



# **Global Overview of Challenges and Prospects for Our Future**

**World Future Society, San Francisco 2015**

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**The Millennium Project -- [themp.org](http://themp.org)**

# The World is Improving **Better** than Most Pessimists Know



People are becoming healthier, wealthier, better educated, more peaceful, and increasingly connected, and they are living longer.

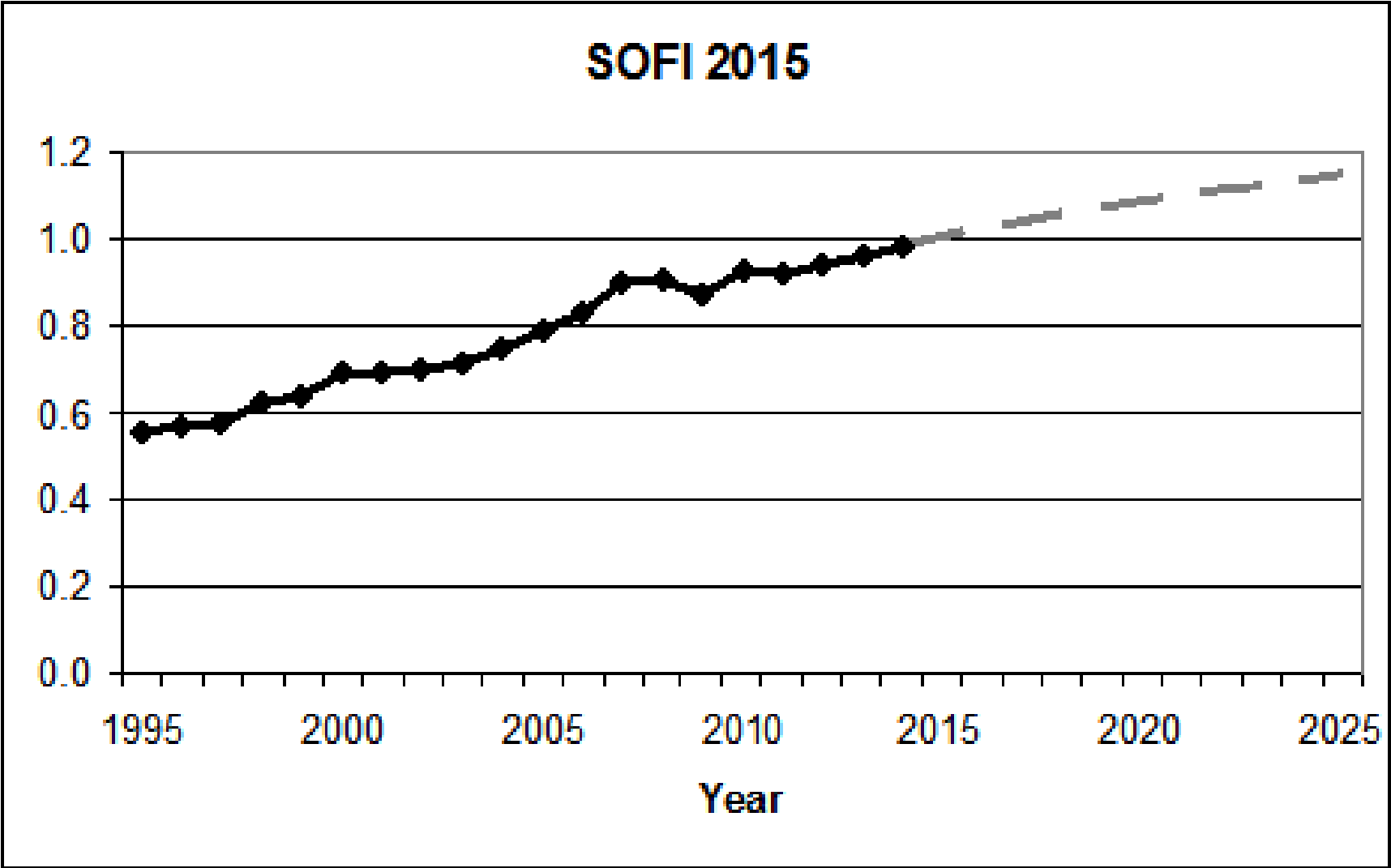
- The child mortality rate has dropped about 50% since 1990
- Half the developing world in extreme poverty 1981, now 17%
- 40% of humanity is connected via the Internet
- Life expectancy has increased 10 years over the past 20 years to reach 70.5 years today
- The Number of International wars continue to fall, **BUT**

# The future dangers are **worse** than most optimists indicate



- Advance technologies could lead to global long-term structural unemployment
- A single individual could one day make and deploy weapons of mass destruction
- Artificial general intelligence could evolve beyond our control in a destructive fashion
- Proliferation of advanced destructive weapons among hate groups could lead to continual chaos
- Long-term effects of global warming could produce massive and continual social violence
- Organized crime lead to worldwide Central America-like conditions making democracy an illusion
- Urban infrastructures may become too complex to manage, maintain, and prevent sabotage
- Uncontrollable nanotech extracting carbon from the air could cover the planet with a gray goo
- Large enough asteroid could hit the earth and cause a “nuclear winter”
- Nanotech warfare may grow beyond human control
- Doomsday scenarios of nuclear proliferation are possible
- The Earth’s magnetic poles could weaken no longer protecting life from solar radiation (500 years)

