*** brings together an extraordinarily diverse set of data, information, intelligence, and, we hope, some wisdom about the future. This is the nineteenth edition of the ***State of the Future***. We believe that each edition is better than the previous one. We update data, improve insights, and respond to feedback. Over the years, the short overviews in each ***State of the Future*** report kept getting longer, and they became too long to say they are "short." In this edition, they are shorter. We hope you like them. The longer "Short Overviews" with regional considerations will still be available free online and updated regularly in the GFIS, which is also available on your mobile phone, for just-in-time information.

Since humanity lives in different conditions around the world, not all of the actions suggested to address the Global Challenges are appropriate in all situations; think of them as a menu of options and a source of stimulation to develop more appropriate strategies to your unique situation. The suggested actions are drawn from feedback on previous ***State of the Future*** reports, Millennium Project Delphi studies, and GFIS's news feeds, scanning items, situation updates, and peer reviewers' comments.

This is the third time we have used the online GFIS to update and improve the ***State of the Future*** report. The challenges in GFIS are updated regularly from news aggregations, scanning items, situation charts, and other resources, which has led to greater detail and depth than in the previous edition. While this report presents the distilled results of recent research by The Millennium Project, GFIS contains the detailed background and data for that research, plus all of The Millennium Project's research since its founding in 1996. It also contains the largest internationally peer-reviewed set of methods to explore future possibilities ever assembled in one source. Readers of this report are encouraged to subscribe to GFIS to keep up to date and to participate in improving insights about future possibilities.

Following is a screenshot of the GFIS homepage:

The purpose of futures research is to systematically explore, create, and test both possible and desirable futures in order to improve decisions. Just as the person on top of the mast on old sailing ships used to point out the rocks and safe channels to the captain below for the smooth running of the ship through uncharted waters, so too can futurists with foresight systems point out problems and opportunities to leaders and the public around the world. Since decisionmaking is increasingly affected by globalization, global futures research is increasingly needed for decisionmaking by individuals, groups, and institutions. The quality of democracies emerging around the world depends on the quality of information received by the public. The issues and opportunities addressed in this report can contribute to better-informed decisionmaking.

This report is for thought leaders, decisionmakers, and all those who care about the world and its future. Readers will learn how their interests fit into the global situation and how the global situation may affect them and their interests. The ***State of the Future*** and GFIS provide an additional eye on global change. These are information utilities that you can draw from as relevant to your unique needs. They provide an overview of the global strategic landscape. Business executives use the research as input to their strategic planning. University professors, futurists, and other consultants find this information useful in teaching and research.

The Millennium Project is a voluntary global participatory think tank of futurists, scholars, scientists, business planners, and policymakers who work for international organizations, governments, corporations, NGOs, and universities and who volunteer their time to improve each edition of the ***State of the Future***. It was selected to be among the top think tanks in the world for new ideas and paradigms as well as for best quality assurance and integrity policies and procedures by the 2013-2016 University of Pennsylvania's GoTo Think Tank Index and as a 2012 Computerworld Honors Laureate for its innovations in collective intelligence systems.

The purposes of The Millennium Project are to assist in organizing futures research, improve thinking about the future, and make that thinking available through a variety of media for consideration in policymaking, advanced training, public education, and feedback, ideally in order to accumulate wisdom about potential futures. The Project's diversity of opinions and global views is ensured by its 63 Nodes around the world. These are groups of individuals and organizations that interconnect global and local perspectives. They identify participants, conduct interviews, translate and distribute questionnaires, and conduct research and conferences. It is through their contributions that the world picture of this report and indeed all of The Millennium Project's work emerges. The Node Chairs and Co-chairs are listed in the Appendix.

Through its research, publications, addresses at conferences, and Nodes, The Millennium Project helps to nurture an international collaborative spirit of free inquiry and feedback for increasing collective intelligence to improve social, technical, and environmental viability for human development. Feedback on any sections of the book is most welcome at <Jerome.Glenn@Millennium-Project.org> and may help shape the next ***State of the Future***, GFIS, and the general work of The Millennium Project.

