### Millennium Project

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1. Millennium Project
The Millennium Project

founded in 1996

Connects futurists around the world to improve global foresight. It was founded in 1996 after a three-year feasibility study with the United Nations University, Smithsonian Institution, Futures Group International, and the American Council for the UNU. It is now an independent non-profit global participatory futures research think tank of futurists, scholars, business planners, and policy makers who work for international organizations, governments, corporations, NGOs, and universities. The Millennium Project manages a coherent and cumulative process that collects and assesses judgments from over 3,500 people since the beginning of the project, selected by its 63 Nodes around the world. The work is distilled in the annual "State of the Future", "Futures Research Methodology" series, special studies, and integrated into its Global Futures Intelligence System.
The Millennium Project

founded in 1996

Purpose

Improve humanity's prospects for building a better future
The Millennium Project

Mission

Improve thinking about the future and make that thinking available through a variety of media for feedback to accumulate wisdom about the future for better decisions today.
A global foresight network of Nodes, information, and software, building a global collective intelligence system recognized for its ability to improve prospects for humanity. A think tank on behalf of humanity, not on behalf of a government, or an issue, or an ideology, but on behalf of building a better future for all of us.
What we do

1. On-going assessment of what are the most significant long-range issues and opportunities, as well as focused analysis of policies and agencies to address them;

2. Communications network of futurists and scholars with an international information system of futures research that provides public access;

3. The annual State of the Future report (based on an integration of others’ forecasts and the Project’s own work, and built on the foundation of the previous years’ reports)

4. Advanced training in the methodology and analysis of critical issues, opportunities, and challenges of the future.

5. Special studies such as Future Issues of Science and Technology, Futures Research Methodology, Middle-East Peace Scenarios, Environmental Security, Education and Learning to the year 2030, Future Global Ethical Issues, Lessons and Questions from History, and Future of Africa;

6. On-line Global Futures Intelligence System connecting all our research, Nodes, software, methods, and going projects.
15 Global Challenges
15 Global Challenges

1. Sustainable Development and Climate Change
2. Clean Water
3. Population and Resources
4. Democratization
5. Global foresight and Decision making
6. Global convergence of IT
7. Rich poor Gap
8. Health Issues
9. Education and Learning
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<td>How can ethical considerations become more routinely incorporated into global decisions?</td>
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Some key Indicators by challenge
How can sustainable development be achieved for all while addressing global climate change?

- Composite indicator of levels of economic growth, infant mortality, life expectancy, and living standards
- Average annual global temperature
- CO2 emissions and other energy related air pollutants, by source
- Reserves of petroleum and key minerals
- Number of countries and companies that use ISO I4000 and I4001
- Total and per capita energy consumption by type of user
01 – Sustainable Development and Climate Change

GLOBAL CHALLENGE 1
How can sustainable development be achieved for all while addressing global climate change?

Some 252 million years ago, global warming due to the increased atmospheric CO₂ killed 97% of life during the Permian extinction.

According to NASA, 16 of the 17 warmest years on record occurred since 2001.

The Global temperature has already increased by 0.94°C (1.7°F) since 1880, and sea levels have risen 8-9 inches during the same period.

If current trends continue, the 2017 US Climate Report projects an increase of 3.8 - 4.8°C (5 - 7.9°F) by 2100.

Even though the growth in CO₂ emissions has slowed over the past three years, the accumulative effect continues warming the Earth.

Actions to Address Global Challenge 1:

- U.S.-China Apollo-Like Goal, with a NASA-like 180D program to achieve it, that others can join; if U.S. falters, then an EU-China Goal should be pursued.
- Produce meat, milk, leather, and other animal products from genetic materials; Seawater/saltwater agriculture; Increase vegetarian diets.
- Retrofit older Cities to Eco-smart Cities and build new additions as Eco-smart Cities.
- Transition from fossil to renewable energy sources.
- Continue policies that reduce fertility rates in high population growth areas.

We must learn how to turn around the growing greenhouse gas emissions and reduce the volume already in the atmosphere today.
How can everyone have sufficient clean water without conflict?