# 2015 State of the Future Index



# 28 Variables use in the 2015 SOFI

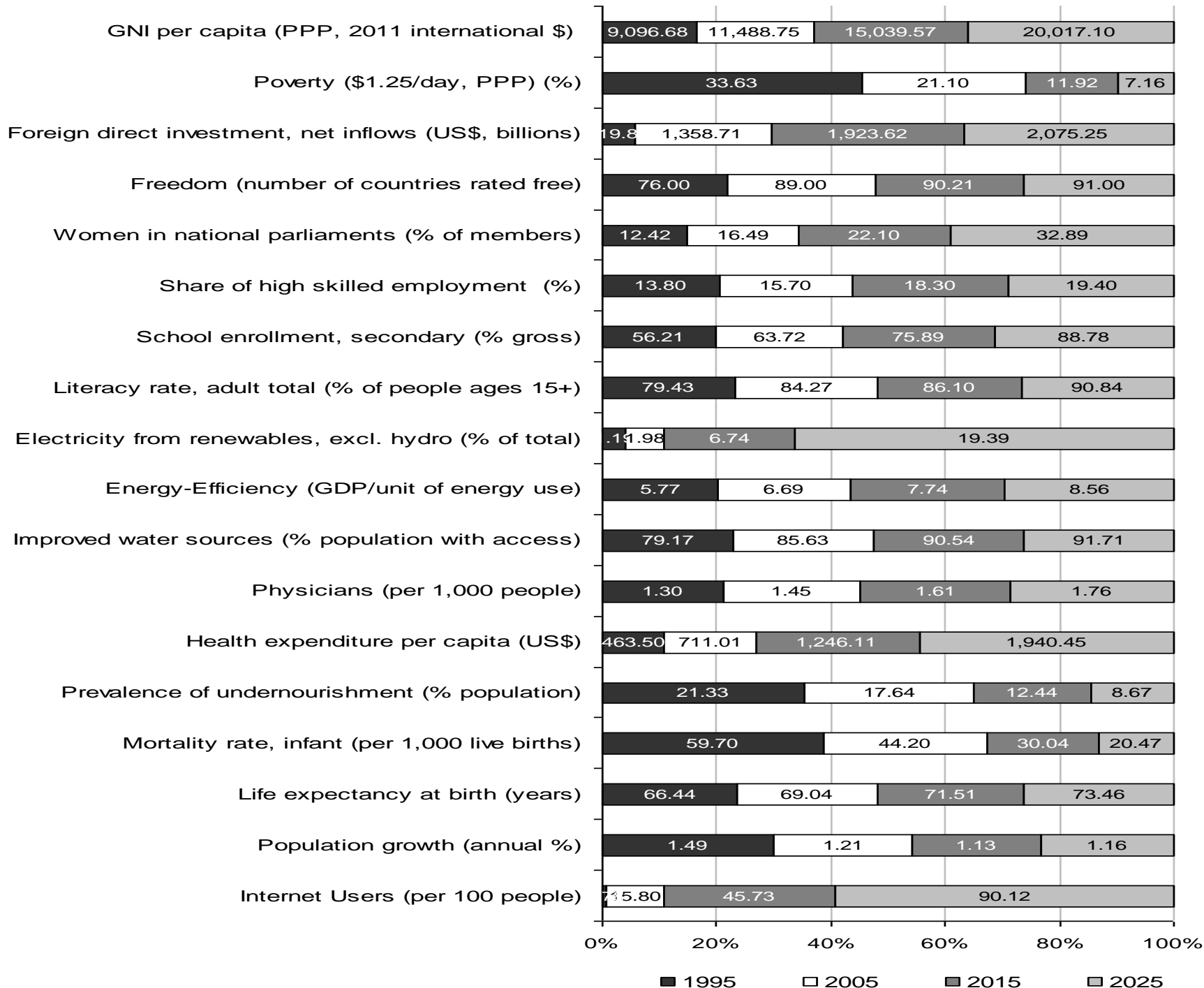


- GNI per capita, PPP (constant 2011 int \$)
- Economic income inequality (income share held by highest 10%)
- Unemployment, total (% of world labor force)
- Poverty headcount ratio at \$1.25 a day (PPP) (percent of population)
- CPIA transparency, accountability, and corruption in the public sector rating Foreign direct investment, net inflows (BoP, current US\$, billions)
- R&D Expenditures (percent of GDP)
- Population growth (annual rate)
- Life expectancy at birth (years)
- Mortality rate, infant (per 1,000 live births)
- Prevalence of undernourishment percent of population)
- Health expenditure per capita (current US\$)
- Physicians (per 1,000 people)
- Improved water source (percent of population with access)
- Renewable internal freshwater resources per capita (cubic meters)
- Biocapacity per capita
- Forest area (percent of land area)
- Fossil fuel and cement production emissions (MtC/yr)
- Energy-efficiency (GDP per unit of energy use (constant 2011 PPP \$ per kg of oil equivalent))
- Electricity production from renewable sources, excluding hydroelectric (percent of total)
- Literacy rate, adult total (% of people ages 15 and above)
- School enrollment, secondary (percent gross)
- Share of high skilled employment (percent)
- Number of wars and serious arm conflicts
- Terrorism incidents
- Freedom rights (number of countries rated “free”)
- Proportion of seats held by women in national parliaments (percent of members)
- Internet users (per 100 people)



# World Report Card

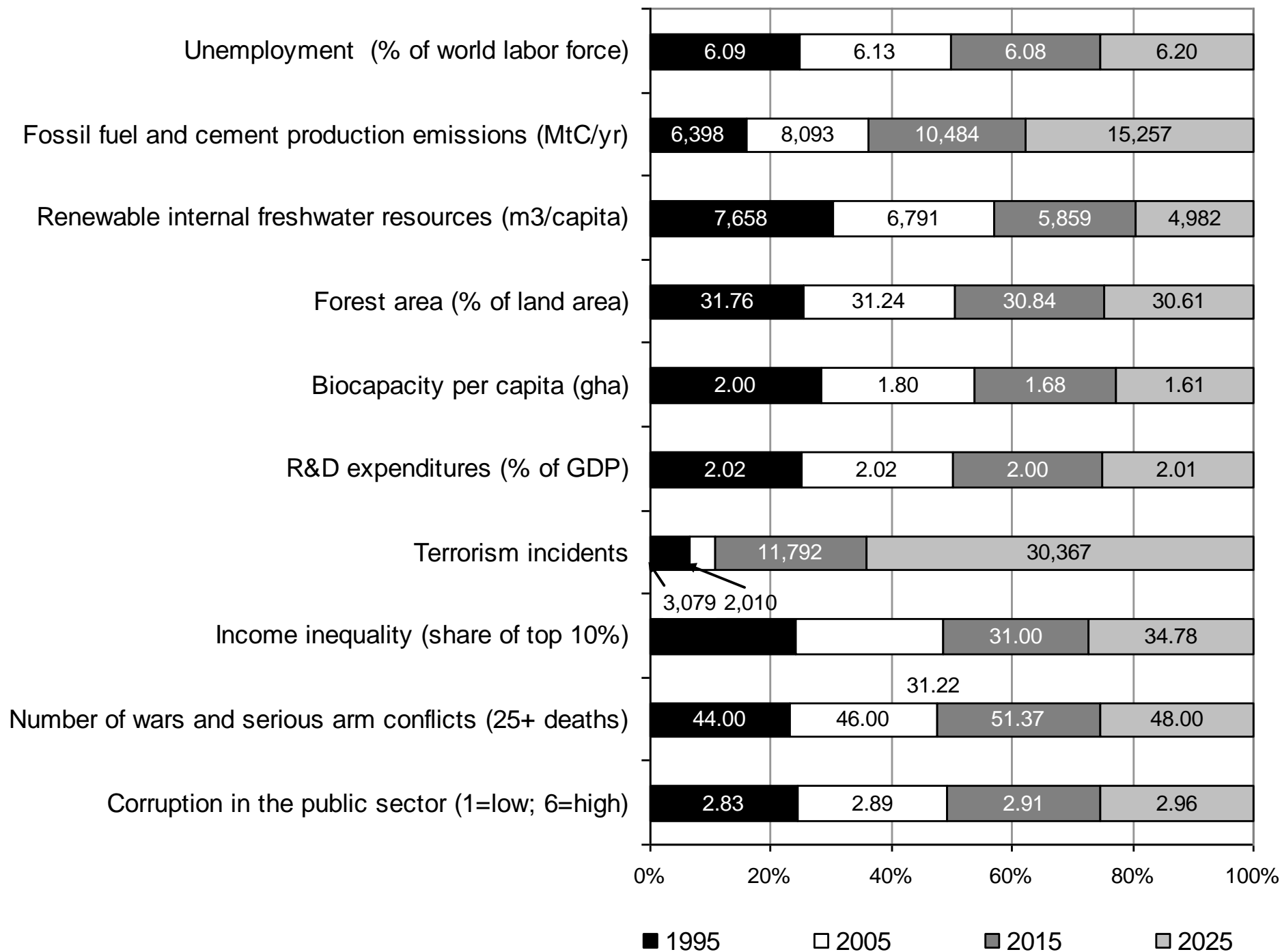
## Where are We Winning?





# World Report Card

## Where are We Losing?



# Framework for understanding Global Change: 15 Global Challenges



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

How can everyone have sufficient clean water without conflict?

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

How can population growth and resources be brought into balance?

How can scientific and technological breakthroughs be accelerated to improve the human condition?

How can genuine democracy emerge from authoritarian regimes?

How can growing energy demands be met safely and efficiently?

How can decisionmaking be enhanced by integrating improved global perspectives during unprecedented accelerating change?

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

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

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

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

How can shared values and new security strategies reduce ethnic conflicts, terrorism, and the use of weapons of mass destruction, and the threat of new and reemerging diseases and immune microorganisms be reduced?

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



# High Impact/Synergetic Actions affecting 4 or more Global Challenges



- 1. Establish a U.S.-China environmental security goal to reduce climate change to 350 ppm and improve trust. (1,2,3,5,10,13,14)**
- 2. Grow meat without growing animals, to reduce water demand and GHG emissions. (1,2,3,13,15)**
- 3. Develop seawater agriculture for biofuels, carbon sink, and food without rain. (1,2,3,13,)**
- 4. Build global collective intelligence systems for input to long-range plans. (1-15)**
- 5. Create tele-nations connecting brains overseas to the development process back home. (4,6,7,8,9,11,14)**
- 6. Establish trans-institutions for more effective implementation of strategies. (1-15)**
- 7. Detail and implement a global counter-organized crime strategy. (4,7,11,12,15)**
- 8. Use the State of the Future Index as an alternative to GDP as a measure of progress for the world and nations. (1-15)**

