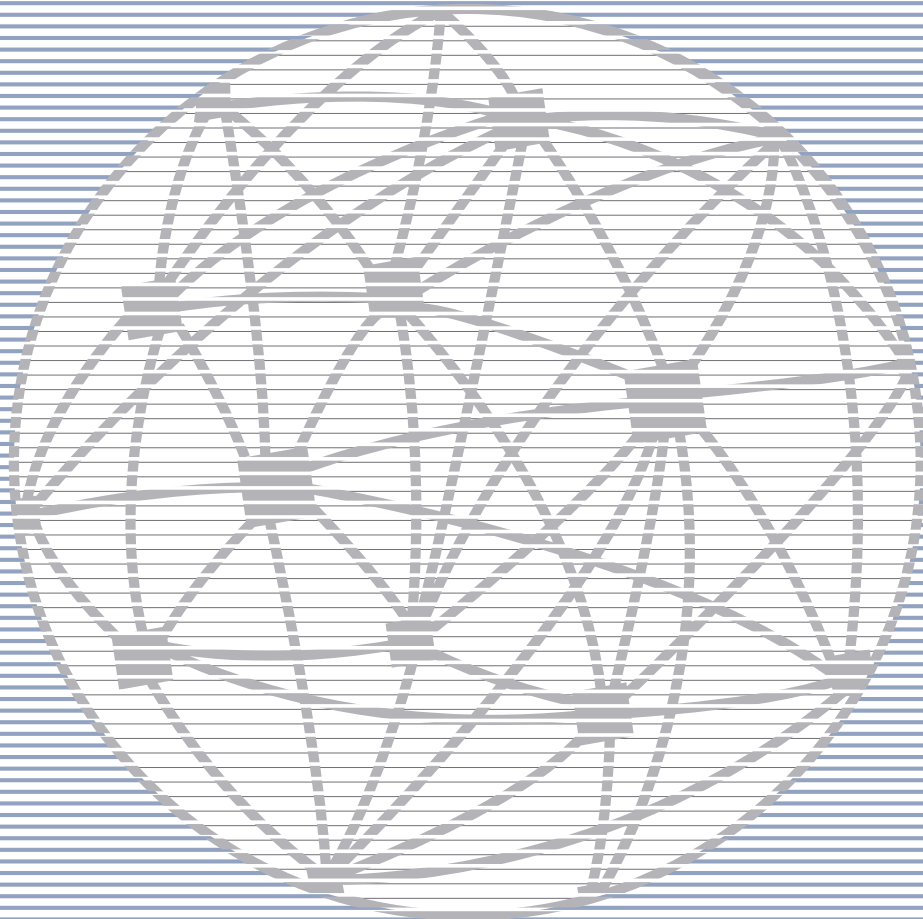


Insight Report

Global Risks 2014

Ninth Edition



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Global Risks 2014

Ninth Edition

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National University of Singapore

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Preface



Our lives are changing at an unprecedented pace. Transformational shifts in our economic, environmental, geopolitical, societal and technological systems offer unparalleled opportunities, but the interconnections among them also imply enhanced systemic risks. Stakeholders from across business, government and civil society face an evolving imperative in understanding and managing emerging global risks which, by definition, respect no national boundaries.

Conceptual models are needed to define, characterize and measure the potential negative impacts of interconnected global risks. It is in this spirit that I present the *Global Risks 2014* report, now in its ninth edition. This report aims to enhance our understanding of how a comprehensive set of global risks is evolving, how their interaction can lead to unexpected and often systemic impacts, and the trade-offs involved in managing them.

Global Risks 2014 is a stimulus for reflection for policy-makers, chief executive officers, senior executives and thought leaders around the world. It is also a call to action to improve international efforts at coordination and collaboration, going beyond the traditional roles and responsibilities of the public and private sectors to equip institutions to understand, map, monitor, manage and mitigate global risks.

The report emphasizes the importance of understanding systemic risks, long-term thinking to address and

mitigate them and the critical role of the younger generation. To do so, it offers deep-dive analytical insights into interconnected risks with the potential to have systemic consequences in the geopolitical, socio-economic and digital spheres. The report features an analysis of a survey of over 700 leaders and decision-makers from the World Economic Forum's global multistakeholder community on 31 selected global risks. For the first time, survey respondents were asked directly to nominate their risks of highest concern, which placed economic and social issues firmly at the top.

I would like to thank the partners of the *Global Risks 2014* report, without whose expert contributions this report would not have been possible: Marsh & McLennan Companies, Swiss Re and Zurich Insurance Group, as well as the National University of Singapore, Oxford Martin School at the University of Oxford and the Wharton Risk Management and Decision Processes Center at the University of Pennsylvania. My appreciation also goes to the World Economic Forum's Network of Global Agenda Councils for their important insights, under the leadership of Martina Gmür. I am also grateful to Jennifer Blanke, Chief Economist, and the *Global Risks 2014* project team members Beñat Bilbao-Osorio, Ciara Browne, Gemma Corrigan, Roberto Crotti, Attilio Di Battista, Gaëlle Dreyer, Margareta Drzeniek Hanouz, Caroline Galvan, Thierry Geiger and Tania Gutknecht for their critical contributions to making this report possible.

Moving from urgency-driven risk management to more collaborative efforts to strengthen risk resilience would benefit global society. Together, leaders from business, government and civil society have the foresight and collaborative spirit to shape our global future.

A handwritten signature in black ink, appearing to read 'Klaus Schwab'.

Klaus Schwab
Founder and Executive Chairman
World Economic Forum

Executive Summary

The *Global Risks 2014* report highlights how global risks are not only interconnected but also have systemic impacts. To manage global risks effectively and build resilience to their impacts, better efforts are needed to understand, measure and foresee the evolution of interdependencies between risks, supplementing traditional risk-management tools with new concepts designed for uncertain environments. If global risks are not effectively addressed, their social, economic and political fallouts could be far-reaching, as exemplified by the continuing impacts of the financial crisis of 2007-2008.

The systemic nature of our most significant risks calls for procedures and institutions that are globally coordinated yet locally flexible. As international systems of finance, supply chains, health, energy, the Internet and the environment become more complex and interdependent, their level of resilience determines whether they become bulwarks of global stability or amplifiers of cascading shocks. Strengthening resilience requires overcoming collective action challenges through international cooperation among business, government and civil society.

Box 1: Objectives of the Global Risks 2014 Report

The world faces risks that can be addressed only by long-term thinking and collaboration among business, governments and civil society. The *Global Risks 2014* report aims to support this process by:

- exploring the nature of systemic risks
- mapping 31 global risks according to the level of concern they arouse, their likelihood and potential impact, as well as the strength of the interconnections between them
- looking in-depth at the ways in which three constellations of global risk – centred on youth, cyberspace and geopolitics – could interplay and have systemic impact

Mapping Global Risks in 2014

Based on a survey of the World Economic Forum's multistakeholder communities, the report maps 31 global risks according to level of concern, likelihood and impact and interconnections among them.

- The risks of **highest concern** to respondents are fiscal crises in key economies, structurally high unemployment and underemployment, and water crises (Table 1).

Table 1: Ten Global Risks of Highest Concern in 2014

No.	Global Risk
1	Fiscal crises in key economies
2	Structurally high unemployment/underemployment
3	Water crises
4	Severe income disparity
5	Failure of climate change mitigation and adaptation
6	Greater incidence of extreme weather events (e.g. floods, storms, fires)
7	Global governance failure
8	Food crises
9	Failure of a major financial mechanism/institution
10	Profound political and social instability

Source: Global Risks Perception Survey 2013-2014.

Note: From a list of 31 risks, survey respondents were asked to identify the five they are most concerned about.

- The risks considered **high impact and high likelihood** are mostly environmental and economic in nature: greater incidence of extreme weather events, failure of climate change mitigation and adaptation, water crises, severe income disparity, structurally high unemployment and underemployment and fiscal crises in key economies. Female respondents perceived almost all global risks as both more likely and more impactful than did males, especially in the environmental category. Younger individuals gave higher scores for the impact of almost all of the risks, particularly environmental risks, such as water crises, greater incidence of natural catastrophes, the loss of biodiversity and greater incidence of extreme weather events.
- The risks perceived to be **most interconnected with other risks** are macroeconomic – fiscal crises, and structural unemployment and underemployment – with strong links between this macroeconomic risk nexus and social issues, such as rising income inequality and political and social instability. The failure of global governance emerges as a central risk that is connected to many different issues. Mapping perceived interconnections between risks helps to understand the potential transmission channels between them.
- The decline of trust in institutions, lack of leadership, persisting gender inequalities and data mismanagement were among **trends to watch**, according to survey respondents. Experts added further concerns including various forms of pollution, and accidents or abuse involving new technologies, such as synthetic biology, automated vehicles and 3-D printing.

Three Risks in Focus

Of the many conceivable ways in which possible interconnections and interdependencies between global risks could play out systemically over the 10-year horizon considered by this report, three are explored in depth:

- **Instabilities in an increasingly multipolar world:** Changing demographics, growing middle classes and fiscal constraints will place increasing domestic demands on governments, deepening requirements for internal reform and shaping international relations. Set against the rise of regional powers, an era of greater economic pragmatism and national self-protection might increase inter-state friction and aggravate a global governance vacuum. This may hinder progress on cross-cutting, long-term challenges, and lead to increased inefficiencies and friction costs in strategically important sectors, such as healthcare, financial services and energy. Managing this risk will require flexibility, fresh thinking and multistakeholder communication.
- **Generation lost?** The generation coming of age in the 2010s faces high unemployment and precarious job situations, hampering their efforts to build a future and raising the risk of social unrest. In advanced economies, the large number of graduates from expensive and outmoded educational systems – graduating with high debts and mismatched skills – points to a need to adapt and integrate professional and academic education. In developing countries, an estimated two-thirds of the youth are not fulfilling their economic potential. The generation of digital natives is full of ambition to improve the world but feels disconnected from traditional politics; their ambition needs to be harnessed if systemic risks are to be addressed.
- **Digital disintegration:** So far, cyberspace has proved resilient to attacks, but the underlying dynamic of the online world has always been that it is easier to attack than defend. The world may be only one disruptive technology away from attackers gaining a runaway advantage, meaning the Internet would cease to be a trusted medium for communication or commerce. Fresh thinking at all levels on how to preserve, protect and govern the common good of a trusted cyberspace must be developed.

Collaborative multistakeholder action is needed. Wide variance in how risks are identified and managed still exists. Businesses, governments and civil society alike can improve how they approach risk by taking steps such as opening lines of communication with each other to build trust, systematically learning from others' experiences, and finding ways to incentivize long-term thinking. By offering a framework for decision-makers to look at risks in a holistic manner, the *Global Risks 2014* report aims to provide a platform for dialogue and to stimulate action.

Introduction

Accelerating change in the 21st century has bound countries, economies and businesses ever more tightly together through better infrastructure, faster and more efficient communication systems, and closer trade and investment links. Innovations such as the Internet and mobile phone have boosted productivity, created new business opportunities and enhanced access to information. Economic growth has lifted millions of people out of poverty.

Yet the same dynamic that lies behind these gains – everything being more connected and interdependent – also threatens to undermine them. Economic growth, for example, may be inexorably undermining its own foundations through its negative side-effects on ecosystems, biodiversity and the climate – effects that cannot be stopped at national borders. Disruptions in the online environment are becoming as impactful as those in the physical world, if not more.

Since 2006, the *Global Risks* report has been calling attention to global risks that can be systemic in nature, causing breakdowns of entire systems and not only their component parts.

These risks can come from many sources. The greater the interdependencies between countries and industries, the greater the potential for events to bring about unforeseen, cascading consequences. The year 2013 alone witnessed a number of illustrations of such risks, bringing significant losses in terms of both human life and wealth. The fiscal crisis in the United States (US), the subsiding threat of sovereign default in eurozone countries and popular protests in emerging markets all presented economic risks far beyond national borders. Typhoon Haiyan took a heavy toll on the Philippines, even as global leaders debated climate change in Warsaw in November 2013. Syria's refugee crisis destabilized the entire Middle East. Revelations about data leakage and new forms of espionage created geopolitical tensions that may yet have far-reaching implications in the years to come. These events have painfully emphasized that the world is not equipped to deal with global risks.

This year, as in past editions, the *Global Risks* report represents a step in a continuous process of improving how global risks and their interconnections can be put on decision-makers' radar screens, to provide a basis for dialogue on how governments, business and civil society can work together effectively to build resilience and mitigate any negative effects accruing from them.

Part 1 of the report presents the results of this year's Global Risks Perceptions Survey, enumerating the 10 risks that respondents nominated as being of highest concern and also those they thought were most likely and potentially impactful. It also maps the strength of perceived interconnections among these risks to provide a holistic picture of the complexity and broad framework needed to understand their full potential impact. Finally, it includes a "risks and trends to watch" section, noting additional issues that respondents and experts were concerned about.

Part 2 selects and explores in detail three constellations of global risks from the Risks Interconnections Map. "Instabilities in an Increasingly Multipolar World" examines possible interconnections among risks related to the changing geopolitical order. "Generation Lost?" looks at how high rates of youth unemployment risk stoking social unrest and squandering human and economic potential, and how the current situation will affect tomorrow's youth. "Digital Disintegration" imagines how cyberspace could become severely affected through growing strength of attacks and dwindling trust, at a huge cost to economies and societies.

The report also features contributions from several of the Forum's Global Agenda Councils, which bring together thought leaders from academia, business, government, international organizations and other civil society organizations to set the global agendas in their respective fields. The Councils' contributions explore a selection of specific risks that rank highly on the Global Risks Perceptions Survey.

The multistakeholder collaboration required to address global risks should take place through effective mechanisms of global governance, as global risks can only be addressed at a global level. Addressing risks effectively takes not only a common understanding of the issues and a willingness to work together but also the building of mutual trust and nurturing of the capacity for long-term thinking – issues further explored in the concluding section of Part 2.

Part 3 analyses the main learnings from past *Global Risks* reports and looks ahead towards the 10th anniversary of the report in 2015.

To work together to prepare and mitigate risks and strengthen resilience, leaders in business, politics and civil society all need to first identify, understand and monitor the most important global risks. The *Global Risks 2014* report aims to facilitate this process and provide a platform for dialogue.

Part 1: Global Risks 2014: Understanding Systemic Risks in a Changing Global Environment

A *global risk* is defined as an occurrence that causes significant negative impact for several countries and industries over a time frame of up to 10 years. A key characteristic of global risks is their potential systemic nature – they have the potential to affect an entire system, as opposed to individual parts and components – as defined in Box 1.1 below.

Box 1.1: What Is Systemic Risk?

Systemic risk is the risk of “breakdowns in an entire system, as opposed to breakdowns in individual parts and components”.¹ Systemic risks are characterized by:

- modest tipping points combining indirectly to produce large failures
- risk-sharing or contagion, as one loss triggers a chain of others
- “hysteresis”, or systems being unable to recover equilibrium after a shock

Note

¹ Kaufman, G. G. and K. E. Scott. 2003. “What Is Systemic Risk, and Do Bank Regulators Retard or Contribute to It?” *Independent Review* 7 (3): 371–391. See quote on p. 371.

Source

Goldin, I. and M. Mariathasan. *The Butterfly Defect: How globalization creates systemic risk, and what to do about it*. Princeton University Press. Forthcoming Spring 2014.

This report considers a core set of 31 global risks in five categories (see Table 1.1): economic, environmental, geopolitical, technological, and societal (Appendix A provides the definitions of individual risks).

Economic Risks

Risks in the economic category include fiscal and liquidity crises, failure of a major financial mechanism or institution, oil-price shocks, chronic unemployment and failure of physical infrastructure on which economic activity depends.

Environmental Risks

Risks in the environmental category include both natural disasters, such as earthquakes and geomagnetic storms, and man-made risks such as collapsing ecosystems, freshwater shortages, nuclear accidents and failure to mitigate or adapt to climate change.

Geopolitical Risks

The geopolitical category covers the areas of politics, diplomacy, conflict, crime and global governance. These risks range from terrorism, disputes over resources and war to governance being undermined by corruption, organized crime and illicit trade.

Societal Risks

The societal category captures risks related to social stability – such as severe income disparities, food crises and dysfunctional cities – and public health, such as pandemics, antibiotic-resistant bacteria and the rising burden of chronic disease.

Technological Risks

The technological category covers major risks related to the growing centrality of information and communication technologies to individuals, businesses and governments. These include cyber attacks, infrastructure disruptions and data loss.

The core set of global risks considered in this report is not exhaustive, and the Forum attempts to continually refine it as the global risks landscape evolves. The list also includes “vulnerabilities”, or those trends that are already manifest and that affect other risks – for example, an ageing population represents a vulnerability potentially affecting a country’s fiscal situation. This distinction is further explored in Part 3 of this report.

Since 2009, the *Global Risks* report has evaluated risks over a 10-year time horizon through the Global Risks Perception Survey, which gathers the perceptions of the World Economic Forum’s multistakeholder communities across different areas of expertise, geographies and age groups. It includes representatives of the World Economic Forum’s

Table 1.1: Global Risks 2014

Economic	Fiscal crises in key economies
	Failure of a major financial mechanism or institution
	Liquidity crises
	Structurally high unemployment/underemployment
	Oil-price shock to the global economy
	Failure/shortfall of critical infrastructure
Environmental	Decline of importance of the US dollar as a major currency
	Greater incidence of extreme weather events (e.g. floods, storms, fires)
	Greater incidence of natural catastrophes (e.g. earthquakes, tsunamis, volcanic eruptions, geomagnetic storms)
	Greater incidence of man-made environmental catastrophes (e.g. oil spills, nuclear accidents)
	Major biodiversity loss and ecosystem collapse (land and ocean)
	Water crises
Geopolitical	Failure of climate change mitigation and adaptation
	Global governance failure
	Political collapse of a nation of geopolitical importance
	Increasing corruption
	Major escalation in organized crime and illicit trade
	Large-scale terrorist attacks
Societal	Deployment of weapons of mass destruction
	Violent inter-state conflict with regional consequences
	Escalation of economic and resource nationalization
	Food crises
	Pandemic outbreak
	Unmanageable burden of chronic disease
Technological	Severe income disparity
	Antibiotic-resistant bacteria
	Mismanaged urbanization (e.g. planning failures, inadequate infrastructure and supply chains)
Technological	Profound political and social instability
	Breakdown of critical information infrastructure and networks
	Escalation in large-scale cyber attacks
Technological	Massive incident of data fraud/theft

Member and Partner companies,¹ members of the Network of Global Agenda Councils,² Global Shapers³ and Young Global Leaders.⁴ Conducted in October and November 2013, this year's survey gathered input from over 700 members of this community. Appendix B lays out a detailed description of the survey sample and methodology.

Three types of results describing global risks accrue from the survey:

- the **Ten Global Risks of Highest Concern in 2014**, which highlights the most pressing issues in the opinion of survey respondents
- the **Global Risks Landscape 2014**, which maps risks according to survey respondents' perception of their likelihood and potential impact
- the **Global Risk 2014 Interconnections Map**, which shows the interdependencies between all risks, providing an understanding of the systemic consequences of global risks.

Ten Global Risks of Highest Concern in 2014

Economic, societal and environmental risks dominate the list of global risks that the respondents are most concerned about, with fiscal crises emerging as the top issue (Table 1.2). Despite the efforts of many eurozone countries to control their deficit and debt levels, concerns regarding fiscal crises persist. They are also fuelled by the high levels of public debt in Japan and the US, where political gridlock has exacerbated perceptions. Fiscal crises can severely affect the stability of the global economy, as explored further in Box 1.2.