Jerome C. Glenn
Executive Director
The Millennium Project

Elizabeth Florescu
Director of Research
The Millennium Project

The Millennium Project Team
Staff, 63 Nodes, Reviewers,
and feedback from readers like you

EXECUTIVE SUMMARY

Most children born today are likely to be alive in the year 2100.

Imagine a world 50 years before then—2050—when the majority of the world could be augmented geniuses inventing their workday, every day, with new people, ideas, and experiences to make life worth living, and civilization could be far better than what we know today. However, without making good decisions, we can all imagine a future far worse than today. This ***State of the Future 19.0*** offers you data, information, intelligence, and some wisdom to provide a context or framework to help make better decisions than is commonly offered today.

Artificial intelligence will drive the development of quantum computing, and then quantum computing will further drive the development of artificial intelligence. This mutual acceleration could grow beyond human control and understanding. Scientific and technological leaders, advanced research institutes, and foundations are exploring how to anticipate and manage this issue.

Meanwhile, human life expectancy has increased from 46 years at birth in 1950 to 72 years now. Child mortality, poverty, contagious disease, and illiteracy have all decreased. The global nervous system of humanity is on the road to completion: 52% of the world—over 3.8 billion people—are now connected to the Internet, about two-thirds of the world has a mobile phone, and over half have smart phones. The Millennium Project's State of the Future Index shows the world is expected to continue improving over the next 10 years (see Chapter 2); however, environmental conditions, armed conflicts, terrorism, and organized crime are getting worse.

The IMF expects growth of the world economy to increase from 3.1% percent in 2016 to 3.5% in 2017 and then 3.6 % in 2018. Given population growth at 1.11%, global income per capita is growing 2.39% annually.

Although extreme poverty fell from 51% in 1981 to 13% in 2012 and to less than 10% today, the concentration of wealth is increasing, income gaps are widening, jobless economic growth seems the new norm, and return on investment in capital and technology is usually better than labor. As

labor costs go up and AI and robot costs go down, manufacturing and service unemployment rates will increase. Hence, new forms of economics seem inevitable if we are to avoid the social disasters of large-scale worldwide structural unemployment that have been forecast by many. Three alternative Future Work/Technology 2050 Global Scenarios in Chapter 4 show how different outcomes might evolve from these trends, along with 100 suggestions to address these issues from The Millennium Project national workshops held in 17 countries in 2016 and 2017. Other national workshops are being planned; taken together, they are intended to broaden and deepen the future of work conversation around the world, leading to improved long-range national policies.

The current world population of 7.6 billion is expected to grow another 2.2 billion in just 33 years (by 2050), putting pressure on food production, environmental management, and financial support systems. Although the world is aging, biological breakthroughs could dramatically extend the lives of healthy, mentally alert people way beyond what is believed today. Future migrations from low-income, high-youth-employment regions to high-income aging societies seem inevitable.

Eco-smart Cities are being built around the world, and older cities are being retrofitted with intelligent systems. China's One Belt, One Road initiative could lend up to $8 trillion for infrastructure in 68 countries to better connect China to Central Asia, the Middle East, and Europe, making it one of the greatest infrastructure projects in history, hopefully incorporating the latest eco-smart systems with AI. It may be that global urbanization is becoming too complex to manage without artificial intelligence. Moving workers to jobs creates massive traffic jams around the world. New technologies will make it increasingly easy to move jobs to workers. Recent calls for a "Fourth Industrial Revolution" that uses AI for all elements of production from market research to manufacturing and sales that are all connected in the cloud is expected to extend to everything from transportation and water management to power production and use.

Although over 90% of the world now has access to improved drinking water, water tables are falling on all continents, and nearly half of humanity gets its water from sources controlled by two or more countries. E-waste pollution is growing with poisonous effects on groundwater worldwide. As the developing world expands, its industries, agriculture, population growth, and GDP per capita income all rise and water consumption per capita will increase, making it impossible to avoid serious water crises and migrations unless major changes occur.