# Inevitability of New Economics



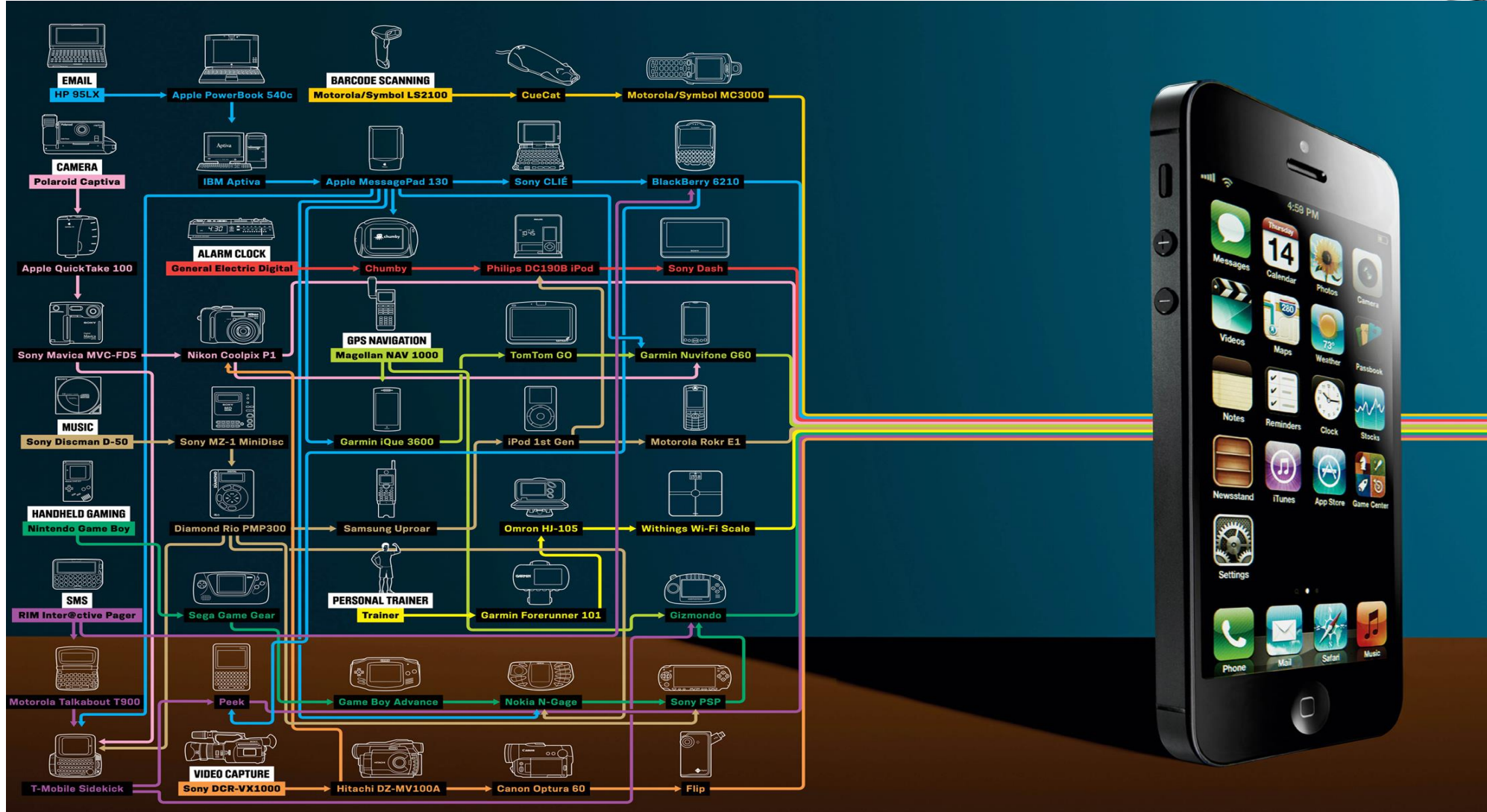
- Concentration of wealth is increasing
- Income gaps are widening
- Employment-less economic growth seems the new normal
- Return on investment in capital and technology is usually better than labor
- Number of persons per services & products is falling
- 25-50% unemployment is a business-as-usual forecast by 2050 without new economic approaches
- If so, will some form of guaranteed income be necessary?

# Increasingly Significant Technologies

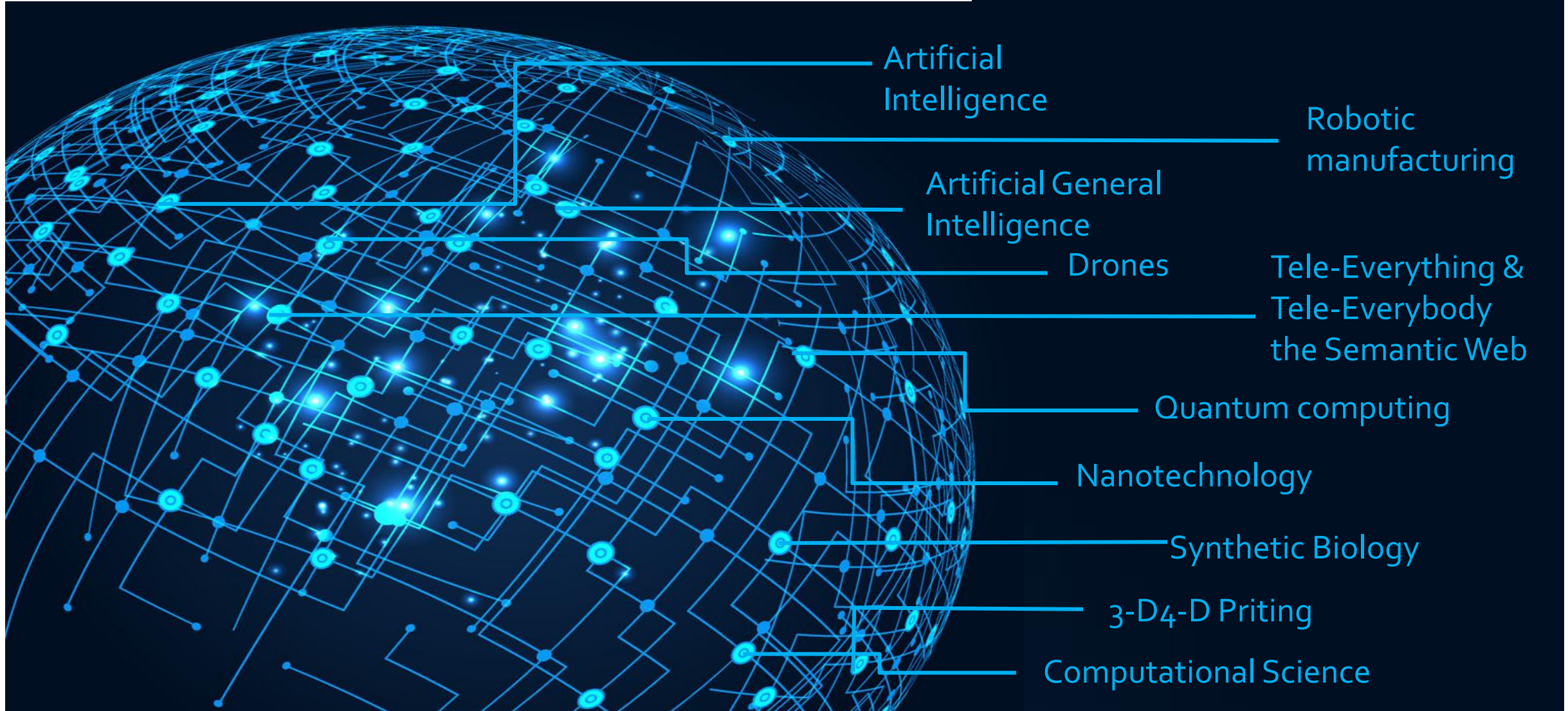


- Synthetic Biology
- Artificial Intelligence
- Artificial **General** Intelligence
- Computational Science
- Tele-Everything & Tele-Everybody, the Semantic Web
- Augmented Reality, Tele-Presence, Holographic Communications
- Quantum Computing
- Increasing individual and collective intelligence
- 3-D Printing biology as well as materials and 4-D Printing
- Nanotechnology
- Robotic manufacturing
- Drones
- Conscious-Technology

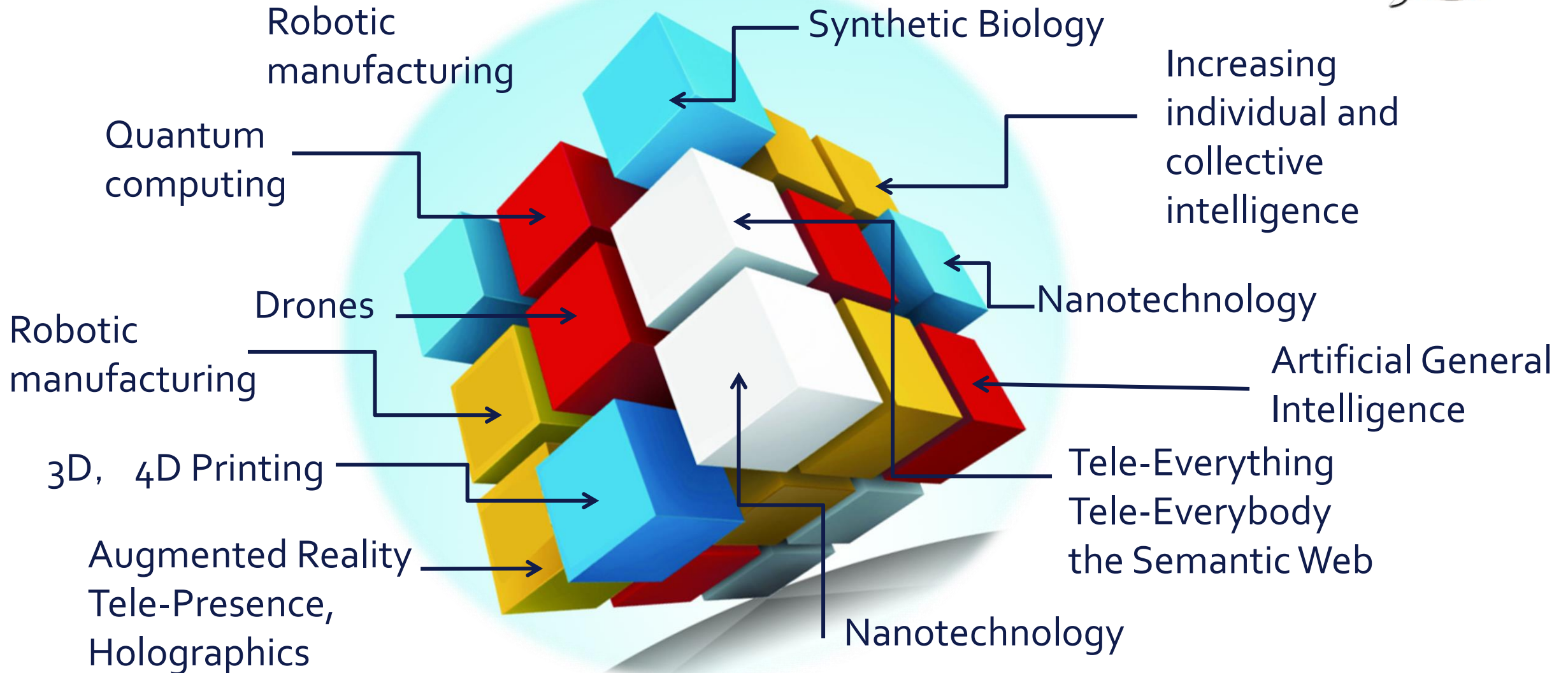
# Smart Phone Integration/Synergies



# Future Technology Synergies



# Future Technology Synergies



# Future Technology Synergies



Robotic  
manufacturing

Artificial  
Intelligence

Quantum  
computing

**Future  
Technology**

Drones

Robotic  
manufacturing

3D, 4D Printing

Augmented Reality,  
Tele-Presence,  
Holographics



# Emerging Technologies Table



If \ Then	Nano-technology	Synthetic Biology	Artificial Intelligence	Robotics	3-D Printing	Augmented Reality
Nano-technology	XXX					
Synthetic Biology		XXX				
Artificial Intelligence			XXX			
Robotics				XXX		
3-D Printing					XXX	
Augmented Reality						XXX