Table 1.2: Ten Global Risks of Highest Concern in 2014

No.	Global Risk
1	Fiscal crises in key economies
2	Structurally high unemployment/underemployment
3	Water crises
4	Severe income disparity
5	Failure of climate change mitigation and adaptation
6	Greater incidence of extreme weather events (e.g. floods, storms, fires)
7	Global governance failure
8	Food crises
9	Failure of a major financial mechanism/institution
10	Profound political and social instability

Source: Global Risks Perception Survey 2013-2014.

Note: From a list of 31 risks, survey respondents were asked to identify the five they are most concerned about.

Five years after the collapse of Lehman Brothers, with its system-wide impacts, the failure of a major financial mechanism or institution also features among the risks that the respondents are most concerned about, as uncertainty about the quality of many banks' assets remains.⁵

Structural unemployment and underemployment appears second overall, as many people in both advanced and emerging economies struggle to find jobs. The youth and minorities are especially vulnerable as youth unemployment rates hover around 50% and underemployment (with low-quality jobs) remains prevalent, especially in emerging and developing markets.

Closely associated in terms of societal risk, income disparity is also among the most worrying of issues. It raises concerns about the Great Recession and the squeezing effect it had on the middle classes in developed economies, while globalization has brought about a polarization of incomes in emerging and developing economies. This is true despite the obvious progress in countries such as Brazil and lower levels of poverty in several developing countries in Asia and Africa.

Environmental risks also feature prominently in this year's list, appearing as three of the top 10 global risks of greatest concern. Water crises, for instance, rank as the third highest concern (see Box 1.3). This illustrates a continued and growing awareness of the global water crisis as a result of

mismangement and increased competition for already scarce water resources from economic activity and population growth. Coupled with extreme weather events such as floods and droughts, which appears sixth on the list, the potential impacts are real and happening today.⁶

Climate change, ranked fifth on the list (see Box 1.4), is the key driver of such uncertain and changing weather patterns, causing an increased frequency of extreme weather events such as floods and droughts. It is important to consider the combined implications of these environmental risks on key development and security issues, such as food security, and political and social instability, ranked eighth and 10th respectively.⁷

Given that global risks can be addressed effectively only through international collaboration, it is hardly a surprise that global governance failure is also included in the list as the risk of seventh highest concern.

Box 1.2: Fiscal Crises: Just When You Thought It Was Safe to Go Back...

Contributed by the Global Agenda Council on Fiscal Sustainability

The risk of fiscal crises features as the top risk in this year's *Global Risks* report. Governments often run deficits, spending more than they raise in taxes. They make up the shortfall by selling bonds – borrowing money from private investors with the promise of repaying it, with interest, at a specified future date. A fiscal crisis occurs when investors begin to doubt the government's future ability to repay; the government then has to offer higher interest on its bonds to compensate investors for the increased risk. A vicious cycle starts: ballooning interest payments add to government debt, increasing the doubts of investors and forcing interest rates up still further. This can rapidly turn into a fatal spiral, in which fears that a country will default on its debt become a self-fulfilling prophecy.

As government bonds tend to be held in substantial part by domestic banks, when the government defaults, the resulting losses on these bonds endanger banks' solvency. In this way, a fiscal crisis can lead to financial crisis. The causation can also run the other way: the government may be forced to bail out large banks at risk of default to avoid a systemic financial crisis. However, the additional debt taken on can plunge the government from an already-precarious fiscal position into a full-blown fiscal crisis.

Unsustainable debt developments ultimately force governments to undertake painful fiscal adjustments by cutting expenditures and/or raising taxes. If such austerity is not timed well, it can trigger a deep recession and a strong increase in unemployment, a dynamic which has played out in many advanced economies since the financial crisis of 2007-2008.

By contrast, most emerging markets were able to quickly recover from the recent financial crisis. Latin American and Asian countries, which had experienced their own fiscal crises in the 1980s and 1990s, had implemented reforms to bring government debt under control. When they were hit by the fallout of the financial crisis, they had the fiscal leeway to stimulate economic activity through the opposite of austerity – increasing spending and/or cutting taxes.

Advanced economies remain in danger of fiscal crises. Given the US's official public debt of more than 100% of its GDP, and Japan's of more than 230%, investors may at some point conclude that these levels are unsustainable. In the short run, the risks are higher for eurozone countries, which lack the option of devaluing their currencies to ease the necessary fiscal adjustment. Although ostensibly in a better position, many emerging markets have seen credit bubbles in recent years that could turn into financial crises, and then fiscal crises, for example, the rapid credit growth in Asia since 2008.¹ A fiscal crisis in any major economy could easily have cascading global impacts.

Finding ways to deal effectively with the current risks of fiscal crises is, therefore, important. Making fiscal frameworks more resilient in the future is even more important given the substantial longer-run fiscal challenges created by an ageing population.

Note

¹ Bowman, A. 2013. "HSBC: Asia's 'worrying' debt-led growth." *Financial Times*, February 21. Available at <http://blogs.ft.com/beyond-brics/2013/02/21/hsbc-asias-worrying-debt-driven-growth/#axzz2mhjDelCh>

The Global Risks Landscape 2014

Figure 1.1 plots the aggregated survey responses on the perceived likelihood and impact of the 31 risks. The risks are grouped in four quadrants as delineated by the averages of their overall likelihood and impact. As evident, most risks cluster around the two upper quadrants, which identify risks with high impact.

The upper right quadrant shows those global risks that are perceived by the respondents as both potentially impactful and likely to occur. Similar to the risks of highest concern, this quadrant is dominated by economic, social and environmental risks. Fiscal crises and structural unemployment and underemployment are among the most impactful risks; the latter also feature among those most likely to occur, with knock-on effects on income disparities, which is regarded as the overall most likely risk.

Climate change features among the five most likely and most impactful risks. Among other environmental risks, extreme weather events are considered the second most likely, and

water crises also appear high on the list. This suggests a pressing need for better public information about the potential consequences of environmental threats, given that collective action will need to be based on common understanding.

The upper left quadrant shows those risks that are considered less likely to happen, but would be impactful if they did. The deployment of weapons of mass destruction is perceived to be high-impact yet the least likely of the 31 risks, despite recent developments such as North Korea's alleged third nuclear test and the deployment of chemical weapons in Syria. Other lower-likelihood, high-impact risks are the political collapse of a nation of geopolitical importance, an oil-price shock and the inability to deal with pandemics.

Box 1.3: Risks that Flow from Water

Contributed by the Global Agenda Council on Water Security

Water crises and extreme weather events have been identified by the World Economic Forum community as two of the top 10 global risks. This is hardly surprising, given the devastating impacts of having too little water, or too much. While water's immediate impacts are often local, water security is now recognized as a systemic global risk.

In 2010, floods in Pakistan paralysed large parts of the country for many weeks, killing thousands of people and wrecking the rural economy. Thailand's slow-onset flood in 2011 caused fewer deaths but showed how one local event could have an impact across the world: global car production slowed as supplies of components were cut, and hard-drive manufacture for the world's computers was slashed. Similarly, Japan's GDP and global industrial production dipped significantly following the tsunami of March 2011.

Too little water can also have systemic impacts. Drought in Russia in 2010 led to restrictions on agricultural exports, causing the price of staple grains to rise across North Africa and the Middle East. The resulting food shortages and price rises aggravated the tensions that led to the Arab Spring. Some studies suggest that water scarcity could reduce grain production by as much as 30%.

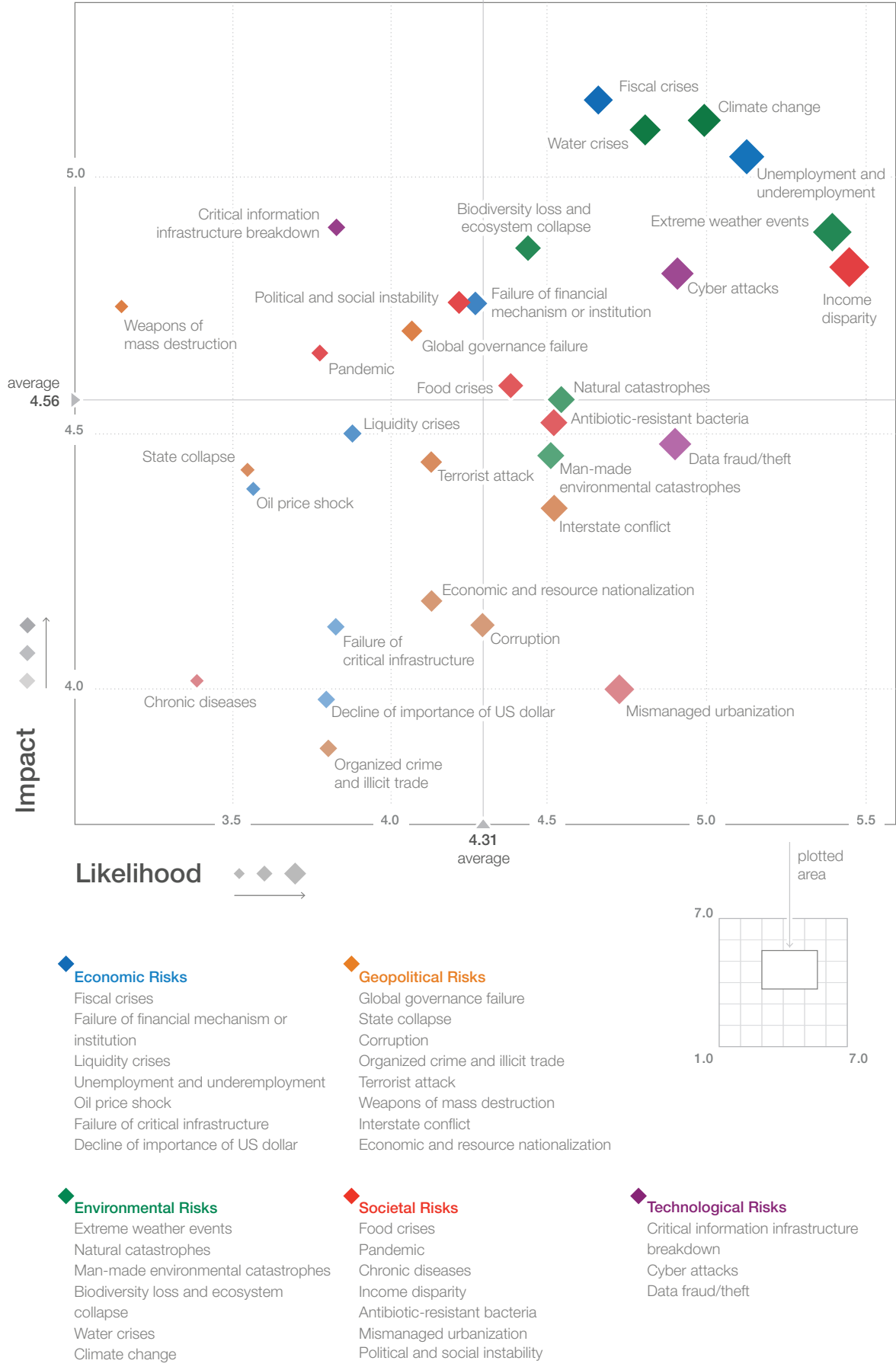
In the future, geopolitical tensions over access to strategic water resources could become more systemically impactful, and water shortage coupled with poverty and societal instability could weaken intra-state cohesion. Because of the systemic importance of water for global economic activity, any failings in its planning, management and use in one country can ripple across the world. That management is becoming increasingly complex and difficult as populations expand and people grow wealthier, demanding more freshwater to supply cities and factories and consuming more foods, such as dairy and meat, that need more water to produce. Water is equally key for energy production. While the world population grew fourfold in the 20th century, freshwater withdrawals grew nine times.

While there is growing concern about future climate change exacerbating water-related risk, many countries cannot even manage today's climate variability. Drought and flood could increasingly ravage the economies of poorer countries, locking them more deeply into cycles of poverty.

Beyond water quantity, water quality is another critical issue. Pollution incidents have paralysed business operations in parts of China and elsewhere, disrupting global value chains and damaging corporate reputations – poor water quality or shortages are often blamed on business operations even when businesses comply fully with regulatory requirements.

How can the global community respond? The overarching prescription is for a package of investments in information, institutions and infrastructure. But successful water management needs the cooperation of a wide network of water users, public and private institutions.

Figure 1.1: The Global Risks Landscape 2014



Source: Global Risks Perception Survey 2013-2014.
 Note: Survey respondents were asked to assess the likelihood and impact of the individual risks on a scale of 1 to 7, 1 representing a risk that is not likely to happen or have impact, and 7 a risk very likely to occur and with massive and devastating impacts. See Appendix B for more details. To ensure legibility, the names of the global risks are abbreviated. Please see Appendix A for the full name and description.

Complementing Figure 1.1, the five risks considered most likely and most impactful since 2007 are shown in Table 1.3. Although the set of risks and their definitions have been continually revised over the years, the comparison still provides some qualitative insight into how global risk perceptions have evolved.

Environmental risks, such as climate change, extreme weather events and water scarcity, have become more prominent since 2011, while health-related risks (pandemics and chronic disease) have become less so. Concern about

geopolitical risks, such as global governance failure, has given way to concern about socio-economic risks such as income disparity, unemployment and fiscal crises. In addition to the socio-economic and environmental risks, cyber attacks and the breakdown of critical information infrastructure are prominent risks. This arguably reflects the increasing digitization of economies and societies, where rising dependence on information and data, as well as the systems to analyse and use them, has made attacks more likely and their effects more impactful.

Table 1.3: The Evolving Global Risks Landscape (2007-2014)

Top 5 Global Risks in Terms of Likelihood

	2007	2008	2009	2010	2011	2012	2013	2014
1st	Breakdown of critical information infrastructure	Asset price collapse	Asset price collapse	Asset price collapse	Storms and cyclones	Severe income disparity	Severe income disparity	Income disparity
2nd	Chronic disease in developed countries	Middle East instability	Slowing Chinese economy (<6%)	Slowing Chinese economy (<6%)	Flooding	Chronic fiscal imbalances	Chronic fiscal imbalances	Extreme weather events
3rd	Oil price shock	Failed and failing states	Chronic disease	Chronic disease	Corruption	Rising greenhouse gas emissions	Rising greenhouse gas emissions	Unemployment and underemployment
4th	China economic hard landing	Oil and gas price spike	Global governance gaps	Fiscal crises	Biodiversity loss	Cyber attacks	Water supply crises	Climate change
5th	Asset price collapse	Chronic disease, developed world	Retrenchment from globalization (emerging)	Global governance gaps	Climate change	Water supply crises	Mismanagement of population ageing	Cyber attacks

Top 5 Global Risks in Terms of Impact

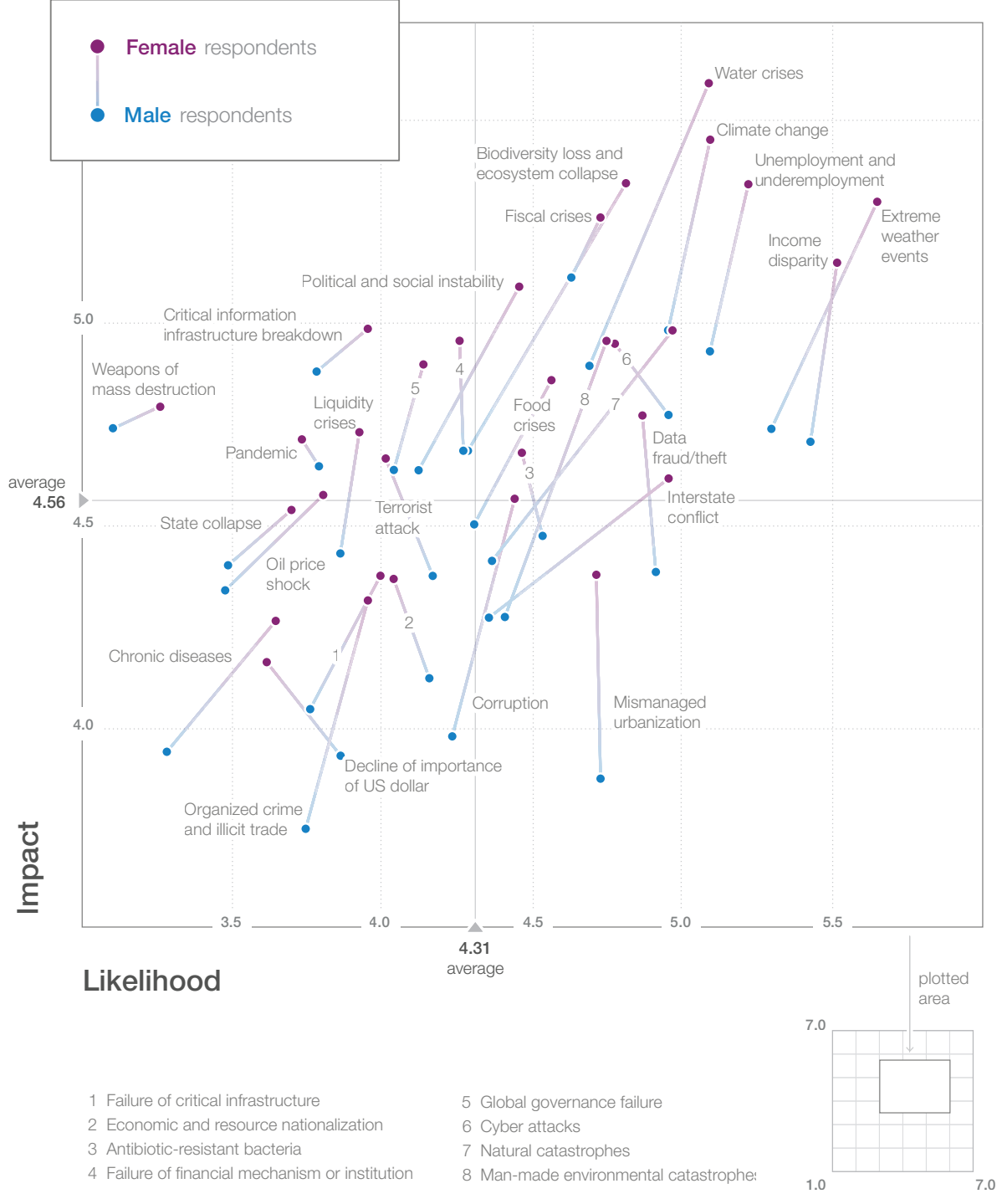
	2007	2008	2009	2010	2011	2012	2013	2014
1st	Asset price collapse	Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises
2nd	Retrenchment from globalization	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change
3rd	Interstate and civil wars	Slowing Chinese economy (<6%)	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises
4th	Pandemics	Oil and gas price spike	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment
5th	Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate change adaptation	Critical information infrastructure breakdown

■ Economic ■ Environmental ■ Geopolitical ■ Societal ■ Technological

Source: *Global Risks* reports 2007-2014, World Economic Forum.

Note: Global risks may not be strictly comparable across years, as definitions and the set of global risks have been revised with new issues having emerged on the 10-year horizon. For example, cyber attacks, income disparity and unemployment entered the set of global risks in 2012. Some global risks were reclassified: water supply crises and income disparity were reclassified as environmental and societal risks, respectively, in 2014.