- Percent of population in the world by country and by region sufficiently supplied with clean drinking water
- Percentage of drip agriculture versus other forms
- Percentage of drip agriculture versus other forms
- Cost of pure water
- Funds allocated for water desalination research and development
- Percentage of waste water that is treated before discharge
GLOBAL CHALLENGE 2
How can everyone have sufficient clean water without conflict?

Over 90% of the world now has access to improved drinking water, up from 70% in 1990.

However, that still leaves 864 million people without access, an increase from 663 million in 2015.

Water consumption for about 500 million people is twice what can be supplied by nature.

Nearly half of the humanity gets its water from sources controlled by two or more countries.

Humanity uses 70% of its water supply for agriculture, 26% for industry, and 10% for domestic uses.

The more developed nations use 50-80% of their water supply for industry.

Actions to Address Global Challenge 2:

- Increase R&D for lower cost of desalination. Invest in the development of wastewater products.
- Manage all aspects of water resources to promote efficiency, equity, and sustainable development.
- Create and promote smart phone apps to show water used to make products.
- Produce animal products from genetic materials without growing animals.
- Mass-produce electrochemical wastewater treatment solar power toilets.
- Implement WHO and UNESCO plans for universal water and sanitation access.

World leaders have agreed to create universal access to safe water and sanitation and other related UN Sustainable Development Goals by 2030.
03 – Population and Resources

How can population growth and resources be brought into balance?

Demographic measures: e.g. population growth and fertility rates

Levels of urbanization and population density

Per capita health measures: doctors, nurses and other health service providers

Female literacy and access by women to education, communications and credit

Resources available (quantity and quality) per capita per region

Per capita consumption of various resources
GLOBAL CHALLENGE 3
How can population growth and resources be brought into balance?

- The current world population of 7.6 billion is expected to grow by another 2.2 billion in just 33 years (by 2050).
- Life expectancy at birth increased from 46 years in 1950 to 71.5 years in 2015.
- People are moving around the planet more than ever, 244 million people moved from one country to another during 2015.
- Food production will have to increase 50% over production in 2012.
- There are currently some countries with disproportionately aging populations and others with an overabundance of children and young people.
- Agricultural runoffs are already polluting rivers and creating dead zones in oceans around the world.

Actions to Address Global Challenge 3:

- Support policies to improve child survival, family planning, and girls education.
- Integrate urban sensors, mesh networks, and intelligent software to create smarter cities.
- Reduce food losses from farm to mouth (one-third or 1.3 billion tons of agricultural production is wasted each year).
- Improve methods that strengthen age differential intergenerational transfers to secure skills and employment for youth and care and services for the elderly.
- Improve rain-fed agriculture and irrigation management. Invest in precision agriculture and aquaculture.
- Expand insect production for animal feed and human diets (insects have low environmental impact per nutrition).

Unless agriculture and food production change, the environmental impacts of feeding another 2.2 billion people by 2050 will be devastating.
How can genuine democracy emerge from authoritarian regimes?

<table>
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<th>Percentage of people voting during elections</th>
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<td>Percentage of people voting for extreme, non-democratic parties</td>
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<td>Freedom of expression, as measured by the number and circulation of independent media</td>
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<tr>
<td>OECD democracy index, which allows immediate comparison among countries.</td>
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</table>
04 – Democratization

How can genuine democracy emerge from authoritarian regimes?

Anti-democratic forces are increasingly using new cyber tools to manipulate democratic processes.

Freedom House: reported that 151 countries are experiencing a net decline in freedom as of 2020, up from 149 in 2019. In net freedom and that 67 countries declined in political rights and civil liberties while 66 registered gains.

Democratization is threatened by increasingly sophisticated organized crime, terrorism, corruption, fake news, and cyber manipulation.

The long-term growth of democratization has stalled over the past decade.

Of 195 countries assessed, 27 were rated free, 59 partly free, and 99 (66% of the world’s population) not free.

Now Internet capabilities provide mass access for greater participation in governance and are increasingly exposing corruption.

Actions to Address Global Challenge 4:

- Implement UN treaties on minorities, migrants, and refugees.
- Implement tempered electoral systems, establish international standards and agreements for the digital world.
- Support research to get undue influence of large sums of money out of politics.
- Secure temper-proof electoral systems.
- Promote transparency, participation, inclusion, and accountability in decision making.
- Explore new forms of liquid democracy and Democracy 4.0.
05 – Global foresight and Decision making

How can decision making be enhanced by integrating improved global foresight during unprecedented accelerating change?