Artificial Intelligence ... that can autonomously  
“write” and improve its code...

by responding to feedback from  
sensor networks worldwide,  
will accelerate AI's intelligence  
worldwide... moment by moment



When this  
begins to  
happen (2050?),  
the speed of  
increasing AI's  
intelligence will  
be *far faster*  
and produce  
more change  
*than Moore's  
Law*

# Future Work/Technology 2025 Study



1. Literature and Related Research Review
2. Real-Time Delphi
3. Road Maps and Scenario Drafts
4. RTDelphi Feedback on the Scenarios
5. Final Scenarios, Policy Implications, and produce initial report
6. Initial Report as input to the National Planning Workshops
7. Collect results of the national planning workshops, analyze & synthesize results
8. Final report for public discussion

# 300 respondents plus 100 tourists



Hangouts Alerts Messages Account

The Millennium Project - Global Futures System

Select Language

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## Future Work/Technology 2050

Over 1000 text comments



The Millennium Project

### Instructions:

You are invited to share your judgments about how future technology over the next 35 years ([artificial narrow intelligence](#), [artificial general intelligence](#), [Internet of Things](#), [robotics](#), [synthetic biology](#), [nanotechnology](#), [3D/4D printing](#), [self-driving vehicles](#), [drones](#), [mobile/cloud](#), [augmented reality/holography](#), etc.) could affect the [future of work](#), and what should be done to create positive conditions for humanity.

# Some demographics



Institutional Affiliation
University (117)
Business (117)
Think Tank (93)
Independent Consultant/Writer (89)
Government (37)
Other (41)
NGO (49)
UN or other Intergovernmental (3)

46-60	30-45	61-70	Under	Over	41-50
(133)	(116)	(72)	30	70	(2)
			(40)	(35)	

Experience in Futures Research
<b>Middle: 179</b> ( <i>well read, maybe published in the field, part of your work is future research</i> )
<b>High: 120</b> ( <i>contributed concepts and/or methods, teach and/or write in the field, use and/or produce futures research full-time</i> )
<b>Low 77</b> ( <i>only general awareness</i> )

# Occupations of Panelists

they could select more than one



Futurist (153)	AI or Related ICT (27)
Executive Manager (82)	Cognitive Science (27)
Engineer/Technologist (75)	Science Fiction (26)
Social Science (53)	Natural Science (22)
Public Policy (50)	Physics (20)
Economist (39)	Biology/Physiology/Neurosciences (18)
Philosophy (38)	Mathematics (12)
<b>Most Common Combinations</b>	
Futurist, Engineer/Technologist (17)	Futurist, Social Science (7)
Futurist, Executive Manager (9)	Social Science, Executive Manager (5)
Engineer/Technologist, Executive Manager (4)	Futurist, Philosophy, Social Science (4)
Futurist, Economist (4)	Futurist, Philosophy (4)

# What was asked?



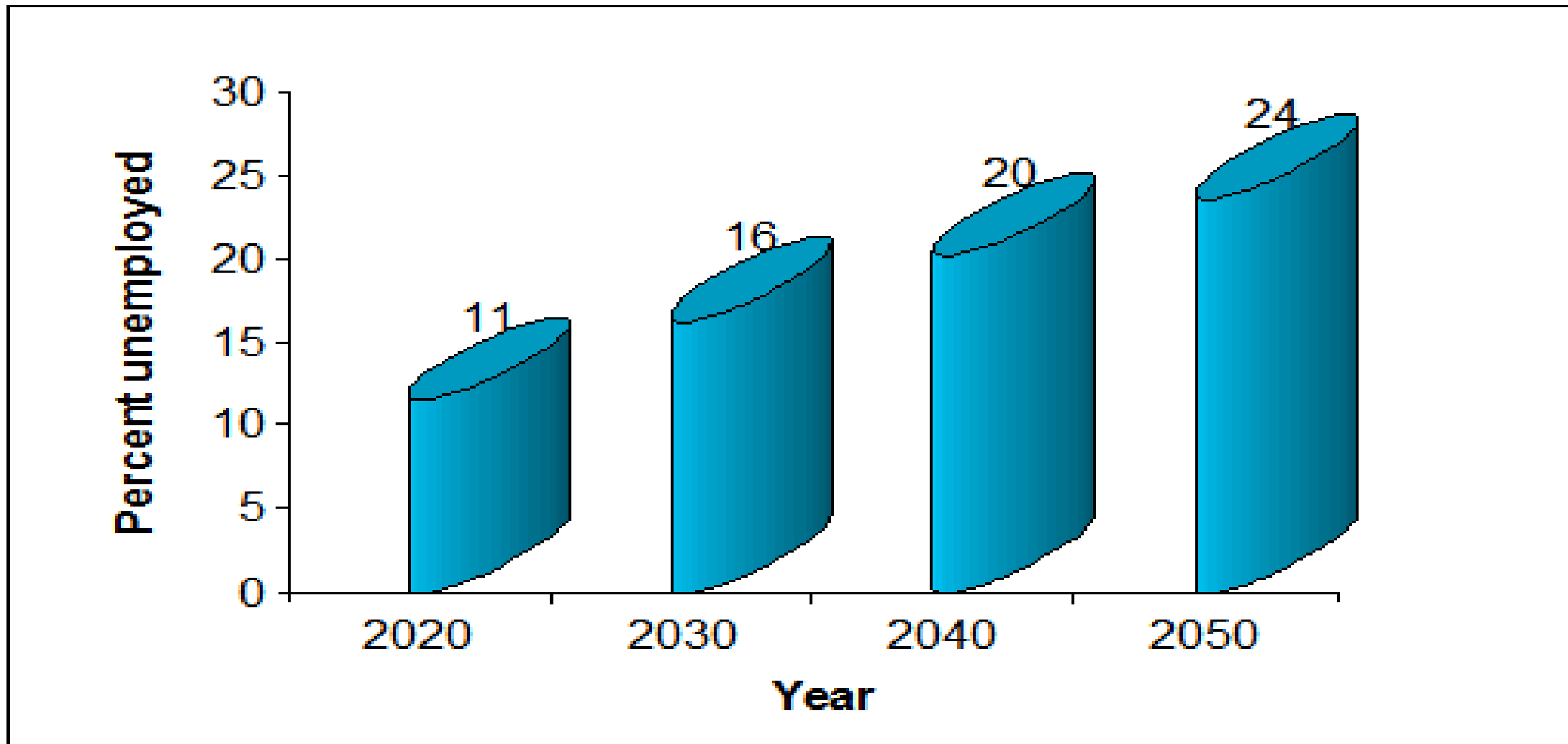
1. If socio-political-economic systems stay the same around the world, and technological acceleration, integration, and globalization continue, what percent of the world do you estimate could be **unemployed** - as we understand being employed today during each of the following years: 2020; 2030; 2040; 2050
2. More jobs were created than replaced during both the Industrial and Information Ages. However, many argue that the speed, integration, and globalization of technological changes of the next 35 years (by 2050) will cause massive structural unemployment. What are the **technologies or factors** that might make this true or false?
3. **What questions** have to be resolved to answer whether AI and other future technologies create more jobs than they eliminate?
4. How **likely and effective** could these actions be in creating new work and/or income to address technological unemployment by 2050?