Increased atmospheric CO_2 that led to the Great Permian Extinction, killing 97% of life, could happen again if changes in food production, energy, and lifestyles do not occur. A trillion-ton chunk of ice twice the size of Luxembourg separated from the Antarctic ice shelf. The global cost of weather disasters increased from $94 billion in 2015 to $175 billion in 2016, according to SwissRe.

Although the vast majority of the world is living in peace and although armed conflicts fell dramatically from 1990 to 2010, conflicts have increased since then, and half the world is potentially unstable. The nature of warfare has morphed into transnational terrorism, international intervention into civil wars, as well as publicly denied cyber and information warfare. Information warfare (as distinct from cyber warfare that attacks computers, software, and command control systems) manipulates information trusted by targets without their awareness, so that the targets will make decisions against their interest but in the interest of the one conducting information warfare. Fake

news via bots, videos, and other forms of information warfare are increasingly manipulating perceptions of truth, while the public does not know how to defend itself. Although the Internet has increased participation in governance and exposed corruption, press freedoms have decreased over the past several years, and anti-democratic forces are increasingly using new cyber tools to manipulate democratic processes.

Nuclear proliferation has not stopped, and future lone wolf terrorists may one day be able to make and deploy a weapon of mass destruction. Families and communities have to raise a new generation of more ethical people because government technical means and public mental health and education systems are not enough to guarantee a future free of the potential for individually active massively destructive technologies. Organized crime takes in over $3 trillion per year, which is twice that of all the military annual budgets combined. An estimated $1.5 trillion in bribes is paid per year; corruption is a major impediment to development for countries that are home to over 5 billion people. Distinctions among organized crime, corruption, insurgency, and terrorism have begun to blur, increasing threats to democracies, development, and security. A global strategy to counter this growth is needed in addition to the current nation-state, sectoral approaches.

Transnational and intercultural collaborations have reduced disease, created safer transportation systems around the world, and produced a global Internet that shares most of the world's knowledge at no or little coast. Neuroscience is showing how brain performance can be improved, and AI is being developed to figure out the best ways for you to learn and what you should, need to, and/or want to learn.

The percentage of women in parliaments, corporate boards, and other executive positions has increased slowly but steadily, although not fast enough to meet the UN Sustainable Development Goal to achieve gender equality and empower all women and girls by 2030. Some 50% of 10-year-olds live in countries with high levels of gender inequality.

The Paris Agreement is expected to reduce fossil fuel consumption and increase the use of renewable sources of energy. Coal use saw a dramatic reduction in 2016. Solar and wind energy are now cost-competitive with coal (especially when the cost of externalities are considered), and massive lithium-ion battery production plants are in construction to help renewables' ability to provide baseload electricity.

The speed of scientific breakthroughs and technological applications to improve the human condition is being accelerated by computational science and engineering, artificial intelligence, common database protocols, Moore's law, and Nielsen's law of Internet bandwidth (50% speed increase per year). Future synergies among synthetic biology, 3D/4D printing, artificial intelligence, robotics, atomically precise fabrication and other forms of nanotechnology, tele-everything, drones, augmented and virtual reality, falling costs of renewable energy systems, and collective intelligence systems will make the last 25 years of S&T change seem slow compared to the next 25.

Increasingly, decisions are being made by AI; since their algorithms are not ethically neutral, the future of ethics—in part—will be influenced by auditing ethical assumptions in software. Meanwhile, political spin masters drown out the pursuit of truth worldwide.