- Collection of examples of successful use of global, long-term perspectives in policymaking
- Ratio of legislation on global issues in national legislatures
- Measurement of progress towards goals of Agenda 21
- Number of courses offered in colleges and universities on morals, futures and decision-making
- Funding of Futures research projects and long-term modeling
- Extent of long-range goals in strategic plans of public authorities and private enterprises
05 – Global foresight and Decision making

GLOBAL CHALLENGE 5
How can decision-making be enhanced by integrating improved global foresight during unprecedented accelerating change?

- Decisionmakers are rarely trained in foresight and decisionmaking.
- Futures research is the systematic exploration of assumptions about future possibilities; unfortunately, its works have not been systematically evaluated and applied to improve its quality.
- The tyranny of the moment tends to override long-term global perspectives.
- Short-term, selfish, economic decisionmaking can be blamed for the 2008 global financial crisis, continued environmental degradation, and widening income disparities.

Actions to Address Global Challenge 5:

- Establish a permanent parliamentary “committee for the future”, as Finland has done, to provide foresight for government and other parliamentary committees.
- Improve future strategy units for heads of state and government. Link these units with corporate, UN, and academic future strategy units to improve international strategic coherence and coordination.
- Synthesize relevant futures research for an annual State of the Future report for nations, issues, sectors, and/or organizations.
- Create stronger links between R&D budgets and priority of problems that need to solving.
- Create a classified collective intelligence system for the heads of government connected to related units in government to offer the opportunity of some continuity in national long-term strategy from one administratio to the next.
- Teach decisionmaking, foresight, futures research, and synthesis as well as analysis throughout educational systems.

Humanity needs a global, multifaceted, general long-term view of the future with long-range goals to facilitate contemporary decisions that lead to a brighter future.
06 – Global convergence of IT

How can the global convergence of information and communications technologies work for everyone?

- Percentage of people with telephones, TV, computers, and Internet
- Number of public libraries with free Internet access
- Volume of e-business
- Number of students per computer(s)
- 5. Investments in information/communication projects that foster local developments
- Measures of the state of information and communications technologies (e.g. average annual Internet user cost, cost of bandwidth, etc.)
06 – Global convergence of IT

GLOBAL CHALLENGE 6
How can global information & communications technologies along with machine intelligence, big data, and cloud computing work for everyone?

- $15 billion was invested in 2,250 AI business deals between 2013 and 2016, while robotics got $13 billion invested in 488 deals.
- Some 51% of the world-over 3.8 billion people are now connected to the internet. About two-thirds have a mobile phone, over half have smart phones.
- As of 2017, more advertising money is spent on internet than on television, and half of all internet traffic is via mobile phones.
- Information security has to address a wide and diverse range of "enemies" - from the "gawk in the room" to criminal organizations and governments.
- Some unemployment impacts of narrow AI are being seen today, but if artificial general intelligence can be created, then the big impacts on unemployment, economies, and culture will much greater.
- As the Fourth Industrial Revolution evolves, all elements of a business will become connected with artificial intelligence; companies will increasingly become collective intelligence systems.

Actions to Address Global Challenge 6:

- Explore elements for a global agreement on use and future development of machine learning and use of AI.
- Promote tele-citizens and tele-citizens people from poorer nations who live and work in richer nations who help develop their original countries via volunteer teleconsulting.
- Invent synergies between government, cyber security personal and independent hackers for a safer Internet.
- Make Internet access a right of citizenship. Support Google’s and Facebook’s efforts to give universal Internet access to the world, regardless of location.
- Create low-cost hand-held computers with direct satellite access for low-income regions to access educational software and telephony.
- Train everyone in their roles in cyber security and stewardship.

How well governments develop and coordinate Internet security technology and regulations may determine the future quality of cyberspace.
How can ethical market economies be encouraged to help reduce the gap between rich and poor?