Figure 1.2: The Global Risks Landscape 2014 – Gender



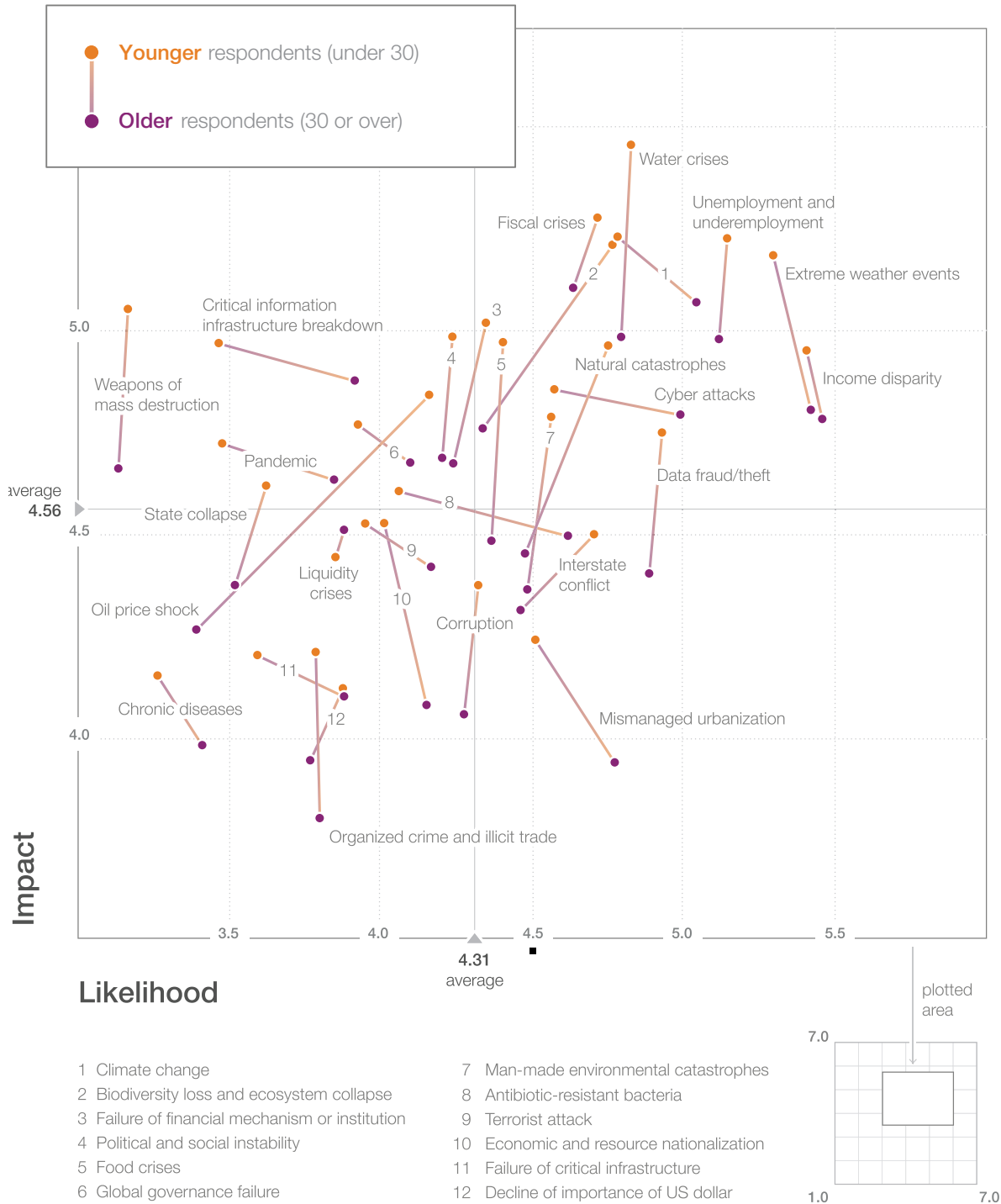
Source: Global Risks Perception Survey 2013-2014. Note: To ensure legibility, the names of the global risks are abbreviated. Please see Appendix A for the full name and description

Responses to the survey can be disaggregated by gender, as shown in Figure 1.2. An extensive body of literature exists on the link between gender and risk perceptions, suggesting women are typically more sensitive to risk than men.⁸ Studies also show that women are more likely to be concerned about environmental issues.⁹ Some argue that this reflects a tendency for women to think more of the long term than men, and to have a more network-focused rather than linear approach to problem-solving.¹⁰

It is also possible to isolate the perspective of young respondents, those aged under 30 years. In general, the younger generation is more concerned about the potential impact of global risks, while perceptions of likelihood show no such consistent deviation.

In particular, younger individuals gave higher scores for the impact of almost all of the risks with the exception of liquidity crises (Figure 1.3). The young consider an oil-price shock, the loss of biodiversity and collapse of the

Figure 1.3: The Global Risks Landscape 2014 - Age



Source: Global Risks Perception Survey 2013-2014.
 Note: To ensure legibility, the names of the global risks are abbreviated. Please see Appendix A for the full name and description.

ecosystem, and the occurrence of natural catastrophes as considerably more likely and impactful than those over 30 years of age. Furthermore, while both age groups agree on the likelihood of environmental risks, younger respondents consider risks such as water crises, man-made natural catastrophes, the loss of biodiversity and extreme weather events more impactful if they were to occur. As with gender differences, similar findings emerge from broader literature about links between age and concern for the environment.¹¹

Younger respondents were also more concerned than their older counterparts about the impact of the failure of a major financial institution, unemployment and political and social instability, which fits with the mindset of the “Generation Lost”, explored in Part 2.3.

The Global Risks 2014 Interconnections Map

While the 31 risks have been separated out for analytical purposes, the numerous and complex interconnections between them can create consequences that are disproportionate and difficult to contain or predict. The Global Risks Interconnections Map (Figure 1.4) seeks to connect the dots by identifying and visualizing the underlying patterns. This allows for a better understanding of the impact of systemic risks so as to mitigate them by identifying the transmission channels between risks and potential second- and third-order effects.

These interconnections do not represent direct causality. They are likely to be indirect, for example through parallel impacts or mitigation trade-offs.

The Global Risks Interconnections Map shows how all global risks are connected to others and underlines the complexity of dealing with global risk in an effective manner. The map visualizes the strength of connection between individual risks – the most strongly connected risks could merit additional

attention due to the multiple ways they affect or are affected by other risks.

Respondents viewed global governance failure as one of the risks most connected to others. A well-functioning system could contribute to preventing and mitigating the consequences of global risks, which by definition require internationally-coordinated responses. The need for an agile and responsive multilateral governance system that can identify, forecast and respond to the multiple and interconnected risks of today's globalized world is explored in Part 2.2 of this report, with particular reference to economic and geopolitical risks.

Macroeconomic risks were strongly linked by respondents to various socio-economic issues. Failure of a financial mechanism or institution, fiscal crises and liquidity crises are risks closely interrelated among themselves and also with the risks of high levels of unemployment and underemployment, income disparity and political and social instability.

Box 1.4: Poor Countries Are Losing Ground in the Race to Adapt to a Changing Climate

Contributed by the Global Agenda Council on Climate Change

The year 2014 is likely to be crucial for addressing climate risks, a point made by United Nations (UN) climate chief Christiana Figueres at the Warsaw Climate Change Conference. Countries made only limited progress on issues such as emissions reduction, loss and damage compensation, and adaptation. Greater progress is urgently needed to create incentives and mechanisms to finance action against climate change while efforts are made to keep temperature rise below 2 degrees Celsius.

Even as governments and corporations are called upon to speed up greenhouse gas reduction, it is clear that the race is on not only to mitigate climate change but also to adapt. Droughts, super-storms and other natural disasters are increasingly causing systemic risks around the world.

Failure to adapt most strongly affects the most vulnerable, especially those in the least developed countries. They tend to lack the infrastructure and capacity to deal with extreme droughts and floods, reduced crop yields and increased stresses on energy and water supplies.

According to the latest Notre Dame-Global Adaptation Index, it will take more than 100 years for the world's poorest countries to reach the current adaptive capacity of higher-income OECD countries. The World Bank estimates the cost of climate change adaptation for developing countries at US\$ 70-100 billion per year through to 2050.

Gradually, however, promising models are emerging of collaboration between the public and private sectors and civil society to strengthen resilience to climate change. An example is the US\$ 3 billion Southern Agricultural Growth Corridor of Tanzania (SAGCOT), intended to create the infrastructure to nurture new value chains. Through techniques such as rainwater harvesting, efficient irrigation and crops that can produce more nutrients for the same input of water, SAGCOT aims to increase food production in a way that is both environmentally sustainable and benefits small-scale farmers and the rural poor.

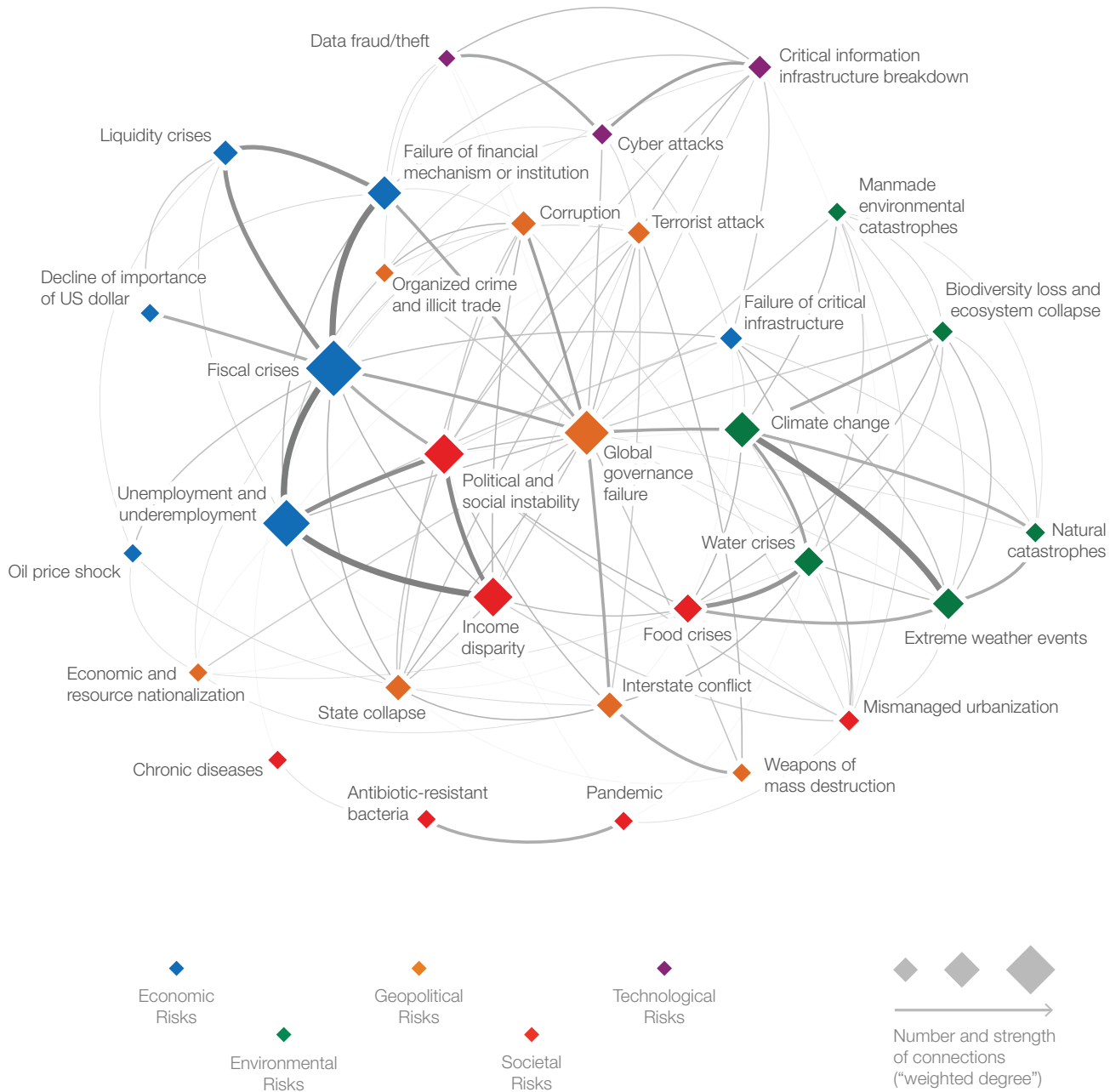
Such innovative and ambitious projects, unlocking investment funds through public-private partnership, showcase the kind of multistakeholder collaboration that will be needed across all sectors to meet the twin priorities of climate change mitigation and adaptation.

Sources

Scherr, S. J., J. C. Milder, L. E. Buck, A. K. Hart, and S. A. Shames. 2013. *A vision for Agriculture Green Growth in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT): Overview*. Dar es Salaam: SAGCOT Centre. Available at http://www.ecoagriculture.org/documents/files/doc_483.pdf

World Bank. 2010. *Economics of Adaptation to Climate Change: Synthesis Report*, Washington DC: World Bank. Available at <http://climatechange.worldbank.org/sites/default/files/documents/EACCSynthesisReport.pdf>

Figure 1.4: The Global Risks 2014 Interconnections Map



Source: Global Risks Perception Survey 2013-2014

Note: Survey respondents were asked to identify between three and six pairs of global risks they believe to be most interconnected. See Appendix B for more details. To ensure legibility, the names of the global risks are abbreviated. Please see Appendix A for the full name and description.

Recent examples illustrate the reality of these interconnections – the failure of financial institutions brought about a financial crisis that resulted in liquidity crises affecting multiple national economies. This in turn led to higher levels of unemployment, widened income disparity and associated political and social tensions and protests, notably in some European countries and large emerging markets. Part 2.3 of this report examines these interconnections through the lens of the challenges facing today's youth.

Environmental risks such as water crises, extreme weather events, natural catastrophes, man-made environmental catastrophes and climate change present another important cluster in the interconnections map. While all these risks are interlinked, climate change is of pivotal importance. The risk of climate change by far displays the strongest linkages and can be seen to be both a key economic risk in itself and a multiplier of other risks, such as extreme weather events and water and food crises. The latest work by the Intergovernmental Panel on Climate Change (IPCC) – its 5th Assessment released in late 2013 – states that warming of

the climate system is unequivocal and that each of the last three decades has been successively warmer at the earth's surface than any preceding decade since 1850. This is the strongest IPCC statement on climate change yet. The increased frequency of extreme weather events, such as storm surges and droughts, is consistent with the latest IPCC modelling.¹² The damage to economic assets, such as city and industrial infrastructure, agriculture and key global supply chains, caused by such extreme weather events is becoming more evident, as is the fragility of the global logistics and mobility systems (see Box 1.5). Consequently, "resilience" has become a key policy and agency theme to counteract the growing sense of economic, political and social risk that changing climatic conditions pose.

The risk of global governance failure, which lies at the heart of the risk map, is linked to the risk of climate change. Negotiations on climate change mitigation and adaptation are progressing by fits and starts, perpetually challenged to deliver a global legal framework. Meanwhile, a regime of national, regional and public-private collaborative efforts to address the problem is gathering pace. This may represent the future of global governance – a more intricate lattice of multiple, interconnected government agreements related to

relatively simple global "goals" (such as a commitment to limit warming to no more than 2 degrees Celsius), supported by a framework of collaborative alliances and partnerships to help deliver on that target across different themes, regions or sectors. Arguably, such a heterogeneous and diverse intergovernmental and public-private response to the climate-change risk could offer more resilience and flexibility to the dynamic challenge of climate change than a homogenous, single global framework.

The technological risks of cyber attacks, data fraud/theft and critical information infrastructure breakdown are strongly connected to each other and to risks such as terrorist attacks and global governance failure. This reflects the changing nature of vulnerability in an increasingly digitized world, and the need for global multistakeholder collaboration to maintain the resilience of cyberspace. These issues are explored in Part 2.4 of this report.

Box 1.5: Growing Cities, Growing Risks

More than half of the world's population now lives in cities. By 2050, the urban population will have nearly doubled to an estimated 6.4 billion. Most of the increase in urban populations will be in middle- and lower-income countries, which have more limited capacity to manage the new risks being created – and existing risks being exacerbated – by the global urban transition.

While urbanization provides important economic and social gains, it substantially increases risks related to ecological disruptions, pollution, climate change and environmental disasters. Populations are agglomerating along coastal areas where climate change portends rising sea levels, extreme weather events, earthquakes and tsunamis. Urban flooding has already become the leading form of disaster in the world, and the UN forecasts that the number of people in large cities exposed to cyclonic winds, earthquakes and flooding will more than double in the first half of this century.

Around 1 billion people, one-third of the world's urban population, live in slums¹ – a number that has been increasing in the current era of high and widening income inequalities. This growing population of urban poor is vulnerable to rising food prices and economic crises, posing significant risks of chronic social instability.

Communicable diseases can spread more quickly in densely-populated areas, increasing the risk of global pandemics. For example, if a new strain of avian flu were to spread globally through the air travel network that connects the world's major cities, 3 billion people could potentially be exposed to the virus within a short span of time.

More generally, cities are connected systemically through physical and informational networks in ways that may become apparent only when events in one location are rapidly transmitted globally in unexpected trajectories. For example, the 2011 earthquake in Japan and subsequent nuclear power plant meltdown had cascading impacts through global supply chains that immediately led to decreases in auto production around the world.

As urban populations grow, multistakeholder processes of inclusive governance will increasingly be needed to make cities resilient against these complex and interconnected risks. While cities have been efficient at driving change in some areas, substantial improvements in urban governance capacities will be needed to address risks, especially in the emerging economies where future urbanization will mostly take place, and which are especially vulnerable to systemic risks.

Note

¹ See <http://www.unhabitat.org/content.asp?typeid=19&catid=10&cid=928>.

Source

For more information, see Douglass, M. 2013. *The Urban Transition of Environmental Disaster Governance in Asia*. Working Paper Series No. 210. Singapore: Asia Research Institute. Available at http://www.ari.nus.edu.sg/publication_details.asp?pubtypeid=WP&pubid=2334.

Risks and Trends to Watch

Adopting a proactive, precautionary approach to anticipating future challenges can help to avoid being caught by surprise and forced into a fully reactive mode. A range of assessment methodologies can be applied to identifying and understanding emerging risks.

In this year's report, respondents to the survey were asked to identify additional global risks that are already or could become relevant and were not explicitly surveyed. Figure 1.5 shows categories of issues that respondents mentioned most frequently. Gathered into three broad categories, the most commonly identified issues are presented here, followed by additional assessments and comments from experts.

Demographic trends have been flagged, including the risk of being unable to deal with rapid population growth and the growing burden of an ageing population – which could also be a source of great opportunities for society and business if managed effectively. Concerns were also raised about unmanaged migration flows, overpopulation and energy crises.

Societal concerns include the breakdown of social structures, the decline of trust in institutions, the lack of leadership and persisting gender inequalities. Risks related to ideological polarization, extremism – in particular those of a religious or political nature – and intra-state conflicts such as civil wars, were also frequently highlighted. Several concerns in this category relate to the future of the youth: the quality of and access to education, the marginalization of young generations and high rates of youth unemployment (see Part 2.3 for more on this topic).

Technological concerns include data mismanagement, loss of privacy, increase in surveillance, and possible abuse of new and more complex information technology, which is further explored in Part 2.4. These risks are becoming potentially more impactful as social media transitioned from a purely social pastime into the corporate communications environment.

In addition, risk experts in the insurance industry have nominated further trends worth highlighting, which could evolve into significant risks:

Environmental: Two kinds of pollution are especially worth noting. First, plastic waste pollution could degrade marine ecosystems and spoil shorelines, posing a credible threat to ecosystems and human health.¹³ Second, endocrine disruptors in the environment have been linked to human health problems through interference with hormonal systems.¹⁴

Another environmental trend to track is the development and production of unconventional oil and natural gas resources, such as oil sands and shales, which require processes and technologies (e.g. fracking) that differ considerably from those used for conventional resources in terms of energy input, cost and environmental impact.¹⁵ Their impact and sustainability are being increasingly questioned.