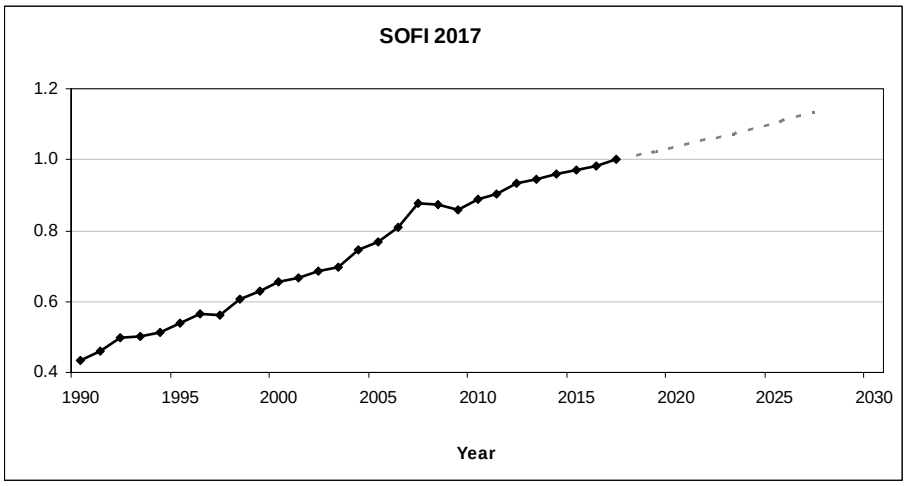
The moral will to act in collaboration across national, institutional, political, religious, and ideological boundaries that is necessary to address today's global challenges requires global ethics. Global ethics is emerging around the world through the evolution of ISO standards and international treaties that are defining the norms of civilization.

So, taken all together, how are we doing? Is the future in general getting better or worse?

To answer this, The Millennium Project with its Nodes around the world and the experts selected by Nodes have tracked progress and regress on 15 Global Challenges (see Chapter 1) for over 20 years and created a State of the Future Index (see Chapter 2).

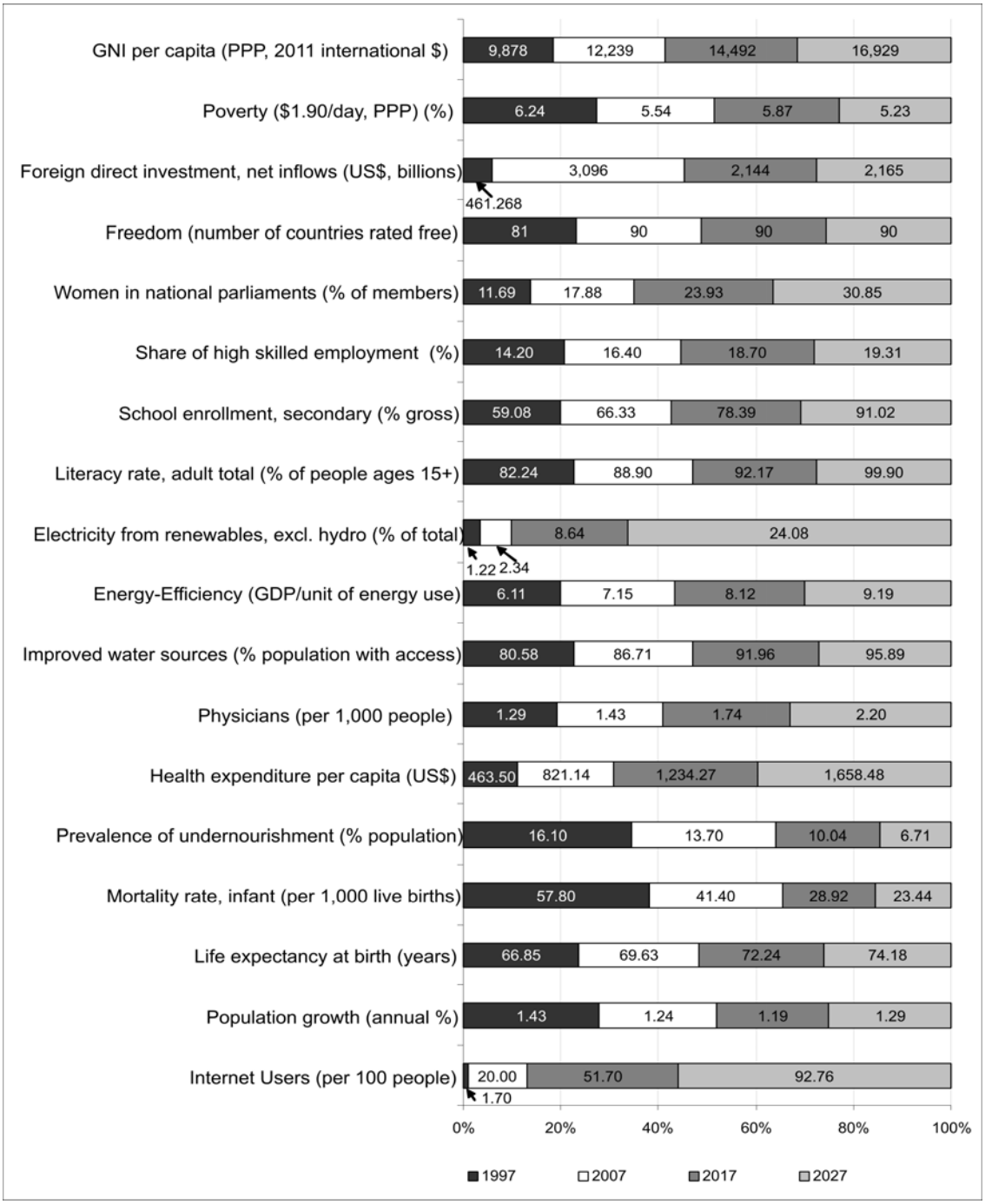
The 2017 SOFI in Figure 1 shows that the world continues to improve in general, although at a slower pace than over the past 27 years. The rate of global improvement in SOFI for the coming decade will be 1.14%, versus 3.14% for the period 1990 to 2017. This is mostly due to the slow recovery after the 2008 financial crises and world recession in 2009. One of the variables that has a large impact on the 2017 SOFI projection is the number of terrorist attacks, which is very uncertain. If terrorism could be contained, the SOFI would appear considerably better. Chapter 3 provides experts' views from around the world on the future of terrorism and its deterrence.