- Employment and unemployment statistics
- Percentage of people completing various level of education
- Measurements of the economic gap between rich and poor
- Magnitude of government expenditure on welfare programs (e.g. labor market intervention and health care)
- Migration statistics
- Combined indicators of rates of internal saving, investment, internal consumption, exports, cost of living
07 – Rich poor Gap

GLOBAL CHALLENGE 7
How can ethical market economies be encouraged to help reduce the gap between rich and poor?

How can ethical market economies be encouraged to help reduce the gap between rich and poor?

Extreme poverty fell from 51% in 1981 to 13% in 2012 and less than 1% today (mostly due to income growth in China and India).

Inequality in Africa remains a serious threat to future stability, with four of the five most unequal countries in the world found there.

The concentration of wealth is increasing (the wealth of just 8 billionaires equals that of all 1.1 billion people, the poor half of humanity).

AI and other next technologies should lower cost of living and should provide base income from taxing robots and other next technologies, making global basic income financially sustainable by 2030.

Although income gaps between rich and poor individuals are widening, the gap between nations is expected to narrow.

IMF expects growth of the world economy to increase from 3.1% in 2016 to 3.9% in 2017 and 3.5% in 2018. Given population growth at 1.1%, global income per capita is growing 2.3% annually.

Actions to Address Global Challenge 7:

- Poorer regions should be assisted in investing more in developing finished productions for export, extending local value changes, and “upcycling” to more advanced technology instead of relying on exporting commodities.
- Promote Decentralized Autonomous Organizations for an unlimited number of peer-to-peer ad hoc “workers”.
- Tax new technologies for new income to social support systems and create tax systems that ensure big businesses and wealthy individuals pay their fair share.
- Explore alternative transaction systems like blockchain and cryptocurrencies (over 450 cryptocurrencies with $1-$2 trillion (not billion) market capitalization).
- Establish community centers for access and training for self-employed to use advanced technology like 3D printing, AI/robotics, and AI apps.
- Give greater attention to the frontiers for work related to the forthcoming biological revolution, which may be as large as or larger than industrial or information revolutions.

World leaders have agreed to the UN Sustainable Development Goal of eliminating extreme poverty by 2030.
08 – Health Issues

How can the threat of new and emerging diseases and immune micro-organisms be reduced?

- Mortality rates by causes
- Pandemic frequencies
- Number of people vaccinated, by disease and geography, including the percentage paid for by states
- Physicians and health care facilities per capita
- Frequency and intensity of new infestations/infections
- Measurements of AIDS deaths and HIV prevalence
08 – Health Issues

**GLOBAL CHALLENGE 8**
How can the threat of new and reemerging diseases and immune microorganisms be reduced?

The health of humanity continues to improve; life expectancy at birth increased globally from 40 years in 1950 to 71.5 years in 2015.

- WHO verified more than 1,100 epidemic events over the past five years, and antimicrobial resistance, malnutrition, and obesity are increasing.
- About 3.8 million people were infected with HIV in 2016, down from 5.5 million in 1999.
- Embryo gene editing has begun and could eventually eliminate inherited disease tendencies, including infectious diseases.
- The New U.S. administration proposes to cut funding for global health by 20% along with local cuts in both NIH and CDC.
- Investment and development of new antibiotics have not kept pace with current and potential antibiotic resistance around the world.

**Actions to Address Global Challenge 8:**

- Implement WHO Global Vaccine Plan.
  - Create and implement strategies to counter the barriers to developing new classes of antibiotics and bringing them to market.
- Increase telemedicine and AI diagnostics as the shortage of health workers continues to worsen in poorer regions of the world.
- Focus in early detection, accurate reporting, prompt isolation, and transparent information and communications infrastructure.
- Optimize the use of current health technologies with corporate/NGO partnering for holistic approaches to health care.
- Improve global plans and resiliency training to address future major epidemics.

Children are receiving the highest level of routine immunization coverage in history.
09 – Education and Learning

How can education make humanity more intelligent, knowledgeable, and wise enough to address its global challenges?