Figure 1.5: Risks and Trends to Watch



Science and technology: Several emerging risks are associated with the use of new technology, such as the potential toxicity of nanomaterials, the future evolution and impact of 3-D printing, and uncertainty about the potential impact of widespread use of autonomous vehicles, which are capable of sensing their environment and navigating on their own. The potential for abuse, or an accident involving synthetic biology, could even pose an existential risk, as discussed in Box 1.7.¹⁶

Economic: As a consequence of the 2008 financial crisis, central banks in many countries have been pursuing an ultra-loose monetary policy. Although theoretical fears of high inflation and unintended asset bubbles have so far mainly been contained, central banks are expected to tighten monetary policy.¹⁷ The resulting higher interest rates could see volatility in asset prices, capital flows and exchange rates, and rising government debt due to higher interest costs.¹⁸

The rise of the bitcoin and the possibility of other new modes of payment could create new risks as well as opportunities. Risks relate to the facilitation of money laundering, corruption, illicit financial flows as well as volatility and susceptibility to security threats and market manipulation. China is among the governments that have already begun to restrict the use of virtual currencies.¹⁹

Social and political: The “costs of living longer” was raised as an X-factor risk to watch in the 2013 edition of this report, and risks related to longevity remain significant as medical advances increase life expectancy, posing funding challenges in retirement financing, long-term care and healthcare.²⁰ Along the same lines, the prevalence of overweight and obesity is increasing and could result in significant economic cost.²¹

Box 1.6: Sustainable Competitiveness and Global Risks

Appreciation is growing that high historical rates of economic progress, especially those experienced by emerging markets, may not be sustainable in the future.

Environmental pressures that could undermine competitiveness include pollution, biodiversity loss and climate change, while scarcity of mineral resources could endanger future consumption as demand continues to climb. The implications of water shortages, for example, are explored in Box 1.3. Social tensions could also undermine competitiveness, as people fear that economic growth may not translate into the desired results for society in terms of inclusion, equity and cohesion.

Although it is clear that these systemic risks can undermine economic competitiveness, the magnitude of their capacity to do so and their complex interactions are not well understood.

Building on its Global Competitiveness Index (GCI), the World Economic Forum is working on a sustainability-adjusted GCI that captures the extent to which prosperity is being generated in a sustainable way, taking into account environmental stewardship and social sustainability.¹ The findings suggest that there is no necessary trade-off between being economically competitive and being sustainable. Many countries at the top of the competitiveness ranking are also the best performers in terms of sustainability measures – for instance, Switzerland, Finland, Germany, Sweden and the Netherlands.

The sustainability-adjusted GCI can be seen as capturing a country's preparedness to face many of the systemic global risks explored in this report. Among the core factors it measures are environmental degradation, strength of governance, provision of health and education, and macroeconomic stability – all factors that influence how sustainable a country's economic competitiveness is, and how resilient it is to risk. Understanding the relationship between sustainability and competitiveness is crucial to understanding how to mitigate and build resilience to global risks.

Note

¹ For more information on the sustainability-adjusted Global Competitiveness Index, see Chapter 1.2 of *The Global Competitiveness Report 2013-2014*, World Economic Forum 2013.

Box 1.7: An Emerging Spectrum of Catastrophic Risks: Existential Threats

Contributed by the Global Agenda Council on Catastrophic Risks

Throughout history, humanity has been all too familiar with catastrophes affecting life and livelihoods on a major scale: earthquakes, floods, droughts, tsunamis, cyclones and so on. Increasingly, however, the new risks coming into focus are more complex, more uncertain and potentially exponentially more consequential. These are existential risks – those that could either annihilate intelligent life or permanently and drastically curtail its potential.¹

Natural disasters could conceivably trigger existential risks in combination with new technologies – a possibility suggested by the March 2011 tsunami that caused a meltdown at the Fukushima nuclear power plant in Japan. There is also the theoretical potential for “error or terror” in emerging sciences, such as nanotechnology or synthetic biology; within a few decades, for example, it may become as feasible to create real viruses in a home laboratory as it now is to create computer viruses on a home computer.

Among other existential risks is the possibility that breakthroughs in artificial intelligence could move rapidly in unexpected directions; the spread of antibiotic-resistant bacteria could dramatically set back modern medicine; solar super-storms could devastate vital information and communications technology networks; climate change could tip into a self-reinforcing, runaway phase of rising temperatures; a meteorite could hit a densely-populated area or an asteroid could strike the earth.

Although these threats sound forbidding, there are ways to prevent most of them, or at least to mitigate their impacts. While research and innovation can provide new approaches, established institutions can also play an important role. For example, in October 2013 the UN General Assembly approved the creation of an International Asteroid Warning Group. It is important for the public and private sectors to work together to address existential risks. The private sector has experience and expertise to offer in the realms of strategic planning, organizational design, institutional adaptation, research, scientific investigation and technological innovation. However, effective public-private collaboration will require vision, strategy and commitment to more extensive, consistent and systematic approaches at the country, regional and international levels. This, in turn, requires an appreciation that existential risks exist not only in the realms of science fiction but also in reality.

Note

¹ Existential risks as defined by Nick Bostrom of Oxford University.

Conclusion

Economic, societal and environmental concerns continue to dominate the global risks landscape in the minds of leaders around the globe, with the threat of fiscal crises in key economies topping the list. The results emphasize the interconnectedness of all the global risks analysed in this chapter, underscoring the need for effective global governance and a better understanding of causes and consequences to be able to prepare for, mitigate and strengthen resilience to these risks.

Global risks can only be effectively dealt with if there is a common understanding of their importance and interconnected nature, and a readiness to engage in multistakeholder dialogue and action. The effectiveness of such an approach was demonstrated when a protectionist response to the 2008 crisis was contained through a joint effort by multilateral institutions, the private sector and the G20. This report offers a framework for decision-makers to look at risks in a holistic manner and to stimulate discussions on ways to address global risks more effectively.

Endnotes

- ¹ See <http://www.weforum.org/communities>.
- ² See <http://www.weforum.org/community/global-agenda-councils>.
- ³ See <http://www.weforum.org/community/global-shapers>.
- ⁴ See <http://www.weforum.org/community/forum-young-global-leaders>.
- ⁵ An independent evaluation to be carried out by the European Central Bank in major European banks should provide a more detailed assessment of the situation.
- ⁶ According to the US Department of Agriculture, the US experienced its most severe and extensive drought in 25 years in 2012, with some 80% of all US agricultural land experiencing drought. This in turn caused around US\$ 40 billion in lost crops and livestock, according to the National Climatic Data Center, and spikes in commodity prices such as corn, which peaked at US\$ 7.63 a bushel – more than one dollar over its high of 2011.
- ⁷ For example, while there is no doubt a number of reasons caused the devastating civil war, recent research is unearthing the hidden role that climate change, extreme weather events and a water crisis also played in Syria. Between 2006 and 2011, up to 60% of Syria's land experienced one of the worst long-term droughts in modern history. Together with the mismanagement of water resources, this drought led to total crop failure for 75% of farmers, forcing their migration and increasing tensions in urban cities that were already experiencing economic insecurity and instability.
- ⁸ Eckel and Grossman 2008.
- ⁹ See, for example, Van Liere and Dunlap 1980.
- ¹⁰ See, for example, Hong and Page 2001 and Coates and Herbert 2007.
- ¹¹ See, for example, Van Liere and Dunlap 1980.
- ¹² The risk multiplier that climate change presents to water shortages, biodiversity loss, ocean damage and deforestation also creates a complex "heterarchy", rather than a simple hierarchy, of environmental risks, often with non-linear patterns of change and self-fuelling feedback mechanisms. This heterarchy is not contained within IPCC models, but could encompass the greatest economic risk of all from climate change.
- ¹³ UNEP 2011.
- ¹⁴ For a recent in-depth risk assessment on endocrine disruptors, see CRO Forum 2012.
- ¹⁵ See IEA 2013 and <http://www.nytimes.com/2013/03/14/opinion/global/the-facts-on-fracking.html?pagewanted=1&r=0>.
- ¹⁶ See, for example, European Commission 2005.
- ¹⁷ IMF 2013.
- ¹⁸ McKinsey Global Institute 2013.
- ¹⁹ See, for example, <http://www.theguardian.com/technology/2013/nov/18/bitcoin-risks-rewards-senate-hearing-virtual-currency>; and <http://www.forbes.com/sites/timworstall/2013/05/29/bitcoins-in-danger-from-the-bureaucracy/>.
- ²⁰ See, for example, http://ec.europa.eu/economy_finance/structural_reforms/ageing/index_en.htm.
- ²¹ Lehnert et al. 2013.

References

- Bowman, A. 2013. "HSBC: Asia's 'worrying' debt-led growth." *Financial Times*, February 21. Available at <http://blogs.ft.com/beyond-brics/2013/02/21/hbsc-asias-worrying-debt-driven-growth/#axzz2mhjDelCh>.
- Coates, J. M. and J. Herbert. 2007. "Endogenous steroids and financial risk taking on a London trading floor." *Proceedings of the National Academy of Sciences* 105 (16):6167-72.
- CRO Forum. 2012. *Endocrine Disruptors: Risk Management Options. Emerging Risk Initiative – Position Paper*. Available at <http://www.thecroforum.org/endocrine-disruptors/>.
- Douglass, M. 2013. *The Urban Transition of Environmental Disaster Governance in Asia*. Working Paper Series No. 210. Singapore: Asia Research Institute. Available at http://www.ari.nus.edu.sg/publication_details.asp?pubtypeid=WP&pubid=2334.
- Eckel, C. C. and P. J. Grossman. 2008. "Men, women and risk aversion: Experimental evidence." *Handbook of experimental economics results* 1:1061-1073.
- European Commission. 2005. *Synthetic Biology: Applying Engineering to Biology. Report of a NEST High-Level Expert Group*. Brussels: The European Commission. Available at <http://www.bsse.ethz.ch/bpl/publications/nestreport.pdf>.
- Goldin, I. and M. Mariathasan. *The Butterfly Defect: How globalization creates systemic risk, and what to do about it*. Princeton University Press. Forthcoming Spring 2014.
- Hong, L. and S. E. Page. 2001. "Problem Solving by Heterogeneous Agents." *Journal of Economic Theory* 97 (1):123-163.
- International Energy Agency (IEA). 2013. *World Energy Outlook 2013*. Paris: IEA.
- International Monetary Fund (IMF). 2013. *World Economic Outlook*. IMF Survey Magazine. Available at <http://www.imf.org/external/pubs/ft/survey/so/2013/RES040913B.htm>.
- Kaufman, G. G. and K. E. Scott. 2003. "What Is Systemic Risk, and Do Bank Regulators Retard or Contribute to It?" *Independent Review* 7 (3): 371–391.
- Lehnert, T., D. Sonntag, A. Konnopka, S. Riedel-Heller, and HH. König. 2013. "Economic costs of overweight and obesity." *Best Practice & Research. Clinical Endocrinology & Metabolism* 27 (2):105-115.
- McKinsey Global Institute. 2013. "QE and ultra-low interest rates: Distributional effects and risks". Available at: http://www.mckinsey.com/insights/economic_studies/qe_and_ultra_low_interest_rates_distributional_effects_and_risks.
- Scherr, S. J., J. C. Milder, L. E. Buck, A. K. Hart, and S. A. Shames. 2013. *A vision for Agriculture Green Growth in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT): Overview*. Dar es Salaam: SAGCOT Centre. Available at http://www.ecoagriculture.org/documents/files/doc_483.pdf.
- United Nations Environment Programme (UNEP). 2011. *UNEP Year Book 2011: Emerging Issues in our Global Environment*. Nairobi: United Nations Environment Programme. Available at <http://www.unep.org/yearbook/2011/>.
- Van Liere, K. D. and R. E. Dunlap. 1980. "The Social Bases of Environmental Concern: A Review of Hypotheses, Explanations and Empirical Evidence." *The Public Opinion Quarterly* 44 (2): 181-197.
- World Bank. 2010. *Economics of Adaptation to Climate Change: Synthesis Report*, Washington DC: World Bank. Available at <http://climatechange.worldbank.org/sites/default/files/documents/EACCSynthesisReport.pdf>.
- World Economic Forum. 2013. *The Global Competitiveness Report 2013-2014*. Geneva: World Economic Forum. Available at http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf.

Part 2: Risks in Focus

2.1 Introduction: Understanding Global Systemic Risk

If societies are to thrive in the face of the global risks explored in the last section, each element of the global system – finance, supply chains, health, energy, the Internet, the environment and others – must become more resilient as most of the global risks are systemic in nature. This part of the *Global Risks* report contains three explorations of how systemic risks could interplay in the coming decade, focusing respectively on instabilities in a multipolar world, the challenges facing the current generation of youth, and the possibility of a breakdown in trust in the Internet.

In general, the biggest challenge in making systems resilient to systemic risk is managing their growing complexities and interdependencies, by proactively addressing collective action failures and resolving problems through international cooperation.

To do this, efforts to understand, measure and foresee the evolution of these complex systems must first be improved. Next, procedures and institutions that are globally coordinated yet locally flexible and responsive must be developed. To meet rising complexity effectively, regulation must not become more complex but, perhaps paradoxically, more simple. Simple and flexible rules are required as rising complexity cannot be matched by ever more complex and burdensome regulations.

Risk in the hyperconnected environment can no longer be treated as something that is confined to particular sectors or domains. Physical transport, trade and travel networks,

energy and water supply networks, and global information technology infrastructure can become either a strong support for global stability or an amplifier of cascading shocks.

Multiple trends are contributing to linking global systems ever more closely and in more complex ways. For example, the increased carbon emissions and reduced ecological diversity resulting from unsustainable economic growth now fundamentally threaten to undermine not only the stability of the global ecosystem but also the economies that depend on it.

Perhaps the oldest form of systemic risk is that arising from viruses and pandemics, a threat that has entered a dangerous new phase as people and goods move at increasing speeds and over greater distances, with many passing through a small number of airports and other hubs. Increasing antibiotic resistance is a major concern, while new technologies that promise to revolutionize healthcare also pose risks of contagious diseases being constructed synthetically in laboratories. The potential of food-based pandemics or the spread of toxic elements in an increasingly globally integrated food chain also raises major concerns.

Society can also generate its own systemic risks, notably from growing economic inequality and weakening social cohesion within countries, which threaten political stability. Globalization has left some countries behind and has been associated with rising inequality between and within countries. This is augmented by restrictions on migration and a failure of policies at the national and global levels to promote a more inclusive system. Together, these factors render poor people and poor countries vulnerable to systemic risks.

This section of the Global Risks report on systemic risk draws heavily on Ian Goldin and Mike Mariathan, *The Butterfly Defect: How globalization creates systemic risk, and what to do about it*, Princeton University Press, Forthcoming Spring 2014. Readers are referred to this book for an extensive discussion of all the issues that are summarized in this section and for further analysis of systemic risk.

Institutions are failing to tackle these problems. The growing complexity of today's interconnected world reduces the ability to make well-informed decisions, leading to a loss of responsibility. Politicians often do not gather the support required to focus on longer-term strategic concerns. As social cohesion weakens and citizens seek to wrest control from distant and apparently unaccountable institutions, there is more visible support for extremist parties, as well as nationalistic, protectionist and xenophobic behaviour.

When “foreign” becomes synonymous with “threat”, the case for collective action is made more difficult. Yet it is only through collective action that resilience can be built and the gravest systemic threats mitigated. Social cohesion could, therefore, underpin more effective management of systemic threats – as could a greater understanding of causal connections between actions and events, allowing for the construction of decision-making scenarios in which the consequences of actions may be anticipated.¹

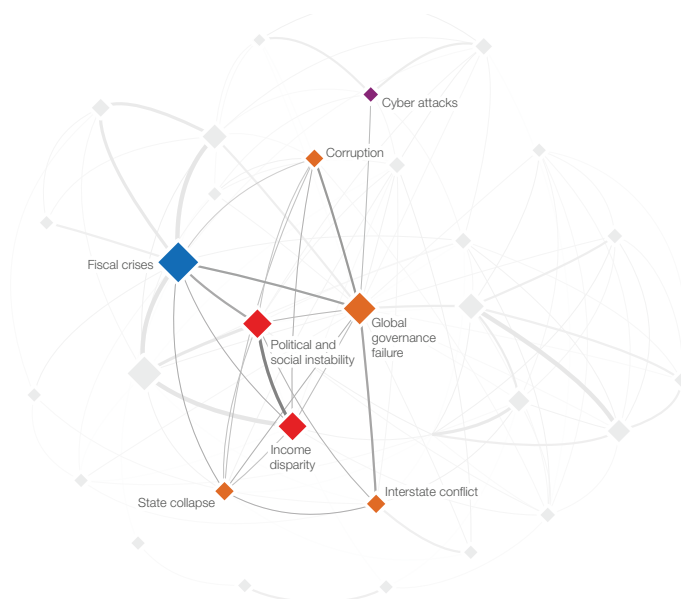
The financial crisis of 2007-2008 was the new century's most widely experienced systemic crisis, and others are likely to follow. The same dynamic of individually rational decisions leading to greater systemic vulnerability is at work elsewhere. For example, in global supply chains, individual firms increase efficiency through just-in-time and other streamlined management practices, but the removal of spare capacity can reduce resilience as each firm believes that system stability and sustainability are not their responsibility.

Systemic risks are a modern manifestation of the tragedy of the commons. They typically transcend national boundaries and involve shared resources as well as causality that are indirect and time-delayed.² They are resistant to direct technical solutions, requiring instead changes to stakeholders' behaviour. Hence, all stakeholders must display greater responsibility – including global businesses, governments, international organizations and civil society – while efforts are made to fundamentally reform global governance. The current system, created in response to the Second World War, requires radical changes, including a renewal of mandates, shareholding and skills to reflect 21st-century realities.

Yet, as the interconnections between transport, communication, financial and other world systems become increasingly complex, the traditional concepts of risk have become inappropriate as a basis of modern global governance. Systemic risks include elements that cannot be easily quantified using traditional tools and formulas from probability theory and mathematics, or made to fit the classical distinction between risk and uncertainty. As it becomes increasingly difficult to identify direct causality, traditional risk management needs to be supplemented with new concepts designed for uncertain environments.

The next three sections explore in more detail how individual risks could combine to create systemic global risks. These sections are followed by an analysis of concrete actions that leading companies and nations are taking to deal with such risks, both individually and through public-private partnerships.

2.2 Instabilities in an Increasingly Multipolar World



Domestic pressures are denting both the appetite and the ability of advanced economies to maintain their authority on the global stage. Large emerging-market countries are keen to play a significant role but are struggling to reconcile rapid economic growth, dramatic social change and complex political reform. At the same time, global multilateral institutions are finding it hard to achieve consensus, and thus concerted action, on critical matters due to the proliferation of assertive, discordant voices. Figure 1.4 in Part 1 shows how the failure of global governance is connected with other risks.

Already, states are prioritizing short-term or proximate concerns over long-term or more global issues.³ Not only may a resulting global leadership vacuum fuel geopolitical instability in the years to come, it may also exacerbate global governance challenges and have undesirable consequences for the long-term development of systemically important sectors such as energy, financial services and healthcare.

Demographic and economic changes, such as growing middle classes in most emerging-market countries, ageing populations in Europe, China and Japan, and fast-expanding populations across much of North Africa, the Middle East and India, are transforming societal expectations and shaping national political priorities. In parallel, ever more extensive trading relationships, international travel, migration and technological advances are increasing the speed at which ideas, information, people, capital, goods and services cross borders.

Against this backdrop, key geopolitical variables will influence global development over the next decade. These include the ability of key emerging markets to successfully deliver on substantial economic and political reforms, and the willingness of leading powers to cooperate economically and on global governance issues. Thus, across the world,

tension between the domestic imperatives of growth and stability is setting the mood for international relations.

The Risk Landscape of the Future

With a five-to-ten year lens, four potential threats can be identified in light of current trends: emerging-market uncertainties, commercial and political frictions between countries, the proliferation of low-level conflict, and slow progress on global challenges.