# Questions Asked continued



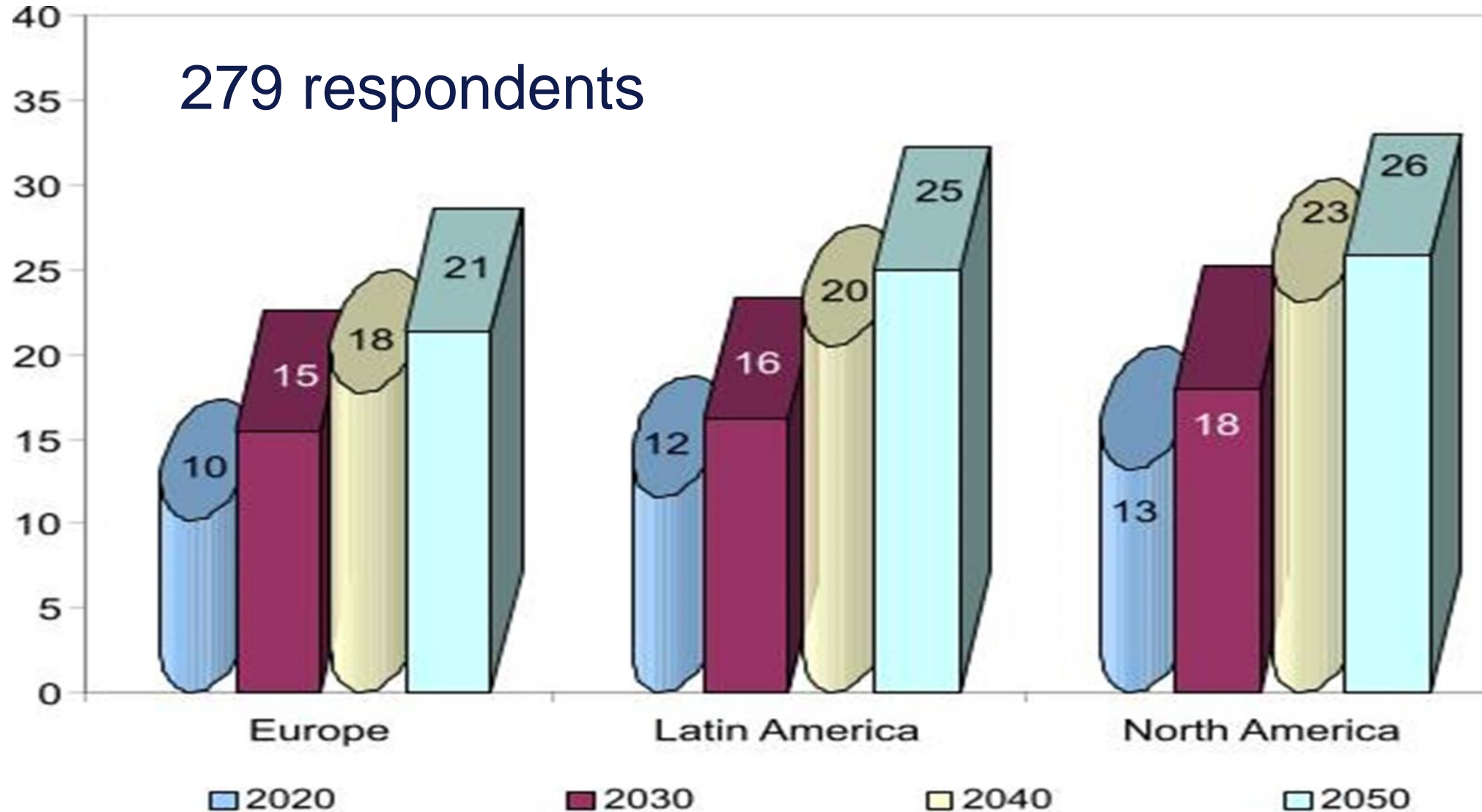
5. Will wealth from artificial intelligence and other advanced technologies continue to **accumulate income** to the very wealthy increasing the income gaps?
6. How necessary or important do you believe that some form of **guaranteed income** will be necessary to end poverty, reduce inequality, and address technological unemployment?
7. Do you expect that the **cost of living** will be reduced by 2050 due to future forms of AI robotic and nanotech manufacturing, 3D/4D printing, future Internet services, and other future production and distribution systems?
8. **Big changes** by 2050?
9. What alternative **scenario axes** and themes should be written connecting today with 2050 describing cause and effect links and decisions that are important to consider today?
10. Other **Comments** to improve this study?