Figure 1. State of the Future Index 2017



One of the advantages of computing the SOFI is the identification of the areas where we are winning, losing, or stagnating—thereby helping to set priorities. Figure 2 shows the trends of where humanity is winning and Figure 3 shows where we are losing or there is little progress. These are further analyzed in Chapter 2 by assessing the individual variables and their potential trajectories.

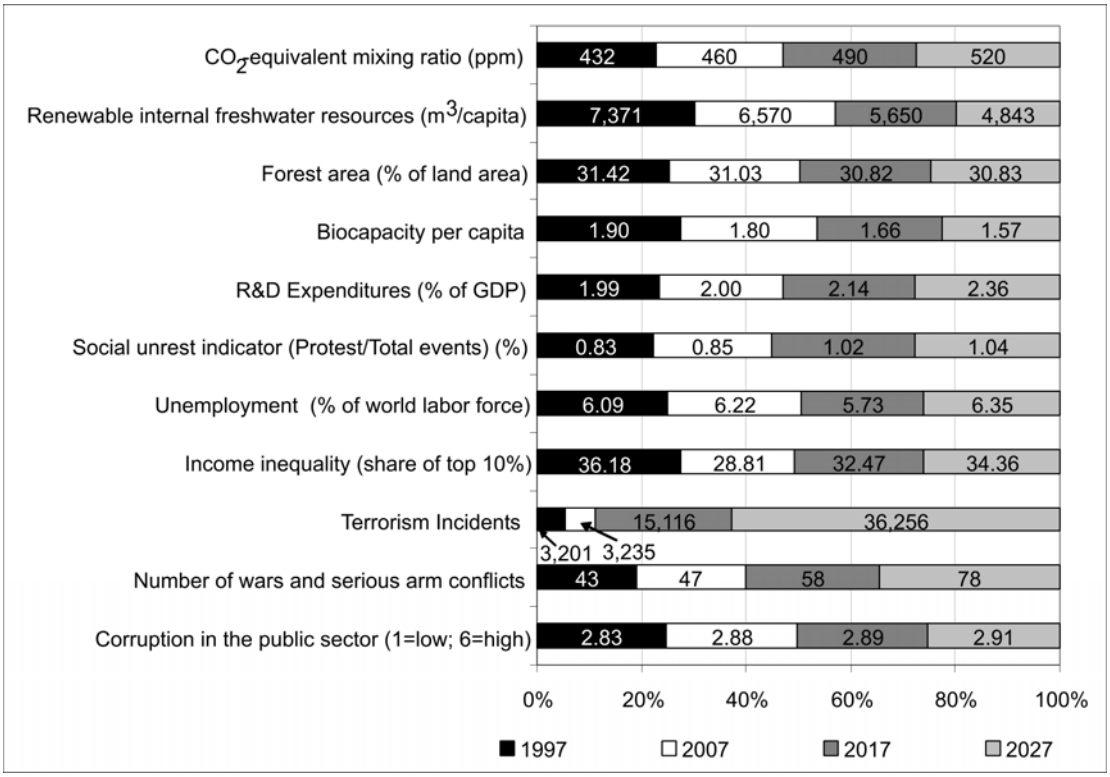
Figure 2. Where we are winning



Although we are winning more than losing, where we are losing is very serious. "Business as usual" trend projections for water, food, unemployment, terrorism, organized crime, and pollution could create complex future disasters. Humanity has the means to avoid these disasters and build a great future, but too many of the necessary decisions and cultural changes to improve our prospects are not being made.