Emerging Market Uncertainties

The four BRIC nations now rank among the 10 largest economies worldwide and China is predicted to top the table on a purchasing power parity basis within the next three to eight years.⁴ But emerging markets in general are by no means a unified group, and in the coming years their economic performance is likely to diverge. Arguably, these countries are reaching an inflection point in their development where the growth model of their economies cannot continue to support the creation of wealth.⁵

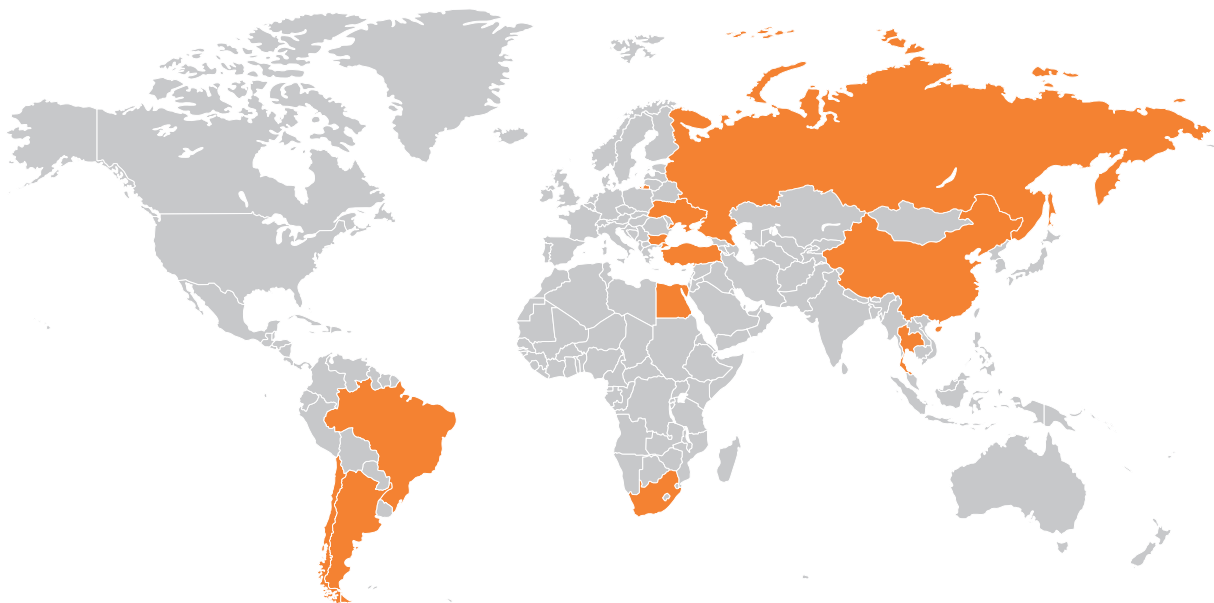
Existing undertones of social unrest may be aggravated by externally driven economic shocks and the unsatisfactory

implementation of far-reaching domestic reforms, even more so where political succession planning is unclear. While increased global trade and the faster movement of capital in a more integrated global economy generally support economic growth, they can expose countries to volatility induced by hot money flows, the fragility of traditional trading partners and a prolonged ebb in the commodity super-cycle, resulting in financial system fragilities. Additional challenges will arise as countries allocate a more prominent role to market forces and extend welfare frameworks, especially where this rubs up against institutional inertia and vested interests in society.

As Figure 2.1 shows, popular discontent with the status quo is already apparent among rising middle classes, digitally connected youth populations and marginalized groups (for example, ethnic minorities and the new urban poor). Collectively, they want better services (such as healthcare), infrastructure, employment and working conditions. They also want greater accountability of public officials, better protected civil liberties and more equitable judicial systems. The misuse of power, official complacency and greater public awareness of widespread corruption have sharpened popular complaints.

Figure 2.1: Countries with Social Unrest in 2013 (selected)

■ Countries with major protests



COUNTRY	FOCUS	PARTICIPATION
Egypt	Leadership	3,000,000
Turkey	Urban development, civil liberties	2,500,000
Brazil	Bus fares, corruption	1,000,000
Argentina	Judicial system	1,000,000
Ukraine	Economic alliances	350,000
Chile	Education system inequality	150,000

COUNTRY	FOCUS	PARTICIPATION
Thailand	Corruption amnesty bill	150,000
South Africa	Labour unrest	50,000
Russia	Political prisoners	50,000
Bulgaria	Energy bills, corruption	30,000
China	Public services, etc.	N/A

Source: Eurasia Group, Oliver Wyman, websites.

Note: Excludes military conflicts in Syria, Mali, Democratic Republic of Congo, Central African Republic, etc.

Interstate Frictions – Commercial and Political

Domestic economic goals will increase pressure on international commercial partnerships. While global trade deals might be harder to come by, notwithstanding the success of the World Trade Ministerial Conference in Bali in December 2013, deals that involve smaller groups of countries are on the rise, with several extensive frameworks currently under negotiation (for example, the Trans-Pacific Partnership, TPP, and Transatlantic Trade and Investment Partnership, TTIP, – see Figure 2.2). These aim for greater economic harmonization on standards and regulations, in addition to tariff reductions. For some governments, a significant political price will have to be paid for being on the inside, such as the opening up of protected industries, while others may face choices that will position their allegiances for years to come.

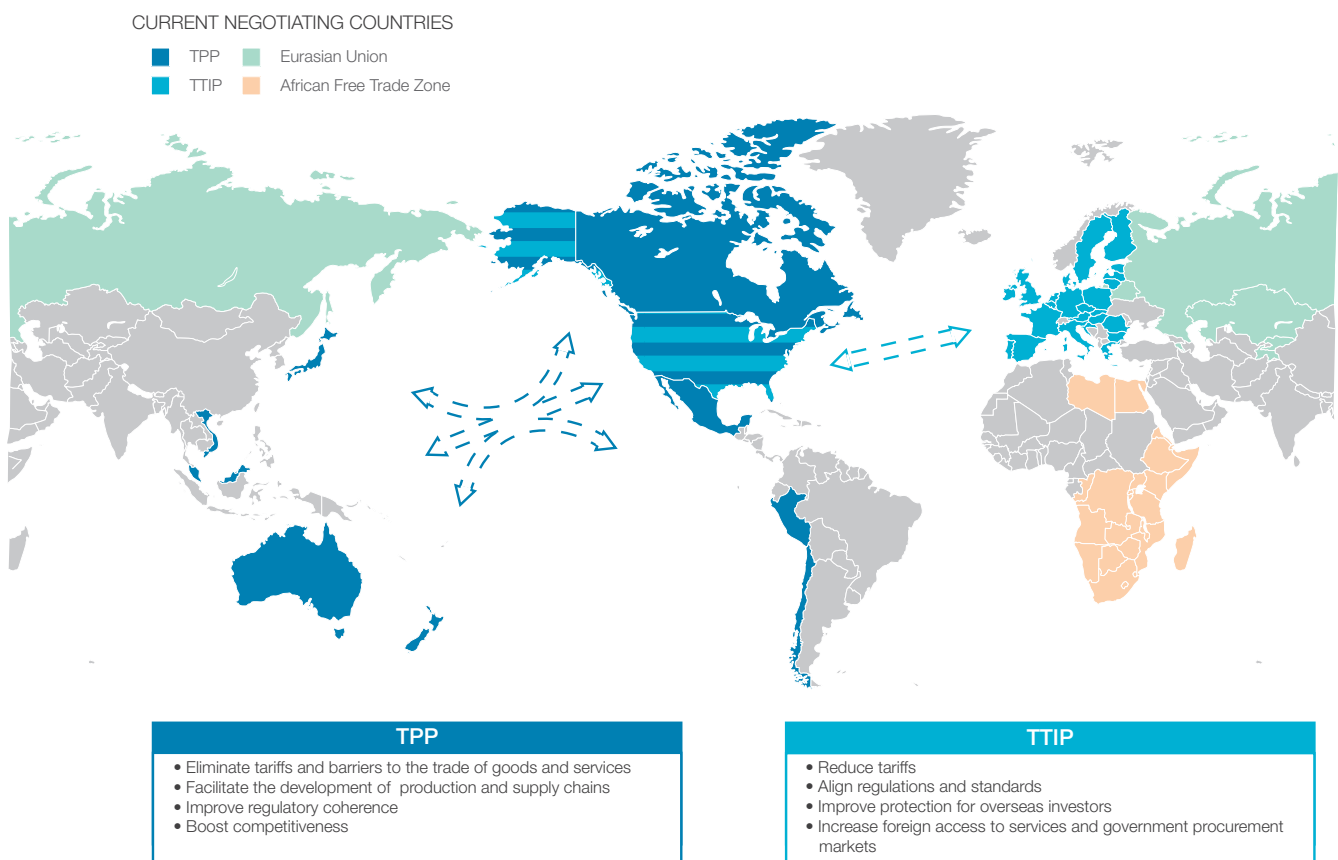
Some countries may use trade and investment relationships as a means of projecting geopolitical power and achieving strategic advantage. At the same time, pursuing geopolitical interests may damage economic confidence, notably in South-East Asia, where rising nationalist expectations and growing pressure on leaders for success is already affecting trade relations in key markets.⁶ Given the large number of potential flashpoints, political missteps may reduce trust and have lasting economic consequences.

Proliferation of Low-level Conflict

Growing opportunities for asymmetrical warfare heighten the risk of national security crises. The risks for developed states posed by traditional forms of terrorism have proved less potent in recent years. At the same time, the number of attacks in the “south” has grown quite quickly and alarmingly. The risk is that terrorist activities in weak or fragile states can undermine states, cause unrest and then spill over into neighbouring countries, causing regional instability.

Technology-based aggressions from state and non-state actors are on the rise.⁷ In the world of cyber warfare, strategic advantage will remain for the foreseeable future with aggressors – barring radical changes to the structure of the Internet (see Part 2.4) – with multiple incidents in every region of the world. Similarly, the inevitable spread of drone technology will create new hard-to-address capabilities for rogue actors – highlighted by the ability of a camera drone to get within three metres of German Chancellor Angela Merkel in September 2013. Multilateral agreements in these low-level conflict areas would help to manage the associated risks, if not eliminate them.

Figure 2.2: New Regional Trade Alliances (selected)



Source: USTR 2011; and Thompson 2013.

Moreover, in a world where fiscal constraints, legitimacy concerns and domestic demands compete for attention, established powers will be more reluctant to accept new responsibilities abroad. As a result, conflicts within and between states may more easily deteriorate into crises. Potential nuclear proliferation in the Middle East will continue to draw high-level political attention in Washington and in Europe. But the capacity to resolve problems elsewhere will likely depend on the creation of regional coalitions of the willing, able and like-minded, given regular impasses in the UN Security Council. This challenge may become especially complex in East and South-East Asia, a region that lacks a viable regional security framework and contains nations that still depend strongly on the US security “umbrella”.

Slow Progress on Global Challenges

Adding to the factors that will weigh on growth, the greater role of regional forums and tendencies towards de-globalization may complicate progress towards sustainable global development. Cross-cutting, slow-burn, systemic challenges, such as climate change, widespread illicit trade, the management of the oceans (including a more accessible Arctic), Internet governance, international cooperation on space missions, and the enhancement of human rights, may prove more intractable when the prioritization of domestic economic and social concerns undermines the ability of states to coordinate and implement policy remedies.

The persistent deadlock and declining expectations regarding international agreements on greenhouse gas emissions exemplify the difficulty in securing collective national self-sacrifice on topics that are not immediately pressing for all and subject to commonly held values. But policy uncertainty surely undermines the global investment environment and deepens scepticism about the ability and willingness of leaders to solve pressing transnational problems.

The growing scale and assertiveness of leading emerging market countries will increasingly challenge the legitimacy, relevance and efficacy of incumbent global multilateral organizations or groupings. Some already face accusations that they reflect an outdated post-Second World War balance of global power, while others are so large, ideologically diverse or financially constrained that decision-making and implementation is hard to achieve. Re-energizing their mandates and encouraging convergence on key goals would be a helpful counterpoint to topics that might best be handled at the regional level.

Implications for Systemically Important Sectors

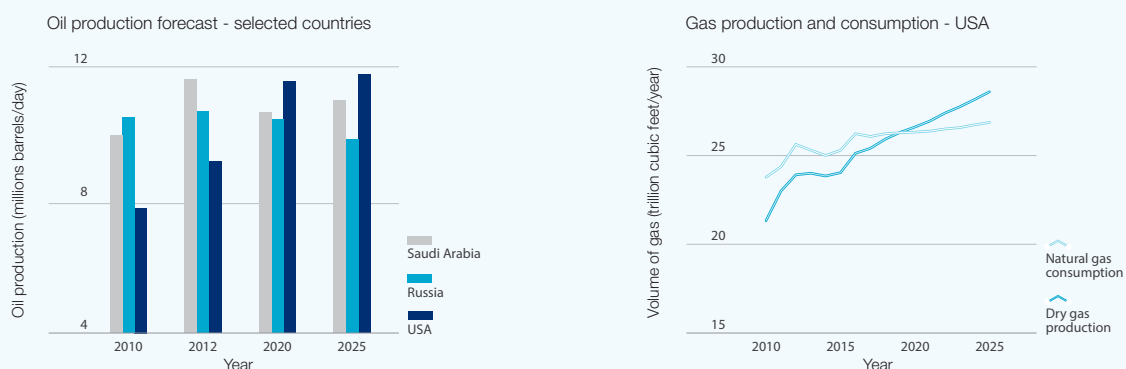
Geopolitical risks will not only affect the interaction between countries but will also affect, and be affected by, developments in three sectors that are critical to the well-being of the global economy: energy, financial services and healthcare. Box 2.1 shows how key themes from the previous section play out in these areas.

Box 2.1: Geopolitical Implications for Systemically Important Sectors

Energy

Geopolitical and energy sector dynamics will remain deeply intertwined over the next decade as a number of key countries strive for greater energy independence, supply chain control and/or supply diversification. Over the coming decade, the US is likely to become the world's top oil producer and a net exporter of natural gas (see Figure A).¹ China is likely to extend its multiple strategic investments in energy assets across the Middle East, Africa and the Americas, and deepen its energy relationship with the Russian Federation. Many European nations, intent on diversifying by fuel type and supply countries, will strengthen their commitment to locally produced renewable energy and also the construction of liquefied natural gas (LNG) terminals.

Figure A: Oil and Gas Production – US Focus (2010-2025)



Source: Based on World Energy Outlook 2013 © OECD/IEA, 2013, table 14.5, p. 481 & table 14.6, p. 484, modified by authors, 2010 data from WEO 2011.

Note: Includes crude oil, Natural Gas Liquids and unconventional oil. Forecast based on IEA New Policies scenario.

Source: US Energy Information Administration database.

The implications for international relations are far-reaching. US energy self-sufficiency and lower feedstock prices are likely to encourage further onshoring of energy-intensive manufacturing. Reduced US dependency on the Middle East may shape perceptions of the region's vulnerability to security crises, with other countries obliged to play greater roles. New unconventional oil supplies, along with financial pressures in emerging-market countries to boost production, will further limit the ability of the Organization of the Petroleum Exporting Countries (OPEC) to set prices. More widely available LNG supplies could undermine the Russian Federation's negotiating leverage with consumers in Europe and Asia. Washington may use LNG exports to achieve foreign policy goals – for example, to encourage the key energy growth markets of Asia to accept US terms for admission into the Trans-Pacific Partnership.

National oil companies are likely to expand their international reach (especially into Africa), using the financial and political backing of their governments to outbid international oil companies (IOCs) on assets, although IOCs will be better positioned for (joint) ventures, such as shale gas, where the latest technologies are required – provided the risks of intellectual property loss and potentially escalating royalties can be managed. In some parts of the world, domestic concerns about local content, employment and energy prices may delay or derail the market reforms needed to facilitate energy sector collaborations and investment in infrastructure. In Europe, policy uncertainty resulting from the desire to balance price objectives and environmental commitments may result in inefficient energy systems featuring stranded assets, continued subsidization, investment delays and higher levels of government interference.

Financial services

Stability will be a key objective in this sector. Advanced economies will focus on implementing major reforms designed to improve market resilience. The application of reform principles is already politicized, with domestically drafted regulations (e.g. Dodd-Frank) set up to protect national financial systems at the expense of extraterritorial institutions.² The drive towards regional harmonization by the European Union (EU) is set to continue, generating political friction as members seek to protect their national interests, an example being the negotiation of safeguards in the EU banking union and market legislation by the United Kingdom (UK).

The complex interplay between layers of regulation and the differences between regimes and philosophies – for example, the UK's values-based approach versus the US's rules-based approach – will increase friction and costs related to compliance, transactions and reporting. This may encourage institutions to reconsider the scope and footprint of their operations. Likewise, the deleveraging of the regulated financial system, via higher capital requirements, might force increasing amounts of financial activity outside the regulatory parameter into the shadow banking system in the pursuit of higher returns.

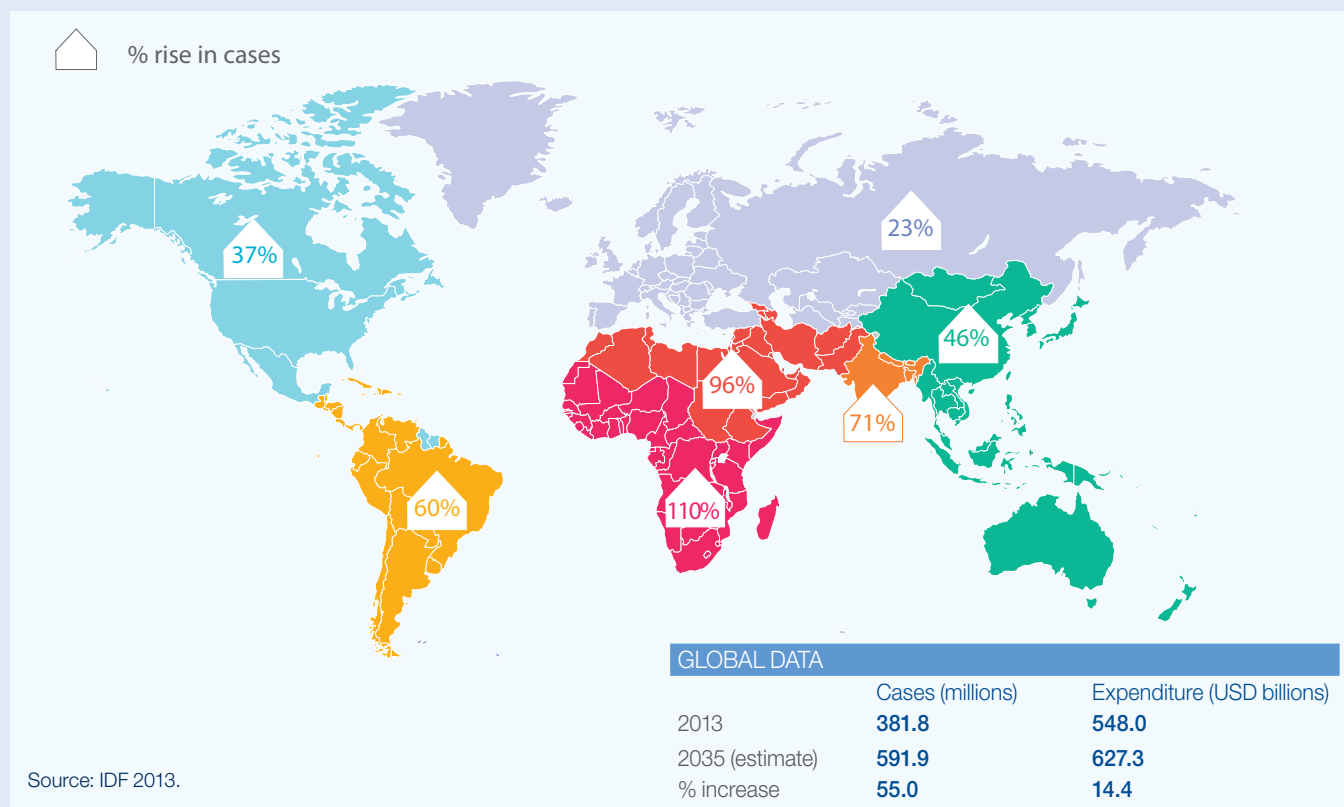
In emerging-market countries, the extent of financial sector liberalization will be shaped by three factors: recognition of the importance of the financial sector as a strategic area of growth; the country's ability to deliver substantial structural economic reform without significant domestic instability; and the strength of domestic financial lobbies. Countries that do open up are likely to set a relatively higher bar to entry for foreign institutions, both to prevent distortions and to protect domestic incumbents.