# Averages of all participants

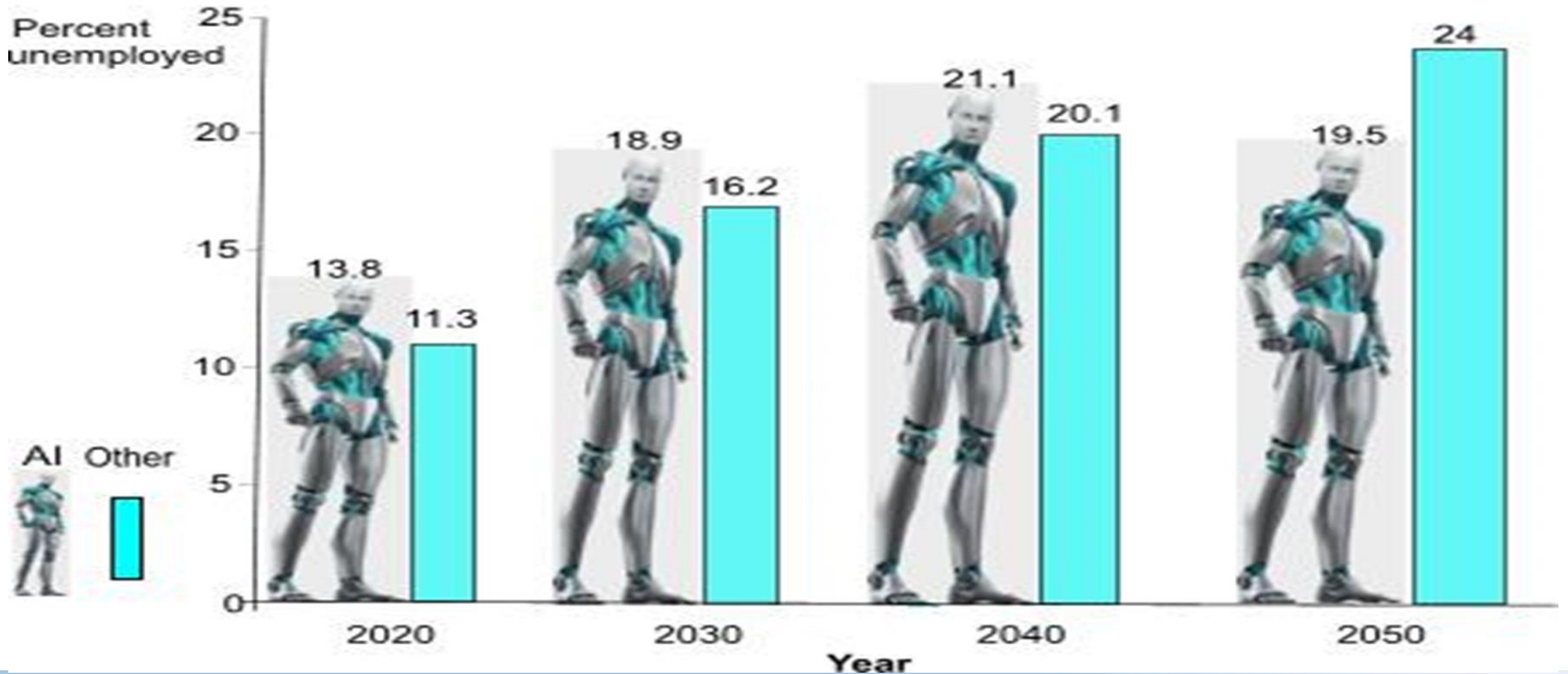




# Without political/economic change, **unemployment?** Europe is more optimistic than others, until 2015



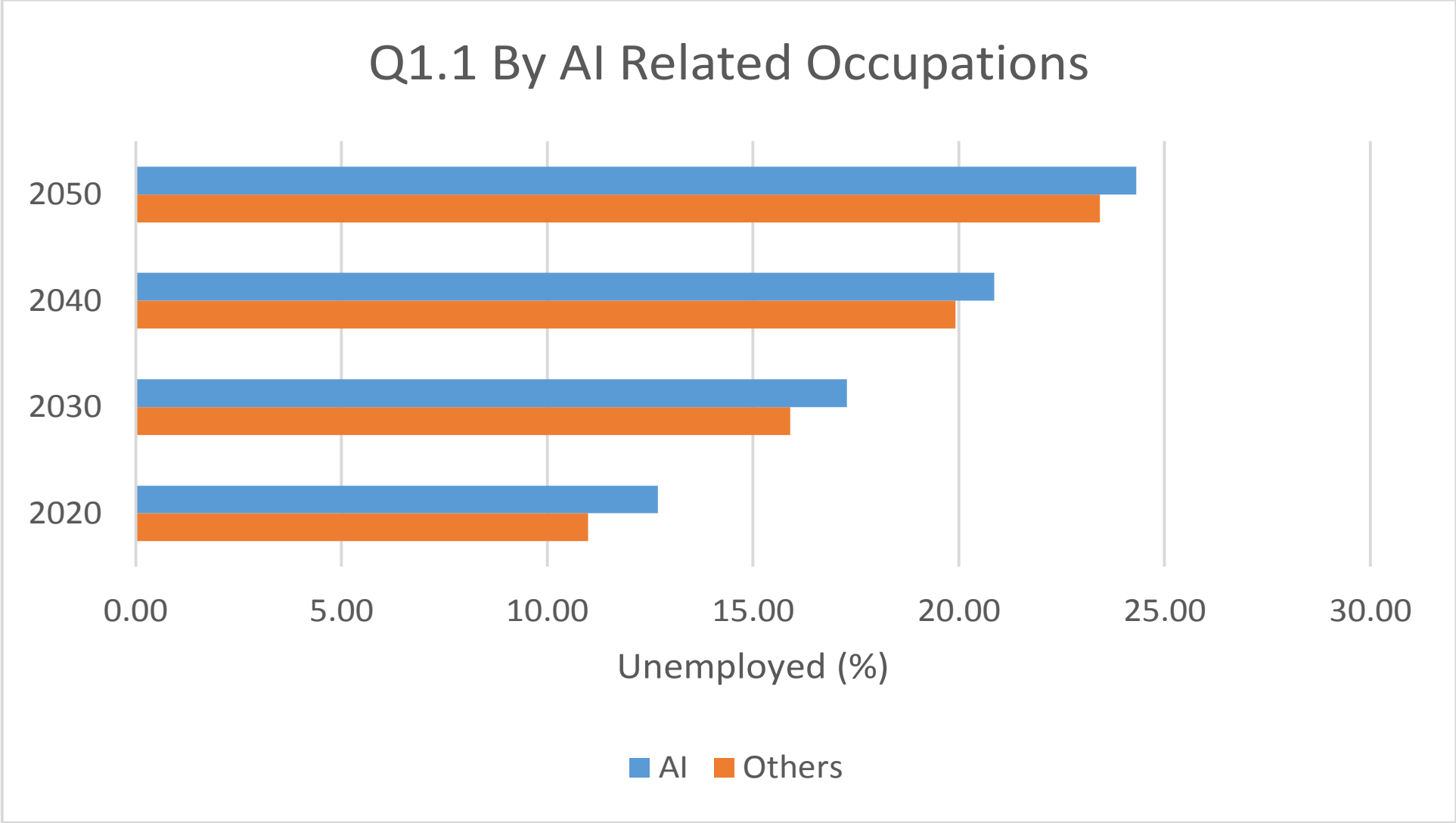
# AI Experts Expect Higher Unemployment



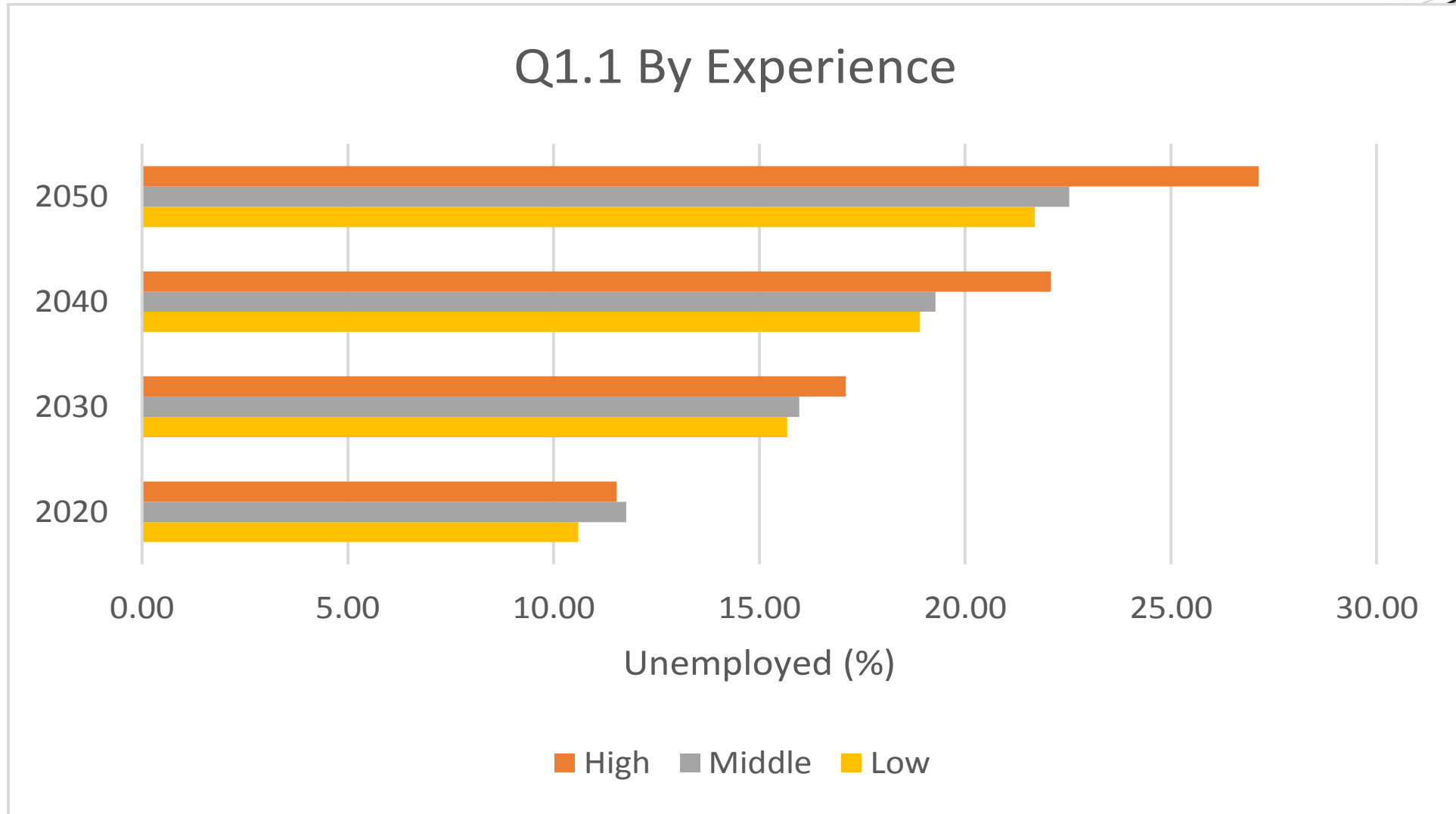
# AI + other technical vs. less technical



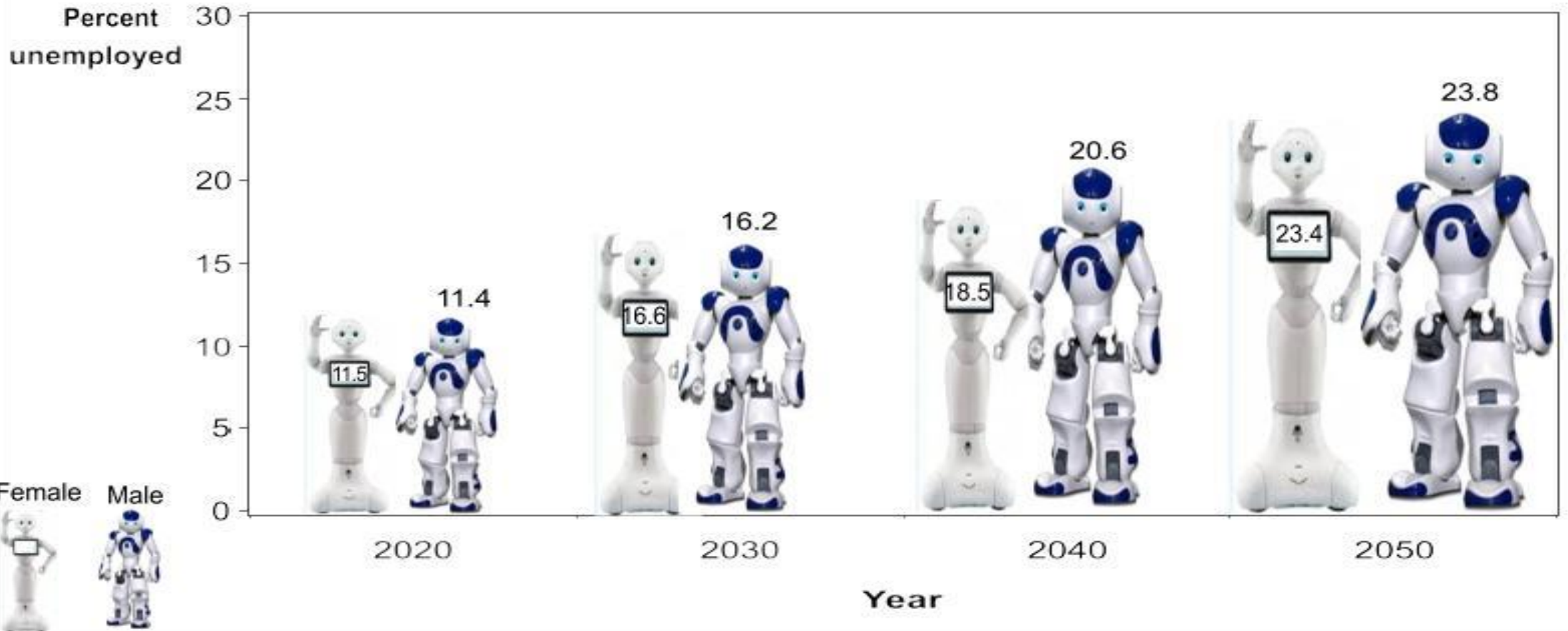
Q1.1 By AI Related Occupations



# More experience **Futurist** have higher 2050 unemployment forecasts



# Gender Unemployment Estimates



# Technological Unemployment Comments



- Concept of work, jobs, employment **will change**. Rates of unemployment may become a meaningless.
- We will be creative and adapt.
- Tech unemployment will accelerate when **AI masters vision and how to learn**
- Everything that can be automated will be; we need to **start talking** about a world without jobs **quickly**. The issue is income or distribution of wealth
- Tech augments human work; **human tech symbiosis**
- 30 hour work week; **global tele-work** will take up the slack; new tech creates **new work**, rising BRICKs and 3W creates new work
- unemployment in richer countries but new jobs in poorer countries
- Unlike the industrial revolution, there will be **no plateau** in which human labor will have a chance to catch up.