Even though the most significant of the world's challenges and solutions are global in nature, global foresight and global-scale decisionmaking systems are rarely used. Global governance systems are not keeping up with growing global interdependence.

Figure 3. Where we are losing or there is no progress



However, global decisionmaking may show signs of improvement with the implementation of the Paris Agreement on Climate Change, the UN 2030 Agenda for Sustainable Development, and advances in the International Organization for Standardization, the World Health Organization, and other international bodies.

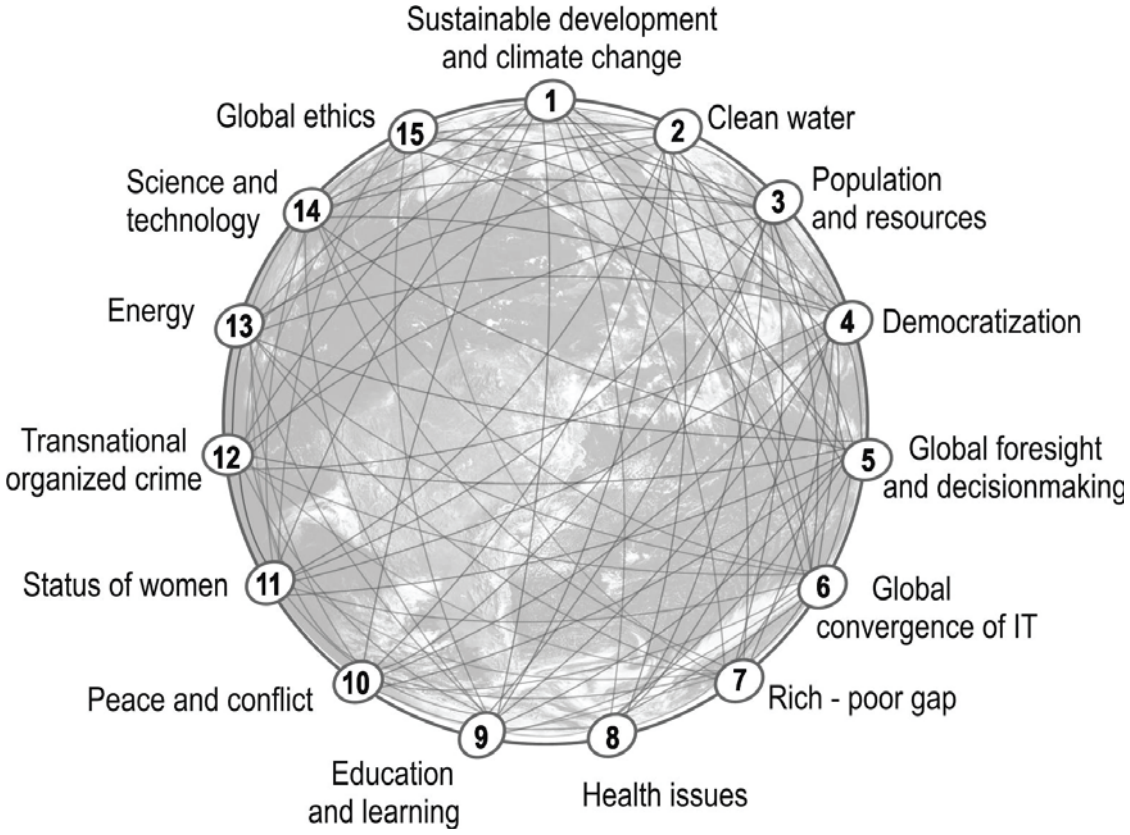
"The United Nations Sustainable Development Goals (SDGs) and the Paris Climate Agreement provide the most powerful common agenda the world has ever seen for achieving peace and prosperity on a healthy planet."