- Number of countries that have "Increasing Intelligence" as a national objective
- Percent of the public that access free tele-education and life-long learning systems
- Percent schools that have integrated personalized artificial intelligence learning aids
- Percent of schools with both STEM and self-paced inquiry-based learning for self-actualization and meaningful working life
- National average age when the basics of reading, writing, and numeracy is mastered
- Number of secondary schools that teach philosophy, entrepreneurship, and ethics
GLOBAL CHALLENGE 9
How can education and learning make humanity more intelligent, knowledgeable, and wise enough to address its global challenges?

1. Artificial Intelligence is being developed to figure out the best ways for you to learn and what you should need, and/or want to learn.
2. Cognitive neuroscience and related research has shown that brain performance can be improved.
3. Finland plans to use an interdisciplinary approach to teach events and phenomena instead of subjects.
4. Teachers led by Facebook and Google are attempting to get everyone on the planet connected to the Internet.
5. Longer-term future approaches to improving brain performance include reverse engineering the brain.
6. Curriculum design can take into account that students remember most clearly items taught first and last.
7. Make increasing individual and collective intelligence a national objective of education.
8. Increase R&D funding of AI human symbiotic evolution.
9. Teacher training schools should show how different teaching strategies affect neural activity of students' brains via fMRI and/or other means as they teach.
10. Promote online lifelong learning in anticipation of aging societies and technological change.
12. Explore alternative models of education and learning (both Finland and South Korea score top in the world but have quite different systems).

Because technological capacities available to the individual will be far more powerful than in the past, increased attention has to be given to ethics, values, citizen responsibilities, and noble behavior.
### 10 – Peace and Conflict

How can shared values and new security strategies reduce ethnic conflicts, terrorism, and the use of weapons of mass destruction?

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<th>Measurement</th>
<th>Description</th>
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<td>Measurements of income and wealth distribution; the economic gap between rich and poor</td>
<td>Funding and status of UN permanent peacekeeping capabilities</td>
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<tr>
<td>Number of people killed in conflicts</td>
<td>Number of refugees and displaced persons due to conflict</td>
</tr>
<tr>
<td>The number of days of peace and people not killed</td>
<td>Levels of funding for programs that promote respect for diversity and equal rights</td>
</tr>
</tbody>
</table>
10 – Peace and Conflict

GLOBAL CHALLENGE 10
How can shared values and new security strategies reduce ethnic conflicts, terrorism, and the use of weapons of mass destruction?

The nature of warfare and security has morphed today into transnational and local terrorism, international intervention into civil wars, and publicly denied cyber and information warfare.

The number of armed conflicts declined slightly from 52 in 2015 to 49 in 2016, and there were 32% fewer battlefield casualties in 2016 compared to 2014.

Information warfare manipulates information trusted by targets without their awareness.

Cyberattacks from governments and organized crime on other governments and corporations are expected to increase.

Conditions that can lead to instability exist in half of the world. 65.6 million people are forcibly displaced from their homes (of whom 23.5 million are refugees today).

According to the 2017 Global Peace Index, the world is slightly more peaceful than in the previous year. 93 countries improved while 9 deteriorated.

Actions to Address Global Challenge 10:

Review conflict resolution and prevention strategies as to when and why they work or fail, and teach these conclusions and integrate them into various forms of media and entertainment.

Readjust school curricula to emphasize compassionate behavior, tolerance for diversity, peaceful resolution of conflicts, compromise, and cooperation.

Conduct education programs for families and communities to detect potential terrorists and prevent them from becoming terrorists.

Increase attention to ways to stop patronage and corruption.

Establish tracking systems of sources and destinations for weapons.

Some conflict prevention strategies include ensuring that government services are available to all groups, establishing transparent and accountable governance.
11 – Status of Women

How can the changing status of women help improve the human condition?

- Female literacy and access by women to education, communications and credit
- Number of women and children in poverty
- Assessments of the effectiveness of family planning programs
- Comparison of pay for similar work by men and women
- Number of women in international, national, regional, state and local government; % of women in policy making and decision making
- Ratio of women to men in various occupations and management levels
11 – Status of Women

GLOBAL CHALLENGE 11
How can the changing status of women help improve the human condition?