# Continued...



- Global **Megaprojects** will really change the economy creating innovations in human-machine work; meaningful activity such as **space** exploration to promote the chances that life and our species survives in the longer term.
- The AI revolution should **trigger changes to the entire social and economic systems**, as the agricultural and the industrial revolutions have done at those times.
- **Freed from the necessity** of working to make a living,
  - 2020: Increasing technological unemployment balanced by economic upswing
  - 2030: People who would like to work increasingly replaced by machines
  - 2040: Basic income guarantee in most wealthy countries -> most people no longer seek employment and the definition of unemployment no longer applies
  - 2050: Basic income in most countries
- The tools and technologies **of abundance** are expanding faster than they can **be expropriated**.
- Work as fulfillment, **self-actualization** and not just income – to earn a living

# Question 2. Number of responses: 263



<b>Technologies Replacing jobs</b>	<b>Causative Strength</b>
Robotics	7.51
Integration and synergies among these making technologies not known today	6.92
Artificial intelligence	6.81
Artificial general intelligence	6.47
Retraining unable to keep up with accelerating technological changes	6.43
3D/4D printing	6.14
Other factors	5.54
Drones	5.35
Nanotechnology	5.19
Synthetic biology	4.66



## Question 2 Comments



- We are currently developing a **second intelligent species**, which we have never done before and which humans simply cannot compete with. Has, across the board, FAR MORE CAPABILITY and LESS COST than humans.
- I don't think full General Artificial Intelligence will arrive in this time frame. **If it does**, it would change most of my answers as it would be a huge force for change and would enable, for example, nanotechnology to achieve its full potential, which it otherwise would have a difficult time doing without AI control systems.
- The current leaps in automation and **AI will NOT "plateau"**. That is the key dynamic we absolutely must address. Never in the history of mankind has the technology itself been so **free of man** to improve itself.
- Technological asymmetry will be a problem between the **haves and have-nots**.
- Impossible to distinguish between different technologies. They all contribute to the development of **a global brain**.

## Q.2.2 Factors creating more jobs/work by 2050, **preventing** mass unemployment (responses: 251)



Factors creating more jobs	Average impact
New economic and work concepts	7.17
Self-employment, freelancing, Do It Yourself support systems, incentives, and training	7.07
Growth in new jobs in leisure, recreation, and health care industries	6.67
Freedom to create new work to make life worthwhile beyond “necessary” work	6.28
Human creativity will accelerate across the world	6.25
Other technologies could create more jobs than they replace	6.14
Human-technology symbiosis and/or augmentation	5.95
Crowd sourcing for finance (Kickstarter) and crowd sourced work	5.61
Biological revolution (synthetic biology and other new biology-related industries)	5.42
Self-correcting: as unemployment goes up, purchasing goes down reducing growth of AI robotic systems, in turn replacing fewer jobs	4.12

## Comments 2.2



- People will adapt by looking beyond today's restrictive views of activities as being "labor" or "work" and seeking to have **worthwhile lives** but only if political and economic and social systems and expectations are adjusted as they should be.
- Internet to obtain skills on a global basis, providing for **new work structures**.
- **Local economies** will be more sound than global economies
- The maker and **self-employed** economies are likely to thrive
- DIY, crowd sourcing, etc. only makes **competition more intense**; a race to the bottom for resources and money.
- The most sought-after good might be a **purpose in life**
- Hormonal peaks and valleys tend to be a driving factor of human creativity. It will be interesting to see how a perfectly engineered intelligence can compete with natural hormonal creative cycles.

# Will we teach people to find markets worldwide for self-employment ?



**Digital Business**

**By 2050 everyone is connected  
to the future Internet and  
everyone is surrounded by a  
9.6 billion person market**

# How many could learn to be self-employed, finding markets worldwide instead of local non-existent jobs? For example:



The capital requirements for start-ups are increasingly low – consider YouTube, Facebook, Uber

The distance, number, and diversity of potential income sources are far greater today.

Informal economies with 3D printing and Internet-based businesses are expanding rapidly.

People could be taught how use Kickstarter.com to help get investments.

Aging Society – work after “retirement age” finding markets on the Internet.

Although advancing tech increases income and jobs for highly skill workers, it also creates low skilled work such as tele-tourism, buying/selling on systems like eBay, tele-personal assistants.

Culture could become more entrepreneurial with media memes like “you can do anything.”

EU had 1.8 million jobs in the app economy with €17.5bn in revenues in 2013. The EU created <http://eurapp.eu/> to help others get in this high tech growth area.

# One-Person Businesses

Find markets  
around the  
world for what  
you are  
interested in  
doing

not non-existing  
jobs



What could this look  
like in 2050?

# Q.3. What questions have to be resolved to answer whether AI and other future technologies create more jobs than they eliminate?



220 answers and 212 comments the responses

- How intelligent can AI and AGI become?
- **Do we want jobs at all**, should we be fighting to retain jobs, or fighting to eliminate them.
- What are **plausible alternative** definitions of work, jobs, employment, and basic income
- **Who will own the AI?** Is AI an independent operator, can it own tools it's using or controlling? Does it have IPR over its productions, code, algorithms or inventions? What if very creative AI make lot of money and become a millionaire, gaining lot of financial leverage? How we determine and control AI motives? And should we?
- How can we create initial conditions for AGI or super or strong AI so it **evolves in a good way?**
- What **taxes** and how collected
- Will human beings still be essential for conceiving, designing, building and applying new technological tools - or will machines also take over this part?
- Work creation though AI, not "jobs creation."

# Continued



- How far will we **allow** machines to emulate us? What is the **ethics** of this?
- Is the objective of the AI and other future technologies: economic **growth or quality** of humanity?
- How can we **control** the developments? co-exist, co-create (with machines) new solutions
- **Who is responsible for AI mistakes** ( autonomous cars - who has to pay in case of accident)
- What knowledge will become **obsolete** and therefore, what effect on **education and professions**?
- What new knowledge, skills, education, jobs will be necessary to get the most out of **the global brain** and to create a sustainable economy with happy people
- Will you become **obsolete** in 10 years **or** will you become a **superprofessional**?
- What impact does it have on the development of our **children's emotional state**.
- Whether **AI** can be constrained or whether artificial super intelligence will be **malevolent or benevolent**.



## Q.3.2 What are your thoughts about answers to the questions you suggested?



- We do not know **names** of these new “post-unemployment” activities or categories yet
- Objective work will be **self-actualization**
- Objective of the economy will be the **well-being** of the humans.
- **Basic income** should be installed and paid by the government
- Combination of open-sourced **kickstarter**-like programs with blockchain distributed ownership schemes, and just plain freely available open-source AI tools that anyone can access and use. Any "income" as it is defined in the future (either through monetary or physical abundance) will be widely distributed in the same way. Again, unemployment is *\*the cure\** not the problem.
- How and by whom is money created and distributed?
- **Artificial biology** to be as **large or larger** than the Industrial Revolution creating many jobs that could be offset by all those jobs lost by AI, robotics, etc.
- **Localization** - Go **back to live in connected villages** in harmony with nature
- Think tanks better addressing transdisciplinary questions like these not universities
- Develop a worldwide organization supported by governments to assess developments and to encourage developers to think about the (long term) consequences.