—The UN Global Compact

15 Global Challenges

The 15 Global Challenges provide a framework to assess the global and local prospects for humanity. The Challenges are interdependent: an improvement in one makes it easier to address others; deterioration in one makes it harder to address others. Arguing whether one is more important than another is like arguing that the human nervous system is more important than the respiratory system.

Figure 4. Global Challenges



1. GLOBAL CHALLENGES

Through a series 55 global futures research studies (beginning in 1997) and global scanning systems, The Millennium Project has identified and been updating 15 Global Challenges. These can be used both as a framework to understand global change and as an agenda to improve the future. The online Global Futures Intelligence System has a more complete assessment of the 15 Global Challenges than the very short overviews in this chapter.

These 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, NGOs, and creative individuals. 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.

Although listed in sequence, Challenge 1 on sustainable development and climate change is no more or less important than Challenge 15 on global ethics. The graphs used in this chapter illustrate trends for several variables and developments that assess changes relevant to the Global Challenges presented. They were created using the State of the Future Index methodology.

Each Global Challenge in GFIS has much more information updated in real time in GFIS at https://themp.org, where each Challenge has the following menu:

1. Situation Chart: Current situation, desired situation, and policies to address the gap
2. Report: Short overview (slightly more detailed than presented in this chapter) plus regional considerations, continuously updated, followed by more detailed content, suggested actions, and other relevant information, totaling the equivalent of some 100–300 pages (depending on the Challenge)
3. Digest: Dashboard-like display of latest information related to each Challenge
4. Edits: Latest edits to the reports and situation charts
5. Scanning: Important information with potential impact to the respective Challenge
6. News: Latest news relevant to the Challenge
7. Comments: Invites users to make comments or ask questions
8. Models: Interactive computer models that can show trends of the Challenge
9. Resources: Web resources for further information on the subject of the respective Challenge

10. Books: Books relevant to the subject of the respective Challenge
11. Papers: Papers relevant to the subject of the respective Challenge
12. Questions: A blog-like area where subscribers and reviewers discuss issues they would like to explore
13. Data: Data sets relevant to the respective Challenge

Figure 1.1 shows screenshot of the GFIS Situation Chart for Challenge 3, Population and Resources:

Figure 1.1 Screenshot of the GFIS Challenge 3 Situation Chart

Readers are invited to contribute their insights to improve the overview of these 15 global challenges for future editions. Please email us at <info@millennium-project.org> or subscribe to the Global Futures Intelligence System at www.themp.org to participate in the full system.