Actions to Address Global Challenge 11:
- Mothers should use their educational role in the family to assertively nurture gender equality and should be supported by their families, communities, and the media to do this.
- Equal remuneration for work of equal value has to be integrated into law.
- Pursue gender policies that encourage female university graduates to start their own business.
- Popularize mobile phone apps that instantly report violence to police and follow up on investigation and prosecution.
- Increase women’s participation in peace, building negotiations, and foreign aid administration.
- Apply sanctions for non-compliance in treaties on women’s rights.
- Make policies to change social structures that help women meet the demands of their careers and family responsibilities.

Gender equity has entered the global consciousness and is guaranteed by the constitutions of 84% of the world’s nations.

Women account for 23.5% of the membership of national legislative bodies, and increase from 12% in 1995.

Women compose about 15% of corporate board seats worldwide, an increase of 54% since 2010.

Women continue to be treated as second-class citizens in barbarian and extremist societies such as female genital mutilation, feminization of millions of girls each year.

Almost 33% of women experienced physical or sexual violence in their lifetime, and over 600 million women live in 15 countries where domestic violence is still not a crime.

Creating equal opportunities for women would unleash creativity and foster entrepreneurship.

Empowerment of women has been one of the strongest drivers of social evolution over the past century and is acknowledged as essential for addressing all the global challenges facing humanity.
How can transnational organized crime networks be stopped from becoming more powerful and sophisticated global enterprises?

- Number of countries adopting internationally consistent laws and regulations against organized crimes
- Crime and gambling statistics
- Statistics relating to illegal drugs and prostitution
- Value of confiscated drugs and contraband
- Number of institutions and individuals identified, arrested, and prosecuted as related to organized crimes
- Apprehension and seizures of weapons
Global Transnational Organized Crime

**Global Challenge 12**

How can transnational organized crime networks be stopped from becoming more powerful and sophisticated global enterprises?

- Organized crime takes in over $3 trillion per year, which is twice all military annual budgets combined.
- Distinctions among organized crime, insurgency, and terrorism have begun to blur, giving new markets for organized crime.
- Businesses may lose $2 trillion due to cybercrime in 2019.
- Although the UN Convention against Transnational Organized Crime came into force in 2005, a global prosecution strategy has not emerged.
- 50% of all medication purchased online is fake, resulting in an estimated $200 billion income to crime per year.

**Actions to Address Global Challenge 12:**

- Conduct a feasibility study for a global counter-organized crime strategy.
- Engage farmers in high-income agricultural alternatives to illegal production.
- Draw lessons from Colombia’s defeat of the FARC, which sustained its armed insurgency with illicit drug trafficking, illegal mining, and extortion.
- Study transferability of India’s demonetization reduction of organized crime.
- Include organized crime as a crime against humanity recognized by the ICC.

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"A financial prosecution system could be established as a new body to complement the related organizations addressing various parts of transnational organized crime today."
13 – Energy

How can growing energy demands be met safely and efficiently?

- Energy/GDP ratio
- Total and per capita energy usage by category of source (fossil, solar, nuclear, etc.)
- Energy production by source, including particularly the amount generated by fossil, hydro, nuclear and alternate energy sources (e.g. wind, solar)
- Total and per capita energy consumption by type of user
- Transportation energy by source (petroleum, natural gas, electricity, etc.)
- Number of nuclear plants waiting to be closed
13 – Energy

GLOBAL CHALLENGE 13
How can growing energy demands be met safely and efficiently?

- The amount of coal power capacity in pre-construction planning fell 48%, from 1,099 GW in January 2016 to 570 GW in January 2017.
- Nuclear power produces about 10% of the world’s electricity, with 449 plants in 30 countries.
- Renewable power generation added a record 136.5 GW or 55.3% of all new power generation in 2016.
- The price of fossil fuels does not include what governments pay to address health costs, environmental damages, and other externalities from the fossil fuel industries.
- Energy companies are racing to make enough safe energy by 2050 for an additional 3.4 billion people (1.2 billion who do not have access now, plus 2.2 billion in population growth).

Actions to Address Global Challenge 13:

- Increase subsidies for renewables and reduce subsidies for fossil fuels.
- Work with International renewable Energy Agency to harmonize regulations and standards for more predictable investment conditions.
- Commit to US-China Apollo-like 10-year energy goal with a NASA-like R&D system to achieve it.
- Periodically publicize country progress on the Paris Agreement.
- Establish a globally accessible collective intelligence system for energy.