# 4. How likely/effective - actions to create new work and/or income 2050?



Action 215 responses	Average Effectiveness	Average likelihood
Retraining programs for more advance skills	3.43	3.20
Require science, technology, engineering, mathematics, and coding in all levels of education	3.33	2.87
Make increasing national and individual intelligence a national priority	3.27	2.56
Create incentives to attract and create advanced skilled jobs	3.25	3.26
National innovation programs	3.24	3.42
Consolidate public welfare systems into a basic guaranteed income pending national situations	3.20	2.48
Create Do It Yourself Maker areas, hubs, centers, districts	3.18	3.05
Double national R&D budgets by 2020 (to have impact by 2050)	3.08	2.35
Create incentives for employee ownership plans	3.05	2.72
Make university education free to students	3.04	2.33
Tax the new wealth generated by new technology for public financial support	3.04	2.74
Massive public training in self-employment	3.03	2.56
Government investments in future technology firms with profits from government shares redistributed to unemployed	2.87	2.40

## 4.3 Please suggest additional actions to address technological unemployment? Number of responses: 190



- We should be thinking in terms of **systemic** rather than one-off **solutions**.
- **Teach** critical thinking, reasoning faculties, compassion, self-employment, enquiry-based learning and data in schools
- **Lifelong** educational programs to keep people's mind busy
- Re-examine **defense** spending
- Public money for financing **start ups**
- **Massive investment in space** exploration and solar system colonization. The current level of investment is too small to matter societally.
- **Other big projects** like addressing **climate change**
- **Set challenging objectives** for the societies as a whole

## 6.1 Please rate how necessary you believe guaranteed lifetime income will be by 2050



**Number of responses: 212**

<b>Guaranteed income necessity</b>	<b>Score</b>
Absolutely necessary	54
Very important	53
Can help	36
Irrelevant	27
Not too necessary	12

# Some Initial Generalizations



- No actions to address these issues received high consensus
- Little understanding of the future of synthetic biology and its impacts on work
- Most understand that the world economic and social systems are going to change by both government and market
- Plausible alternative cash flow projections for introduction of basic income are missing
- Many of the respondents envision a better future for humanity, end of the tyranny of jobs to earn a living, and a flourishing of the pleasure of meaningful work – a self-actualization economy
- The changes will be irregular around the world

# Guaranteed income – cash flow projection elements



## Income to Government

- License and tax Robots
- Carbon Tax
- Tobin tax – on international financial transfers
- Eliminate tax havens
- Universal minimum corporate tax
- Own percent of corporations
- Tax massive wealth growth like some IT

## Lower annual cost of guaranteed income

- Consolidate welfare programs (unemployment payments, etc.) into the guaranteed income
- AI/robotics lowers to cost of living
- Free health and education

## Factors to consider

- National service; Minimum annual public work
- Phase in from work to “next” what every post-job/employment will be
- Different incomes in different areas, countries
- Can you both work income and guaranteed income?

# Future Work/Technology 2025 Study

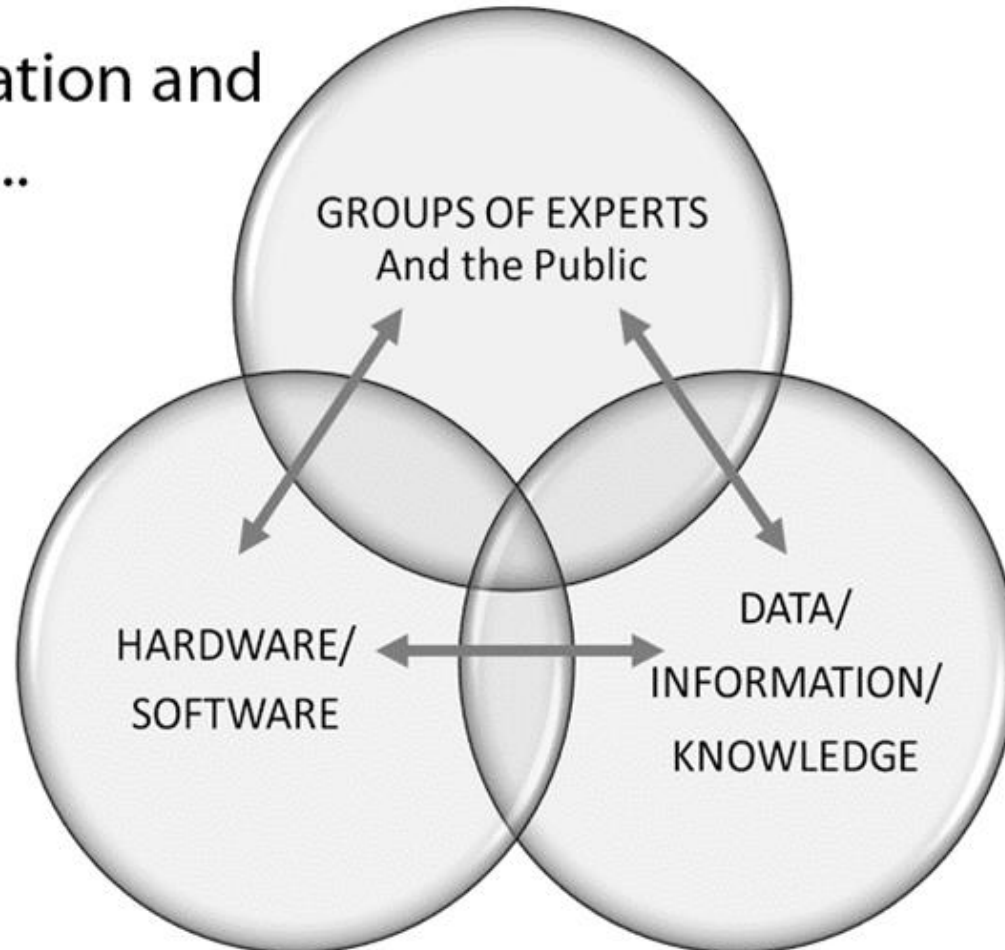


1. Literature and Related Research Review
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# Collective Intelligence Systems: Each Can Change the Other



Improving integration and synergies among...



Producing Collective Intelligence



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Intro Tour

State Of The Future

## Sections of GFS

Full System

15 Global Challenges

Research

Futures Methodologies

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4 since your last visit

Scanning Items  
10+ in the last week

Data Sets  
0 since your last visit

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## The Millennium Project

A global foresight network of nodes, information, and software.

Functioning as a think tank on behalf of humanity, not on behalf of a government, an issue, or an ideology.

Created to improve humanity's prospects for building a better future.



## The 2013-2014 State of the Future



- A must read for any decisionmaker with a long-term vision.*  
Enrique Peña Nieto, President of Mexico
- Global intelligence on the future of the world in the palm of your hand.*  
KurzweilAI News
- One of the premier guides to global future trends for asset managers*  
Hazel Henderson, President, Ethical Markets
- The most influential annual report on what we know about the future of humanity*  
Paul Werbos, National Science Foundation
- The 15 Global Challenges in the State of the Future should be read by all leaders.*  
Eduardo Frei, Former President of Chile
- Strategic Planning for the Planet... remarkably articulate and prescient.*

# ... May become a *TransInstitution*



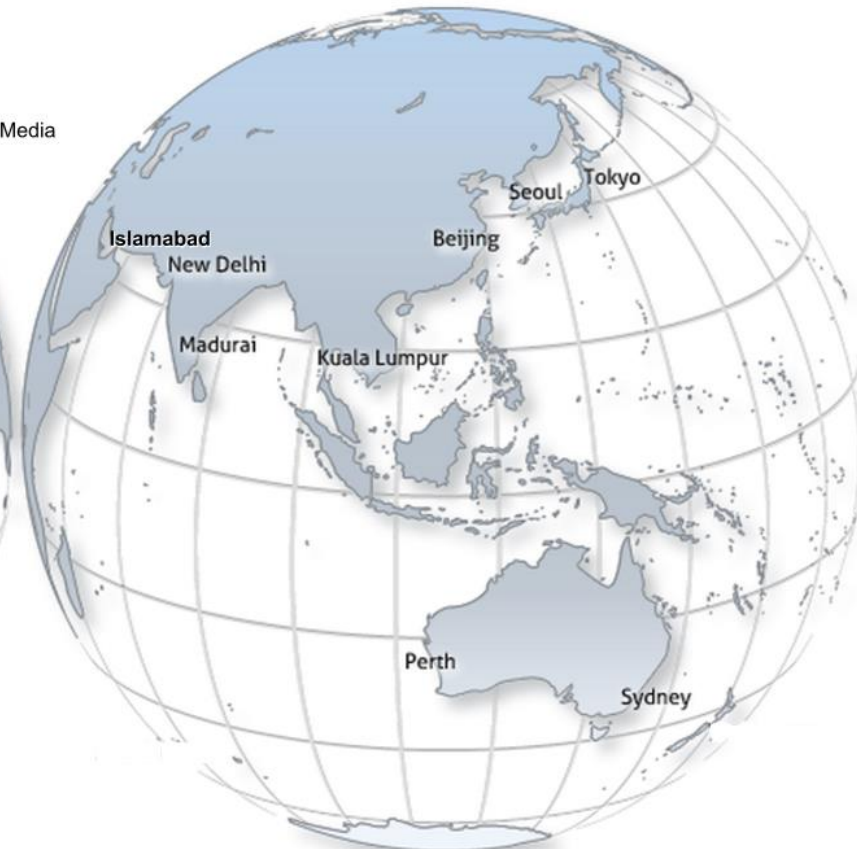
# The Millennium Project has 56 Nodes and two Regional Networks (in Europe and Latin America)



Cyberspace



Arts & Media



**A Node is a group of institutions and individuals the connect global/local futures work – making it easy**

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**We've got to let  
the world know  
that.**

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