While some measures – such as the establishment of wholly-owned subsidiaries with local capital and governance – should limit systemic risk impacts, other measures may inhibit innovation that could support economic growth. A measured approach to liberalization may help some countries avoid stop-start policies, as seen in Brazil's insurance market, as well as reduce the risk of the unwelcome macroeconomic consequences that come with hot money and incorrectly sequenced reforms, notably inflationary pressures, exchange rate appreciation and asset-price bubbles.³

Leading emerging markets may increasingly seek to position themselves as regional financial centres and reduce their vulnerability to volatile foreign capital flows while increasing their domestic investor base. To attract talent and capital, regional hubs – existing (such as Hong Kong SAR and Singapore) and aspiring (including Istanbul, Shanghai, Moscow, Johannesburg and Dubai) – will need to strategically identify the areas in which they will specialize to better understand the opportunities and risks presented by partners and competitors.

Healthcare

Due to slower economic growth, healthcare funding will be a defining challenge for all countries over the next 10 years. Ageing populations and the persistent rise in chronic and lifestyle diseases (see Figure B) will force both developed and emerging economies to transform provisions and how they are paid for.

Figure B: Projected Increase in Number of People with Diabetes Aged 20-79 (2013 vs 2035)

In emerging markets, any failure to create sustainable universal healthcare systems – a constitutional obligation in Brazil and Turkey, and a stated ambition in India, Indonesia and South Africa – may arouse social unrest. In developed markets, a failure to transform care would threaten the implied social contract with citizens and imperil countries' abilities to finance other public priorities, such as foreign policy. Future cost pressures are likely to fall increasingly on employers and insurance programmes, with an increasing role for the financial sector in all countries.

Necessary reforms in the health sector could have geopolitical implications. A shortage of qualified physicians could increase poaching between countries. Inefficient, localized models of care may give way to consolidated structures. Increasing cost pressures are likely to broaden the supply and demand of health tourism, with the potential for large cost savings. Innovations in care delivery models, such as more radically separating acute specialist care from more remote monitoring / telemedicine could further open up provision of healthcare.⁴ A sharper policy focus on lifestyle improvements could affect the global food production industry, among others.

It is likely that emerging markets will pragmatically open up investment opportunities for foreign firms in healthcare and pharmaceutical provision, albeit sometimes in partnership arrangements. Foreign involvement will probably be blocked in areas that are easily managed domestically, such as the production of simple generic drugs, though more complex areas, such as biologics, may well remain open. Requirements for technology transfer and assistance for local research and development (R&D) are likely to intensify, however – as is apparent in the Russian Federation's Pharma 2020 strategy.⁵

Cost pressures in these countries are likely to lead to the increasing use of compulsory licences, harder scrutiny of pharmaceutical patents and demands for transparency on pricing, as well as controversial pricing mechanisms to lower drug costs. India has already implemented such measures, and similar approaches are anticipated in Brazil, South Africa and possibly China. Rather than taking a blanket protectionist stance, it is likely that governments will target the drugs that cost them the most money, such as those for oncology. This pressure, already echoed in such developed countries as Germany, asks big questions about the feasibility of large-scale research and development work and thus the ability to meet future healthcare needs.

Notes

¹ IEA 2013; and US Energy Information Administration 2013, Annual Energy Outlook. Available at [http://www.eia.gov/forecasts/aeo/pdf/0383\(2013\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf).

² Oliver Wyman 2012a.

³ University of Pennsylvania: The Wharton School 2013b.

⁴ Oliver Wyman 2012b.

⁵ The strategy can be found at <http://pharma2020.ru/>. For an appraisal in English, see the Analytical Summary from the Swiss Embassy at http://www.s-ge.com/de/filefield-private/files/25703/field_blog_public_files/5244.

Strengthening Resilience

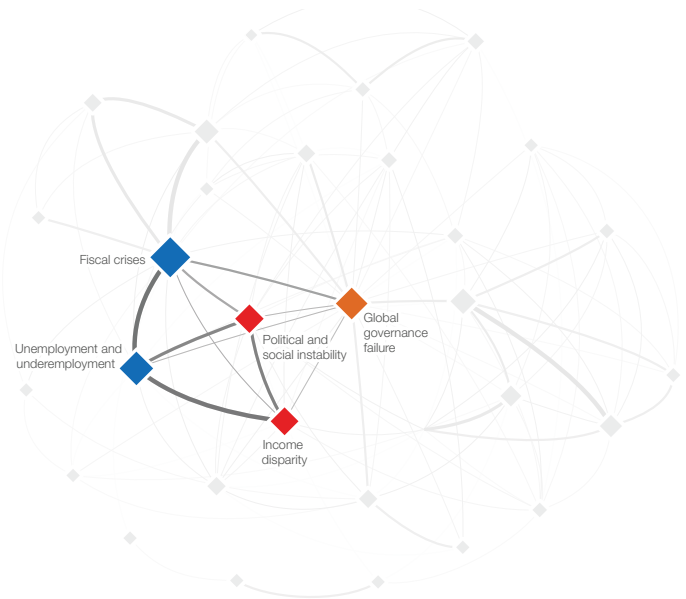
Navigating through a fractured and potentially volatile geopolitical environment will require foresight, flexibility and fresh thinking for countries, companies and multilateral organizations alike. In the face of potential surprises and reversals, the agile and the adaptable are most likely to thrive.

Given the potential for reversals and unwelcome surprises, strategic diversification will be critical. Just as governments should avoid relying on individual security, trade and investment partnerships, so companies should take a portfolio view of their risk exposures to particular markets and seek natural hedges against them.

Successful risk mitigation for all participants will also involve a constant challenge to engage and communicate more deeply. Legitimacy will be increasingly important for multilateral organizations, accountability for governments and transparency for companies. When these aspects are not adequately addressed, loss of trust will have significant political and economic consequences.

Broad-based coalitions, where they are not overly ambitious, may help to overcome new barriers that could emerge from the focus on domestic priorities. Multistakeholder initiatives may increasingly prove key to building consensus, unlocking capital and developing innovative solutions to national, regional and global challenges. It will often be important to nurture relations with all useful partners, regardless of political differences. But careful alignment in areas of mutual benefit will enable participants to harness a wide range of future opportunities.

2.3 Generation Lost?



Around the world, the generation coming of age in the 2010s is most affected by the legacy of the financial crisis and slow economic growth. In many countries, dramatically high unemployment is frustrating young people's efforts to earn, generate savings, gain professional experience and build careers. Traditional higher education is ever more expensive and its payoff more doubtful. These issues need to be addressed inclusively on local, national and global levels to minimize the risks of a breakdown in social cohesion and enduring loss of human and economic potential.

In general, the mentality of this generation is realistic, adaptive and versatile. Smart technology and social media provide new ways to quickly connect, build communities, voice opinion and exert political pressure.⁸ This generation of digital natives is full of ambition to make the world a better place, yet feels disconnected from traditional politics and government – a combination which presents both a challenge and an opportunity in addressing global risks.

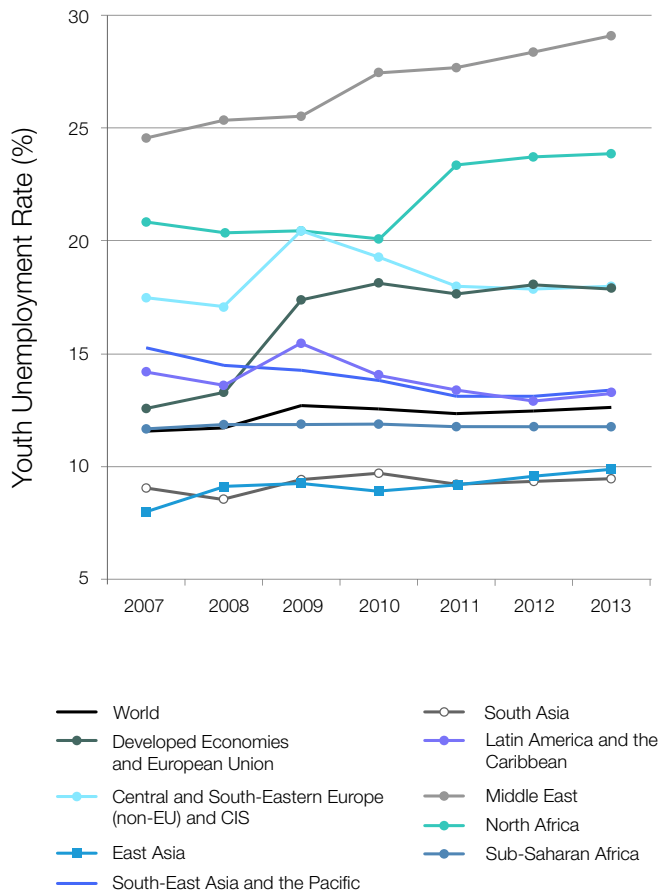
A Generation at Risk

The generational frame in this chapter focuses on a cohort aged roughly between 13 and 23 in 2013. It will be aged about 23 to 33 in 2023. This category overlaps with the millennials or the millennial generation, defined as those born between 1980 and 2000.⁹

Young people entering the job market today are at high risk of unemployment or precarious job situations. Youth unemployment rates have soared since the financial crisis. The situation is especially dire in the Middle East and advanced economies, notably some European countries such as Spain and Greece. Moreover, employment statistics do not reveal that in many developing regions – where 90% of the global youth population lives – a majority of young people are employed only informally.¹⁰

In advanced economies, jobs with long-term prospects – the normal situation for previous generations – have become scarce. Young people are vulnerable to being entrapped by either long-term unemployment or the inability to move on from low-quality and temporary or part-time employment.¹¹

Figure 2.3: Youth Unemployment Rate by Region (2007-2013)



Source: ILO 2013b.
Note: 2012 and 2013 are projections.

In advanced economies, the challenge of finding stable and remunerative employment comes on top of the burden of fulfilling the social contract with an ageing society. Today's youth need to support a growing population of the elderly and save for their own old age. This burden is carried to extremes in Japan, a country with one of the world's highest life expectancies and lowest birth rates, due partly to the lack of widespread support structures for young families.

Prospects for the young generation are brighter in high-growth markets, particularly in Asia, where the middle classes are rising. Yet – as explored in the previous section – the transition of these economies from emerging to advanced is not without problems, including the same demographic burden which afflicts advanced economies. Emerging markets may not have a top-heavy age structure yet, but soon will. While it took 115 years for France's population of over-65s to double from 7% to 14%, it will take China, South Korea and Singapore only about 20 years.¹²

In contrast to most advanced nations, the developing economies of China, Latin America and Africa face additional pressures of population growth as rural-urban migration creates megacities with complex risks and vulnerabilities (see Part 1 – Box 1.5 on urbanization and risk).¹³ Africa's youth population, for example, currently totals 200 million and is projected to double by 2045.¹⁴ Sufficient economic opportunities will need to be generated to absorb this growing and increasingly better-educated labour force. In many countries, the young need to adapt quickly as traditional societies change and new skills are required; skills mismatch is a particular problem in Africa and the Middle East. The growth of populations and cities puts pressure on food production, so the prospects for a young generation of farmers also need to be addressed.

Young people in low-income economies usually cannot benefit from social protection systems. The extent of unemployment and underemployment risks generating social instability, especially in post-conflict settings or fragile states, is evidenced by the Arab Spring. Nearly two-thirds of the youth in developing economies are not achieving their full economic potential, which holds back these economies.¹⁵

In some emerging economies, demographic shifts mean the relative supply of labour will be decreasing within a decade or two. In China, for example, the number of university graduates currently exceeds market demand in many regions, but the situation is projected to flip by 2020 with demographic change and the shift from industries to services. Very quickly, demand for skilled and educated people is expected to exceed supply.¹⁶

This will ease the problems of unemployment and underemployment for the next generation, but many of the current generation may remain "lost" in unstable, low-paid and low-productivity jobs in the informal economy. Access to lifelong education is a possible solution, but requires addressing wider problems in the education sector.

Box 2.2: Acquiring Productive Skills without Losing the Bigger Picture

Contributed by the Global Agenda Council on Education & Skills

Demand for higher education is set to grow in the coming decades. Secondary school graduates will increase in number and a rising share will strive to continue their schooling at the tertiary level in pursuit of “good jobs”.

Unfortunately, these future students have no guarantee that their tertiary education will actually equip them with the skills they need to fill those jobs. Many current graduates are discovering that despite their academic qualifications – often gained at significant expense – they lack the specific technical and professional skills demanded by the ever-changing jobs market.

An obvious response to this problem is to reform the traditional model of academic universities aimed at the middle classes in advanced economies so that it places more emphasis on professional and vocational education and training. Many countries that score highly on the World Economic Forum’s Global Competitiveness Index have such systems, which can be adapted to the needs of emerging economies where much of the increase in demand for tertiary education will be centred.

As the resource-strapped public sector struggles to meet rising demand for higher education, it is also likely that for-profit institutions will play a growing supply role. The necessarily high tuition and fees at many such institutions may lead them naturally to focus on the preparation of jobs-ready graduates, at the expense of disciplines with less attractive career payoffs, such as the arts and humanities.

This, in turn, raises the risk of eroding higher education’s role as a vital space for social discourse. As well as producing graduates with specific skills demanded by the labour market, societies need graduates who can engage in informed and thoughtful discussions of values and norms. An interconnected world cannot afford to neglect nurturing a new generation of well-informed opinion leaders who can guide societies in beneficial directions.

The challenge is not only to prepare the future workforce, but to do so in a way that preserves the role of higher education in focusing minds on the bigger picture.

The Future of Education

As public finances come under pressure, the rising costs of higher education are increasingly borne by the individual. Many graduates in developed economies leave university not only highly educated but also highly indebted.¹⁷

Unfortunately, many then struggle to find their way into careers commensurate with their education levels or sufficiently remunerated to pay off their debts. According to the International Labour Organization (ILO), under-30s in advanced economies are far more likely than over-30s to be taking up jobs for which they are overqualified. Often they change frequently from one temporary job to another. Even before the crisis, the term “Generation 700 Euros” had become a common way to describe this phenomenon in Greece.¹⁸

If potential students perceive higher education as a risky investment, they may increasingly embark on university degrees only if their families are able to offer financial support. Higher education has traditionally been a way of reducing income disparities by enabling people to move up the social ladder, but it may now be starting to entrench income disparities instead, with potentially dire consequences for social cohesion. Some of the challenges higher education institutions face are discussed in Box 2.2.

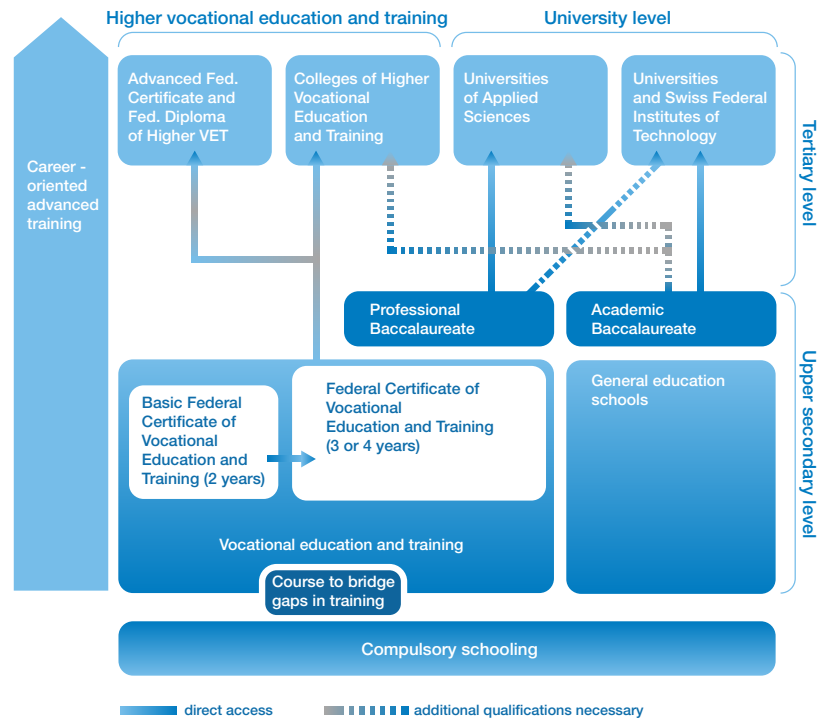
Highly indebted students who cannot find a career allowing them to pay back their debts will not be in a position to save for the future, storing up trouble for social safety nets. They

will also be reluctant to take on more financial risk to re-educate or invest in a start-up, which could potentially reduce the dynamism of economies.

Fortunately, the disruptive role of technology may ultimately restore the equalizing role of higher education. The spread of high-speed Internet is opening up access to free or inexpensive quality online courses. Such courses also promise to help make education and further training a lifelong possibility in developed as well as developing economies, enabling people to update their skills in response to the fast-changing job markets of modern knowledge economies.

Educational establishments and businesses also need to work together to ease the school-to-work transition. The professional education system needs to be revised in many countries. A dual education system, such as in Germany and Switzerland – with professional education on the job and parallel education at a vocational school – may lower many of the barriers and risks depicted above. Other models for public-private partnerships to mitigate risks for effective investment in skills and training are at hand.¹⁹

Figure 2.4: The Swiss Dual System of Vocational and Professional Education and Training (VET/PET)



Source: Federal Office for Professional Education and Technology (OPET) based on Kammermann 2010.

Pragmatism and Political Engagement

A recent global opinion survey sheds light on the awareness, priorities and values of global youth.²⁰ All around the world, young people are well aware of the challenges, such as pressures on old-age pensions, an increase in the occurrence and intensity of natural catastrophes, meeting the energy needs of the world in 2050 or feeding 9 billion people. Indeed, this survey confirms the result of the Global Risks Perception Survey, where young people under 30 came across as more concerned with risks on average and with environmental risks in particular.

The breadth and homogeneity of their awareness speaks of their high level of interconnectedness. Global events are quickly brought to the local level, often with a personal touch due to friends in social networks.²¹ These personal channels filter the world of the “digital natives” – the first generation to be brought up with everyday communication and information dominated by Web browsers and smartphones.²²

Another picture repeated over the world is that young people look for solutions first among themselves and second in the circle of family and friends. They are willing to invest more in private pension schemes, rely on close personal contacts in case of natural catastrophes, want to do more to prevent food waste and are willing to invest in clean energy sources. What does not appear on their radar screen of solutions is the state or government. They think independently of this basic fallback system of the older generation – governments providing a safety net.²³

This points to a wider distrust of authorities and institutions. The mindset of this age cohort has been shaped by experiences such as the apparent helplessness of governments in the face of the recent economic downturn and recent revelations about online spying by US intelligence agencies.²⁴ Anti-austerity movements and other protests give voice to an increasing distrust in current socio-economic and political systems. The young are an important constituent of the general disappointment felt in many nations with regional and global governance bodies such as the EU and the International Monetary Fund (IMF).