The Paris Agreement is expected to reduce fossil fuel consumption and increase renewable sources of energy.
How can scientific and technological breakthroughs be accelerated to improve the human condition?

- Investments in R&D by governments and companies, counting expenditures in areas including solar, health; in a) absolute terms, b) percentage of GDP, and c) per capita
- Number of researchers and percentage, by field and country
- Extent of international scientific collaboration
- Number of scientists having papers in well-known publications in the world; number of papers published on international journals each year
- Number of patents in selected fields
- Standard of life indicators (public health, reduced number of working days, aged population socially active, etc.)
14 – Science and Technology

**GLOBAL CHALLENGE 14**
How can scientific and technological breakthroughs be accelerated to improve the human condition?

**China** has demonstrated quantum entanglement between an orbital satellite and Earth and is creating a quantum communication network between Beijing and Shanghai.

As of June 2017, China’s Tianhui-1 (9.3 petatlops) and Tianhe-2 (33.8 petatlops) are the two fastest computers, followed by Switzerland’s Piz Daint (12.3 petatlops).

Computer-mediated elementary brain-to-brain communications have been demonstrated.

International R&D spending is forecast to be 1.21% of global GDP in 2017, while the U.S. and South Korea forecast 2.83% and 4.29% of their GDP respectively.

E-waste pollution is growing worldwide, with the potential to poison groundwater.

New combinations and manipulations of genetic molecules and life forms will be developed to create the biological revolution.

**Actions to Address Global Challenge 14:**

- **Establish** some kind of international S&T organization to improve the human condition more as an online public access global collective intelligence system rather than as an intergovernmental body like UNESCO.
- **Support** research to prevent future artificial superintelligence evolving against human interests.
- **Create** global means to link research agendas to human needs and threats.
- **Encourage** scientists to take an oath similar to the Hippocratic Oath, which states “I will do no harm.”
- **Pass** laws to prosecute “patent trolls” firms that don’t produce anything but simply file patent lawsuits for extortion to drop deceitful patent law cases.
- **Explore** ways to limit materials and S&T information that can be used by individuals for destructive purposes.

The speed of scientific breakthroughs and technological applications to improve the human condition is being accelerated by computational science and engineering.
15 – Global Ethics

How can ethical considerations become more routinely incorporated into global decisions?

- Voter participation in and frequency and quality of free elections
- Extent of coverage in local papers, radio and TV news on ethical issues
- Number and type of terrorists incidents and ethnic conflicts
- Measurement of the level of non-state actors in global institutions, notably for religious bodies (e.g. Churches) and charities (e.g. Oxfam) in UN, EU and other global and regional organizations
- Social capital indicators like: the quantity of citizens’ organizations and initiatives; quality of citizens’ activities in ‘ethical terms; ethical atmosphere in terms of trust and global ethics
- Extent of training in conflict resolution and ethics being provided in schools, universities, government, and business
GLOBAL CHALLENGE 15
How can ethical considerations become more routinely incorporated into global decisions?

Increasingly, decisions are being made by AI, since their algorithms are not ethically neutral, the future of ethics will in part be influenced by auditing their ethical assumptions.

An increasingly educated and internet-connected generation is increasingly rising up against the abuse of power and demanding accountability.

Although short-term economic “me first” attitudes are prevalent throughout the world,

The Universal Declaration of Human Rights continues to shape discussions about global ethics and justice and influence decisions across ethical, religious, and ideological divides.

The acceleration of scientific and technological change seems to be beyond conventional means of ethical evaluation.

Actions to Address Global Challenge 15:

Establish an international IAEA-like system to deter cyber and information warfare.

Require civics and ethics in all forms of education, focusing on making behavior match the values people say they believe in.

Develop new social contracts between governments and citizens rights and responsibilities to prevent future forms of massively destructive terrorism.

Use entertainment media to promote memes like “make decisions that are good for me, you, and the world.”

Enforce measures to reduce corruption such as those recommended by Transparency International.

Technologies accessible to individuals, organizations, and governments have become too powerful and diverse to allow the growth of unethical behavior.
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