This generation draws confidence for taking things into their own hands from the technical developments they experienced while growing up. The digital revolution gave them unprecedented access to knowledge and information worldwide. They are used to collaborating and sharing, and addressing global issues on their respective local levels. They value collaboration and transparency, are able to build abstract networks addressing single issues and place less importance on traditionally organized political parties and leadership.

The challenge for those in positions of authority in existing institutions is to find ways to engage the young generation. Young people’s enthusiasm to address global risks is there to be tapped, but they will engage in conventional governance only if mechanisms to do so can be devised to fit with their new ways of operating.

Investing in the Future

What can be done to mitigate intergenerational tension arising from demographic and economic pressures on welfare systems? How can the millennial and post-millennial generations be socially better protected?

First, youth must be prioritized in political agendas. The younger generation needs jobs and career opportunities and adequate education, as discussed in Box 2.3, as well as power in political forums and discourse. Only if young people see and get a chance to make a living, a career – or just a liveable life – will they integrate into the global society. This

will be a prerequisite to regain the trust of the youth and encourage their participation in societal and political institutions, authorities and leadership.

Second, a systemic environment that fosters long-term investments will be crucial to prevent this young generation from being lost. To bridge the pension and social protection gap affecting the young, countries will have to strengthen both the economic security of the young generation and ensure robustness of old-age pension systems. In emerging markets, the challenge is to put systems in place to ensure that the current youth will not have to face the same problems as their counterparts in advanced economies.

Box 2.3: The Challenge of Youth Unemployment

Contributed by the Global Agenda Council on Youth Unemployment

Urgent, bold and collective action is required to promote job creation and address the skills mismatch. Government, business, education, civil society and the financial sector all have a role to play.

About 300 million young people – over 25% of the world's youth population – have no productive work, according to World Bank estimates. Add low-paid rural and urban self-employed workers, and the estimates rise to 600 million. An unprecedented demographic “youth bulge” is bringing more than 120 million new young people on to the job market each year, mostly in the developing world.

Youth unemployment on this scale is not only a waste of human capital and potential but also threatens to halt economic progress, creating a vicious cycle of less economic activity and more unemployment. It also raises the risk of social unrest by creating a disaffected “lost generation” who are vulnerable to being sucked into criminal or extremist movements.

Part of the problem is that economic growth is no longer generating enough of the skilled and stable jobs that previous generations took for granted. This is a by-product of years of technological advances and globalization, along with labour market regulations that incentivize companies to prefer retaining older workers to hiring new ones.

Of course, technology is also creating many new jobs, businesses and even industries. These jobs demand more from workers than basic skills, but there is a growing skills mismatch. In a recent global survey, one in three employers claimed to have trouble filling open positions with qualified candidates. Many school leavers lack both the specific credentials and “soft” skills – such as critical thinking, problem solving, time management and communication – they need to compete for jobs or become entrepreneurs.

Concerted effort is required to match education and training to the new digital opportunities. Technology is a significant aspect of the employment landscape and opportunity for young people, and one that government and the private sector can directly nurture and support at both the national and sub-national levels. Governments, for example, can mobilize stakeholders behind properly funded national action plans with measurable outcomes, and look for ways to incentivize employers to hire younger workers.

The private sector can guide curriculum and training programme design by communicating about projected skills needs. Businesses can work with the educational sector to establish partnerships with schools and improve apprenticeship opportunities. Educational and civil society organizations, in partnership with industry, can prioritize entrepreneurship education, soft skills and earlier delivery of sector-relevant and professional skills in schools, all of which promote employability.

There are encouraging examples: Serbia's National Action Plan for Youth Employment has been cited as a model by the Council of Europe, while Germany's apprenticeships programme has helped cut its youth unemployment rate to less than half the European average.

Successful initiatives need to be urgently replicated and scaled up to solve this complex, cross-sector challenge. Youth employment policies must also be designed and implemented with the experience of the youth in mind to understand their attitudes and abilities.

Source

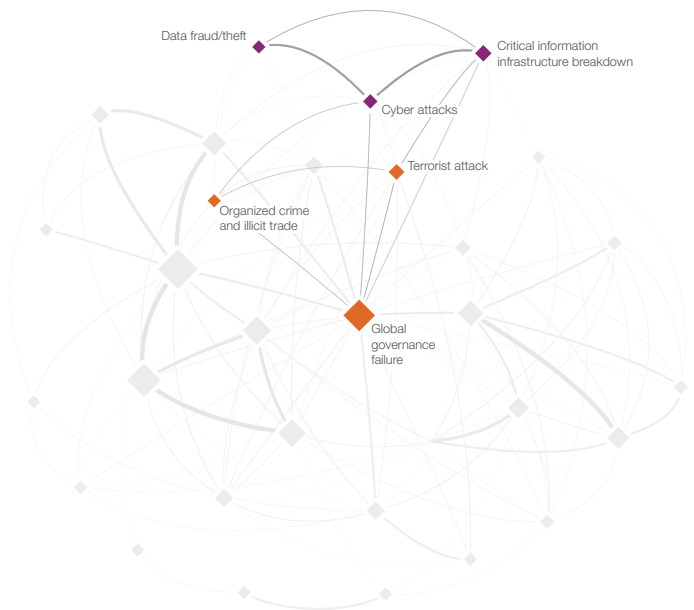
For more details on the recommendations made by the World Economic Forum's Global Agenda Council on Youth Unemployment, see *The Future at Risk*, available at <http://www.weforum.org/content/global-agenda-council-youth-unemployment-2012-2014>.

Third, political and regulatory conditions need to be adjusted to strengthen and incentivize investments with a long-term perspective.²⁵ Companies and financial systems need to give greater priority to their long-term resilience and look beyond short reporting cycles, as explored in Part 2.5.²⁶ At the same time, opportunities must be enhanced for individuals to build assets, to save and to invest.

The public and private sectors can work together to foster lending and investment with long-term perspective. The insurance industry can play a central role in risk mitigation for entrepreneurs and collectives, but governments and international institutions have to facilitate intergenerational asset transfer as well. Only fair and sustainable systems of tax and subsidy redistribution will ensure growth that also encompasses social protection, remedies poverty and allows for resource-friendly and environmentally sound development.

Finally, migration needs to be managed with a long-term and global perspective. Migration can reallocate skilled workforces, providing an opportunity to address the skills mismatch, but with the risk of brain drain in the countries from which skilled labour migrates.²⁷ To make migration a win-win situation for the country of origin and the receiving economy, it is crucial to incentivize a subsequent return of the skilled emigrants to their country of origin and to strengthen the related international agreements.

2.4 Digital Disintegration



While cyberspace has proved largely resilient to attacks and other disruptions so far, its underlying dynamic has always been such that attackers have an easier time than defenders. There are reasons to believe that resilience is gradually being undermined, allowing this dynamic of vulnerability to become more impactful.

First, the growth of the “Internet of Things” means that ever more devices are being connected online, touching many more parts of life and widening both the potential entry points for and impacts of disruption. Second, there is ever-deepening complexity of interactions among the many aspects of life that are dependent on connected devices, making those impacts potentially harder to predict.

Together, these twin trends demand new thinking about global governance of the Internet. Yet the prospect of achieving this has been undermined by recent revelations about the extent to which national security organizations are shaping cyber policy and conducting espionage and attacks, eroding trust among the very stakeholders whose collaboration will be necessary to avert a conceivable “Cybergeddon”.

Offence vs Defence in Cyberspace

Cyber risks are not new. It was written in 1988 that “espionage over networks can be cost-efficient, offer nearly immediate results, and target specific locations ... insulated from risks of internationally embarrassing incidents.”²⁸ Warnings about a “cyber Pearl Harbor” extend back to 1991.²⁹ However, although online espionage and crime remain daily issues, cyberspace has so far been resilient to truly disruptive infrastructure attacks, those that could break systems or societies and not just pilfer information.

Cyber incidents have so far tended to have effects that are either widespread but fleeting (such as the Morris Worm, which took down an estimated 10% of the early Internet) or persistent but narrowly focused (like the 2007 attacks on Estonia). No attacks or even failures have been both widespread and persistent. This is due to robust standards and networks, high levels of investment and the ability of the technical community to flock to and overwhelm disruptions (such as undersea cable outages). Such feats are possible only due to the open and participative structure of the Internet, driven by non-state actors such as incidence response teams and service providers.

Nonetheless, risks to the Internet continue to grow more serious for one key reason: attacking others in cyberspace (breaking into or disrupting their system) has always been easier than defending them. The offence has had the advantage over the defence. This dynamic is in part historic: the Internet was built for resilience rather than security, since everyone using it in the earliest days was trusted. But the practical underlying dynamic – an attacker needs only to find a single way through defences at a single point in time, while the defender must defend all vulnerable points forever – increasingly threatens to undermine that resilience.

Many companies use a “red team”, or penetration testers, to try to break into their own online systems to improve their security. This practice dates back to at least 1979, when the ARPANet had not yet become the Internet and TCP/IP protocols were not yet standard. As one report put it back then: “Few, if any, contemporary computer security controls have prevented a [red team] from easily accessing any information sought.”³⁰ The same remains true today, and cyber risks will likely continue to get more serious, year after year, until global stakeholders can upturn this underlying dynamic or restore trust.

This is not impossible. In physical warfare, the dynamic between attackers and defenders has flip-flopped with inventions such as the machine gun and the tank. It will, however, be made more difficult by the online world’s increasing interconnectedness and complexity.

Interconnectedness, Complexity and Systemic Risks

A threat to the Internet increasingly means a threat to everything. Every part of the world’s societies and economies uses the same underlying infrastructure, the same hardware, software and standards with billions of devices connected to the Internet, from simple e-book readers to electrical distribution networks.³¹

In the past, cyber attacks typically had only a limited effect because they broke only ones and zeroes or things made of silicon. Organizations under attack might have a bad week, but after that they generally could execute business continuity plans, rebuild computers and use data from securely backed-up vaults. However, projects such as the Smart Grid – online connection of electrical power generation and transmission – are increasing the possibility of cyber attacks breaking things made of concrete and steel.

As Rod Beckstrom, former President of Internet Corporation for Assigned Names and Numbers (ICANN), puts it: “Everything that is connected to the Internet can be hacked, and everything is being connected to the Internet.”³² This growing hyperconnectivity raises the prospect of disruptions having systemic impact. Previous publications from the World Economic Forum have highlighted that interdependence introduces new vulnerabilities and opportunities for failures cascading from unexpected directions.³³ This can have far-reaching impacts: “When the shock to the system is greater than what the system can tolerate, the number of functions the system can perform may decrease dramatically.”³⁴

What kinds of disruption are possible? Cyber risks are often summarized through the acronym CHEW – crime, hacktivists, espionage and war.³⁵ But there are other risks in cyberspace that could have systemic impacts. For example, a large cloud provider could suffer an Enron- or Lehman-style failure virtually overnight.

Environmental triggers could also easily play a role, especially given the inherent fragility of the underlying physical infrastructure. A long-dreaded earthquake on the San Andreas fault could devastate the world’s technical centre of Silicon Valley. A solar super-storm could cause substantial outages of national grids, satellites, avionics or signals from global navigation satellite systems (GNSS). The growing mass of “space junk” in orbit around the earth also poses a threat to GNSS.

A surprising number of critical systems rely on GNSS, including emergency 911 calls, ATMs and other financial infrastructure, and both wired and wireless communications networks.³⁶ Wireless is fast becoming the vital “last few metres” of Internet connection, and there are growing concerns that government sell-offs of the radio spectrum may have made it more vulnerable to interruption. The World Radiocommunication Conference in 2015 will analyse the extent and potential consequences of this nascent risk.

Disruption to the critical systems that rely on GNSS could have significant cascading effects while workarounds are found for systems that now depend on hyperconnectivity, since fewer and fewer people now remember the old pen-and-paper ways of doing things. Risks arising from hyperconnectivity urgently require multistakeholder collaboration, but trust among stakeholders is under pressure.

The Role of National Security Organizations

Recent months have seen a series of revelations about the online role of national security organizations. The militarization of cyberspace was already common knowledge: over 30 nations have a published cyber warfare doctrine, with 12 having formal organizations (such as the US Cyber Command).³⁷ However, wider understanding of the extent to which national security organizations have allegedly been using the Internet for espionage now threatens repercussions that may make it more difficult to prevent widespread attacks, or contain them when they occur.

For national security organizations, the dynamic of attackers having the advantage over defenders brings advantages of being able to spy anonymously on their adversaries. However, by the same logic, nations are also vulnerable to the use of such tactics by others. Immediate benefits to national security come at the price of more long-term cyber risk for interconnected societies and economies.

An increasing erosion – or even eventual breakdown – of international trust seems a natural consequence. A lack of trust and confidence helped to accelerate the financial crisis (such as when nations limited the amount of help their banks could give to subsidiaries in other nations) and could prove similarly disastrous when dealing with international cyber shocks.

There are already signs that revelations about the role of national security organizations have exacerbated risks of fragmentation of the Internet, which could lead to an overall erosion of the factors that led cyberspace to be so transformational in the first place. In the early days of the Internet, the interests of industry, governments and society largely converged. Now that the stakes are higher, these interests are diverging and conflicting, which can lead to suboptimal solutions, reduced innovation and investment, and a risk of a fragmentation of the Internet; for example, through the imposition of strong national boundaries where none currently exists.

This trend is already apparent, most clearly with the approach China has taken, but also with reports that the US government may have leveraged US-based IT and telecom companies as part of national security surveillance efforts. As nations are increasingly distrustful of the US government not to look at their data if it is stored in or transits that nation, they are more likely to follow the lead of Brazil or the EU to consider erecting laws to ensure that data on their citizens does not leave their own jurisdictions.

Concerns about the US hosting ICANN, the main governance body for the Internet, could further fuel a Balkanization of the Internet. This trend is also apparent in corporate “walled gardens” that attempt to lock users in or restrict what software can be run in the walled environment, and provisions by governments to block preferential market access to IT firms in other countries.

The main casualty of US spying allegations may not be US relations with Germany or Brazil, but people’s trust in their government’s integrity on online privacy. Young people around the world, disillusioned with traditional politics and authorities as explained in the previous section of this report, may increasingly see governments as an online aggressor to be confronted. Behaviour such as online spying that national governments and the Cold War generations might see as business-as-usual are likely to be seen as much more personal affronts today.

This complex interconnection of issues touches on multiple interacting layers – standards, infrastructure, data and derived knowledge – which have outpaced the adaptive ability of the world’s governance response. Certainly the governance approaches will have to change, which could

have a profound effect on the value that society could and should expect from the Internet in a more hyperconnected world.

The Worst-case Scenario: “Cybergeddon”

While it is possible for the balance of advantage between attackers and defenders to flip, it is also possible for it to become more pronounced. A future in which attackers – whether hackers, organized-crime groups or national militaries – have an overwhelming, dominant and lasting advantage over defenders could be just one disruptive technology away.

Attackers in this future could achieve a wide range of effects with little input, making large-scale, Internet-wide disruptions easy and common. The Internet would cease to be a trusted medium for communication or commerce and would be increasingly abandoned by consumers and enterprises. Cyberspace would no longer be divided between attackers and defenders but between predators and prey.

Worse yet, this situation could become entrenched as the increasingly fragmented nature of the Internet stymies attempts to reach global agreement on new, more secure technologies or standards. Cooperation among nations or non-governmental organizations would become similarly useless either because there is rampant mistrust in creating newer security standards or because attackers are ubiquitous, relentless and triumphant. A technology company has explored this future in a scenario called “Insecure Growth”: “This is a world in which users – individuals and business alike – are scared away from intensive reliance on the Internet. Relentless cyber attacks driven by wide-ranging motivations defy the preventive capabilities of governments and international bodies. Secure alternatives emerge, but they are discriminating and expensive.”³⁸

This future has also been called a “Cybergeddon”.³⁹ The next generation could grow up with a cyberspace that is less open, less resilient and fundamentally less valuable than the one existing today. The most transformative technology since Gutenberg would regress, to the loss of societies, economies and humanity. Piecemeal, individual solutions generally fail to address the underlying systemic issue: the mismatch between attackers and defenders. The world will not be able simply to secure, risk-manage or information-share its way out of this situation to tip the balance of advantage towards defenders.

Even if international trust were to be rebuilt, attackers would still retain the advantage and new solutions would need to be found. Global stakeholders should be under no illusion that bigger budgets, more information-sharing or more regulation will make much difference. To shift the advantage to the defenders will require new thinking, and soon.

Box 2.4: Towards Measurement of Cyber Risks

As constant digital connectivity becomes the new norm in economies and societies, there is a need to “normalize” cyber risks. A critical step in advancing the collective capacity to manage systemic risks will be to develop methodologies to measure and price these risks. Efforts to quantify such risks are needed, and in some cases have started, at multiple levels.

At the enterprise level, moving towards a risk-based approach for dealing with cyber threats and vulnerabilities will require improved methods to deal with such risks in line with broader enterprise risk management practices of the kind discussed in Part 2.5. Many organizations are already attempting to evolve their internal practices in this regard, and collaboration among companies to share ideas can also be observed.

A number of challenges must be overcome in such efforts. Not least of these is capturing the full range of potential vulnerabilities – connected supply chains, outsourcing and other factors make the idea of the “enterprise network” somewhat fluid – as well as determining the scope of impact, on stock prices or reputation, for example.

Given the implied value of “intangibles and goodwill” threatened by cyber events, there would seem to be considerable opportunity for the nascent cyber risk insurance market to evolve and mature. While insurance companies are no strangers to underwriting events with a high degree of uncertainty, improved and standardized methods to capture and account for risks at the enterprise level would clearly aid the development of this market. Other non-insurance, risk-transfer markets could also be imagined; some central banks have begun to consider potential systemic risks posed by cyber attacks.

Research has also started on understanding the macroeconomic impact of cyber risks on national competitiveness, GDP and growth. Countries’ ability to drive competitiveness through technology has been documented by the Forum’s *Global Information Technology Report* for many years, while other studies have focused on the Internet’s contribution to national GDP. However, there are emerging research discussions on specifically measuring a country’s readiness or capacity to deal with cyber risks, as well as the economic impact of slowed business investments due to concerns over such risks.

Finally, further research is required on the impact of concerns about cyber risks on global trade flows and output. Security concerns can lead to, or be used to defend, protectionist positions that can have a negative impact on trading relations. Should such concerns result in a fragmented policy landscape or the Balkanization of the Internet, global trade will suffer.

A Question of Trust

Increasingly, there is recognition that the growing role of cyberspace is not only a technical and geopolitical concern but also presents serious risks to economic well-being. While the failure of critical online infrastructure represents a systemic risk that could impact global growth, so does a large-scale loss of trust in the Internet. Stakeholders may need to move beyond traditional solutions, with fresher ideas that can scale and move away from a national security mindset.

Thinking of cyberspace in economic terms offers several advantages. Economic cooperation and recognition of the gains from global trade has provided a positive platform to promote global international relations, rather than focusing on narrow national interests and protectionism. This can be directly applicable to cyber risks. Protecting the “common good” of the Internet creates strong economic incentives among the youngest generation, the “digital natives”.

Of course, the economic frame is more than an analogy. Many corporations already think of cyber risks in terms of reputational and stock-price impacts, raising the issue to the strategic level that an effective strategy requires. Some countries, too, have taken explicit steps to position themselves as safe places to do business in the digital age, integrating cybersecurity with capacity building.

Many of the gains already seen from globalization would not have been possible without the Internet. Much of the innovation and promise of growth foreseen in the coming years is also predicated on an Internet as integrated as it is today, and similar levels of trust. These innovations are occurring at all levels, from entire industries (e.g. the “connected car”) to individual entrepreneurs in emerging and developing economies around the world.

The economic perspective does not preclude other perspectives. Geopolitical, military and technical dialogue will still need to continue. But to the extent that stakeholders can recognize the tremendous gains from a stable, secure and resilient Internet, the space for constructive discourse can be expanded and a useful context provided for discussions on protecting cyberspace.

A critical element in advancing this discussion will be improving the collective ability to measure the economic impact of cyber risks, at all levels – within individual businesses, nationally and globally (see Box 2.4). Effective methods for measuring and pricing cyber risks may even lead to new market-based risk management structures, which would help in understanding the systemic interdependencies in the multiple domains that now depend on cyberspace.

2.5 Strategies for Managing Global Risks

The previous sections have explored ways in which global risks could play out in the next decade – geopolitical turmoil, the potentially far-reaching effects of youth unemployment and cyber vulnerabilities. Many other ways are possible.

Firms must distinguish between risks they can only hope to manage, and risks they can also hope to address through collaborative action; a consistent message of this report is that global risks are best addressed collaboratively. However, firms cannot rely on others, or on collaborative measures alone, to minimize how they will be affected by global risks. They need to prepare for them within their own organizations.

More and more firms have learned the hard way that when it comes to unlikely but impactful risks, such as natural disasters, intercontinental pandemics or financial crises, it is unwise to rely on the hope that they probably will not happen in the next few years. Tempting as it is for managers to take a NIMTOF (“not in my term of office”) approach to low-likelihood risks, it can lead to severe adverse impacts if the risk occurs.

This section examines the wide variety of ways in which firms approach risk in general. It goes on to suggest strategies for firms – and also governments – to build resilience to shocks from systemic global risks that, through interconnections and interdependencies, may impact them in unexpected ways.

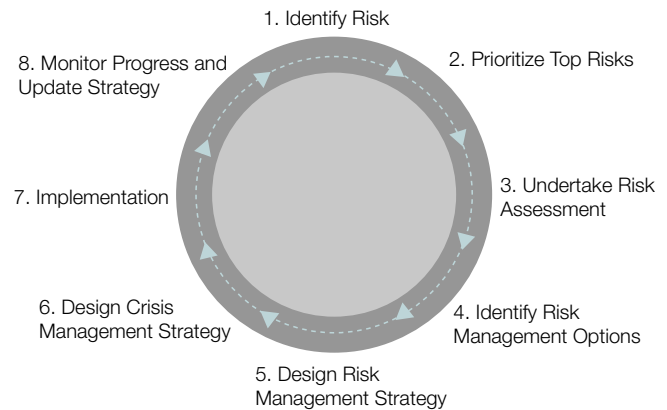
How Firms Approach Risk

Over the past decade, risk management has assumed a much more important role in many firms across different industry sectors. In general, there is a trend away from technical planning for individual risks and towards holistic planning for a range of unspecified risks. A spate of crises and extreme events in recent years has convinced many companies that the benefits of globalization have been accompanied by a much greater degree of interdependency and interconnectedness, bringing new vulnerabilities from unexpected directions.

A related trend is for risk management to be approached from a more strategic and enterprise-wide perspective, typically with a chief risk officer (or some senior executive playing this role) reporting to the chief executive officer and the board, rather than decentralized to departments or reporting to the chief financial officer. Having the chief risk officer report to the top makes possible a more holistic approach to risk, where previously individual departments might have argued only for addressing risks that specifically affected them. This dynamic applies to governments, too, where there is also a tendency for departments to argue for attention to their own sector-specific risks rather than take a more holistic overview of the risks of the greatest national importance that may interact with and reinforce others if not mitigated.

The risk analysis and management process is broadly the same across most firms, as depicted in Figure 2.5, but – as explored in the following sections – there is a wide spectrum of ways in which each step of the process is carried out.

Figure 2.5: The Risk Analysis and Management Process



Source: Kunreuther, Michel-Kerjan and Useem 2013.

Identifying and Assessing Risks

Firms’ perceptions and assessments of risks can be skewed by decision-making biases, such as the “availability” bias. This involves overestimating the likelihood of a recently experienced disaster and underestimating the likelihood of those that occurred in earlier years. For example, a firm in Thailand whose building was burned down during political unrest decided to build its new office nearer the airport, which proved to be a high-risk location when floods afflicted the country in 2011.

Another decision-making bias that can skew risk perception is the tendency to put risks perceived as being below a possible threshold of likelihood in the category of “it will not happen to us”. For example, after the Japanese earthquake, all seven production lines of one large IT firm shut down; its risk planning had previously focused on a worst-case scenario of only one or two lines going down. Finally, another perception distortion is not realizing the hidden benefits of pre-emptive measures such as redundancy.

These are examples of “intuitive”, in contrast to “deliberative”, thinking about risk. Many firms now attempt to avoid the pitfalls of intuitive thinking by employing more formal deliberative techniques, such as scenario analysis, stress tests and ranking/scoring metrics. Still, in some leading firms, risk assessment does not go beyond qualitative analysis through meetings and discussions. Figure 2.6 shows the range of methods employed by firms for identifying and assessing risks, based on a series of interviews of 100 S&P 500 firms conducted recently.⁴⁰

In the finance and insurance sectors in particular, there is strong reliance on quantitative measures of risk probability. Some other firms, wary of being blindsided by erroneous

assumptions in the numbers that go into calculating the likelihood of adverse events, prefer to focus solely on the severity of risks and disregard any attempt to estimate their probability of happening.

In most firms, risk assessment is now a highly formalized process conducted systematically and regularly, whether annually, quarterly, monthly or continuously. In some firms, risk assessment is part of the process through which the senior leadership defines the firm's willingness to assume certain risks as a matter of high-level corporate strategy. Figure 2.7 shows the level at which risk identification, prioritization and assessment are performed in various firms. Box 2.5 discusses risk management strategies of firms.

Figure 2.6: Identifying, Prioritizing and Assessing Risks

Figure A: How Risks Are Identified and Prioritized

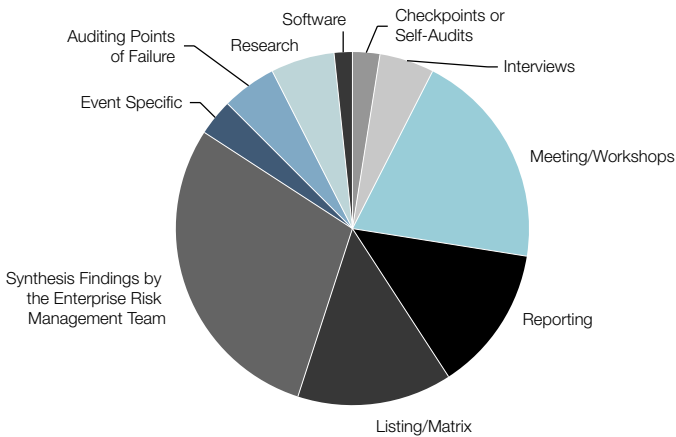
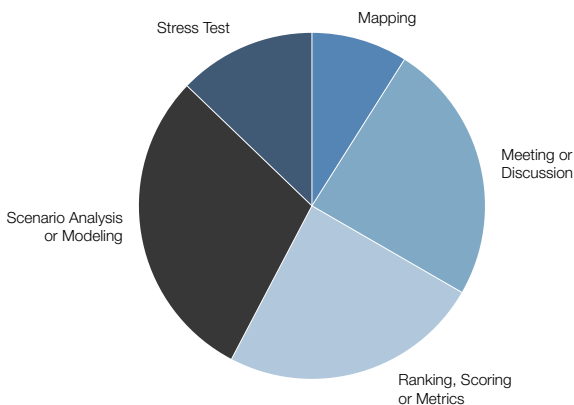


Figure B: How Risks Are Assessed



Source: Kunreuther, Michel-Kerjan and Useem 2013.

Figure 2.7: Who Is Involved in Identifying, Prioritizing and Assessing Risks

Figure A: Who Is Involved in Risk Identification and Prioritization

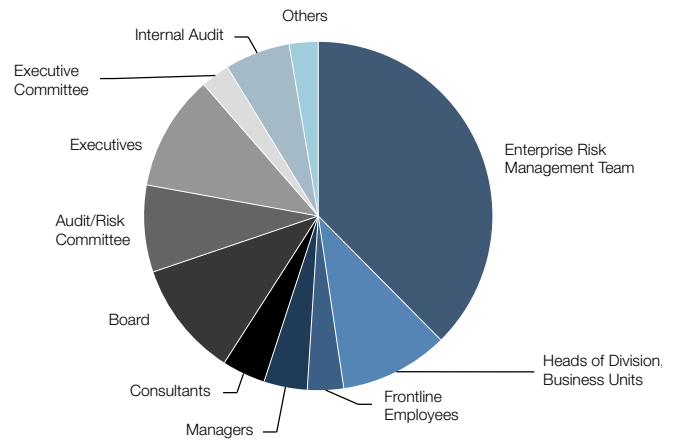
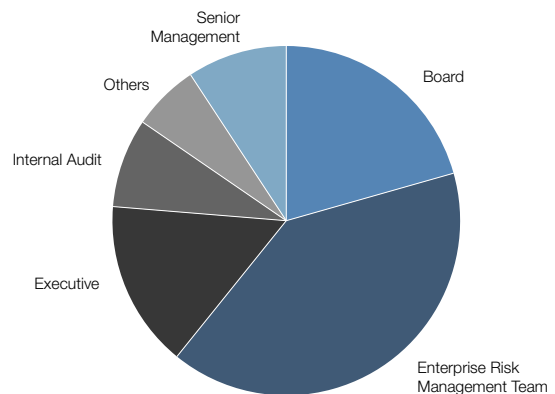


Figure B: Who Is Involved in Risk Assessment



Source: Kunreuther, Michel-Kerjan and Useem 2013.

Collaboration and Learning from Others

Firms are typically much more aware than they were even a few years ago of how interdependencies can lead to shocks affecting them in unexpected ways. For instance, historically a crisis befalling a competitor might have been regarded principally as an opportunity to gain market share; today, there is an awareness of the possibility of knock-on consequences, such as governments responding with hasty and ill-considered regulatory changes affecting the entire industry. Regulators are as prone as other decision-makers to the bias of placing too much emphasis on recent experiences.

Box 2.5: Managing Risk

Risk-management strategies are guided by a firm's risk appetite; the level of risk an organization is prepared to accept to achieve its objectives, such as profitability and safety goals. Often, although not always, there is a trade-off between profitability in times of normal operations and resilience in the face of negative events affecting the firm. Examples of risk management and monitoring strategies include:

- **Mitigation measures:** Actions taken by the firm to reduce the likelihood and/or consequences of a negative event; for example, designing plants to withstand specific levels of natural disasters such as earthquakes, floods and hurricanes.
- **Accountability measures:** Finding ways to incentivize individual employees not to cut corners in ways that would normally be undetectable but would increase a firm's vulnerability in a crisis, such as failing to maintain back-ups. Some firms hire external consultants to assess how effectively they are mitigating risks identified as priorities.
- **Supply-chain diversification:** Sourcing supplies and raw materials from multiple providers in different locations to minimize disruption if one link in the supply chain is broken. Another hedge against sudden unavailability of inputs is to maintain an excess inventory of finished products.
- **Avoiding less profitable risks:** Firms may decide to drop activities altogether if they represent a small part of their overall business but a significant part of their risk profile.
- **Transferring the risk:** In addition to the range of insurance products available – liability, property, business interruption – some large firms run their own “captive” insurance companies to distribute risks across their own different operations and subsidiaries.
- **Retaining the risk:** When insurance is unobtainable or not cost-effective, firms can choose to set aside reserves to cover possible losses from low-probability risks.
- **Early warning systems:** Some firms employ their own teams to scan for specific risks that may be brewing, from political crises, for example, to storms off the coast of Africa that may become hurricanes in the US in the next fortnight.
- **Simulations and tabletop exercises:** Many firms simulate crisis situations; for example, by making critical staff unexpectedly unavailable and assessing how other employees cope. Such exercises can capture lessons to be integrated into the risk-management strategy.
- **Back-up sites:** Many firms are set up so that if one or more factory or office becomes unusable, others are quickly able to assume the same functions.

A crisis-management strategy complements a firm's risk-management strategy by defining roles and decision-making procedures for preserving the continuity of business to reduce the economic, social and reputational impacts to the firm in the event of an emergency. Crisis-management plans identify who will be the most relevant decision-makers in a crisis. The key person is usually a manager in the affected location. In crises that are severe and span international boundaries, the chief executive officer and the board of directors are often involved. A growing number of firms have developed a general crisis plan to address unforeseen risks that complement specific plans for dealing with risks that have previously been experienced or scenarios that are considered especially plausible.

The upside of this dynamic is that it creates awareness of the potential benefits of opening up channels of communication with competitors and the government so as to compare their risk- and crisis-management strategies. Box 2.6 explores the growing acceptance of the need for joint efforts involving companies, governments, civil society and research institutions to minimize the occurrence of global risks and their impact.

Such dialogues enable mutual learning about risks on the horizon; they also create trust, which can be extremely helpful in navigating a crisis. Box 2.7 summarizes lessons learned from recent disasters in Asia on the need for “disaster governance” – coordinating diverse efforts among public, private and non-profit responses in a crisis. Chile's

rapid economic recovery after the devastating earthquake of 2010 is another important example of success in government-led multistakeholder coordination.

Many firms have improved their risk management by systematically learning from their own catastrophic losses and near-misses as well as from other firms, even in different industries. For example, the BP oil spill in the Gulf of Mexico in 2010 prompted firms in various sectors to think more about operational risk. One leading firm in the energy industry studied the experience of investment banks after the financial crisis of 2008 to gain a new perspective on organizational blind spots. An auto-parts supplier revamped its approach to enterprise risk management after studying what happened to Enron and WorldCom.

Box 2.6: Public-Private Partnerships for Managing Catastrophic Risks

Contributed by the Global Agenda Council on Catastrophic Risks

No single entity possesses all the necessary authority, resources or expertise required to assure a community's security and resilience to catastrophic risks. Government action alone cannot be relied on to prevent, protect against, respond to, recover from and mitigate the effects of adverse events. Governments need to be able to leverage the collective strengths and capabilities of the private sector and non-profit communities.

As people and things are increasingly hyperconnected and many critical infrastructure systems are intrinsically international in nature, the impacts of catastrophic events know no geographical, jurisdictional or industry boundaries. The interdependencies inherent in shared and global infrastructure can compound existing systemic risks, making consequences non-linear and hard to predict.

In this environment, to strengthen overall resilience to catastrophic risk, the ability to create, effectively utilize and sustain multistakeholder partnerships is crucial. The public and private sectors must establish channels for structured dialogue, interaction and coordination to more comprehensively understand risks before they manifest and to more effectively manage them when they do.

The public and private sectors bring different capabilities to the table. For example, the public sector can offer disaster management frameworks, including legal protections, personnel and training. The private sector can offer products and supplies, innovative business processes, community understanding and engagement, customer collaboration-driven engagement, and intimate knowledge of how critical infrastructure and communities work at a local level. Both sectors can offer research and development.

However, there is not always a perfect overlap between the interests of public and private sector stakeholders in catastrophic risk management. While they share many interests – such as the safety and security of people and property and continuity of business – the private sector is also interested in establishing competitive advantages. When seeking to create a public-private partnership, all potential partners should be able to identify a value proposition for partnering and demonstrate a return on investment. That means identifying what interests can be aligned and mutual benefits gained.

Successful public-private partnerships also identify and agree to outcomes and objectives, establish roles and responsibilities, leverage environmental factors that support such partnerships, and mitigate any environmental barriers to the successful implementation of such partnerships. The World Economic Forum's Global Agenda Council on Catastrophic Risks works to codify and articulate such leading practices about how public-private partnerships can work.

A cultural shift is under way, out of necessity, towards the creation of public-private partnerships to address catastrophic risks. Analysing the establishment and operations of these partnerships, as well as the effective use of the partners' collective capabilities, is a vital step towards strengthening communal security and resilience.

Open dialogue about risk is important not only outside a company but also within it, to ensure that the board of directors, C-suite and employees share a common understanding of the organizational approach. In fact, more boards are becoming proactive by asking management what the firm is doing to handle global risks as part of their overall strategy. Communication with others in the supply chain can be equally important, given that risk interdependencies can create cascading effects across borders and industry sectors. One of the most important steps a firm can take to improve its own risk management is to work with others in its supply chain to ensure that they are doing the same.

Towards a Culture of Long-term Thinking

The growing trend for boards to be involved in risk management is creating opportunities to shift organizational cultures away from a focus on quarterly results or daily share-price movements and towards the kind of longer-term thinking that is a prerequisite for addressing global risks. A similar shift is also urgently required in government, where the natural focus is on electoral timeframes – the NIMTOF philosophy.

The role of chief risk officer, reporting to the chief executive officer and the board, is an institutional acknowledgement of the challenges in combining long- and short-term thinking –

Box 2.7: Learning from Responses to Large-scale Disasters

Since the devastating tsunami in the Indian Ocean in December 2004, a multitude of large-scale disasters have hit the Asia-Pacific region. Valuable lessons have been learned about the factors that determine how people and institutions cope with disasters, and how to reduce the cascading or compounding effects of disasters.

In the aftermath of a catastrophic event, it is challenging to coordinate the massive influx of resources and organizations to meet pressing needs amid heavy damage to infrastructure. Emergency response to Typhoon Haiyan in the Philippines in 2013, for example, was delayed as most airplanes carrying crucial relief supplies were too big to land on smaller airstrips, causing bottlenecks at nearby international airports.

And beyond the first crucial weeks of the relief phase, coordination has become even more complex as more actors get involved. Alongside national responders and international NGOs, external contributions now typically come from foreign religious-affiliated institutions, private corporations and business networks. As the focus switches from immediate humanitarian aid to longer-term recovery, this can create tensions with efforts to maintain national sovereignty.

The past decade has consequently seen a shift away from “disaster management” to what is referred to as “disaster governance”. There is growing attention to the need for “downward” accountability – ownership of relief and recovery efforts by the beneficiaries in the affected regions – to match the attention already given to “upward” accountability, which is about countering funders’ fears of waste and corruption.

In recent years, for example, ASEAN has partnered with civil society organizations on capacity building for downward accountability. After the 2008 Wenchuan earthquake, China paired institutions offering assistance with a specific region. After 700 bushfires raged across Australia’s Victoria state in February 2009, the response operations featured sharing of information across government agencies and with the public, along with community engagement and local decision-making in the subsequent rebuilding efforts.

In general, disasters are exacerbated by poverty, badly planned and badly managed urbanization, environmental degradation and weak institutions for managing risk at local and national levels. These effects were exemplified by the Thailand and Cambodia floods of 2011. Political support for disaster preparedness activities, from both the legislative and executive bodies, is central, but there is still a lack of funding and prioritization from international organizations and national governments, especially in lower-income countries. These countries may not have the liquidity or borrowing capacity to expeditiously recover from natural disasters, but evidence has shown that risk transfer to insurance markets can be particularly effective for these countries to avoid drastic disruptions to economic growth.

Going beyond the preparedness of institutions and formal mechanisms, containing damage from disaster also calls for an expansion of preparedness in society as a whole. For example, the Singapore government conducts regular large-scale exercises to stress-test crisis capabilities and rehearse the unfolding of interdependencies. An exercise in 2012 involved 18,000 employees participating in terror-attack simulation.

Scientific advances have been made in early-warning systems, digital technologies and in-time meteorological data, but these must be coupled with awareness campaigns and mainstreaming disaster preparedness in educational systems. Countless lives could have been saved as Typhoon Haiyan hit the Philippines had there been a greater level of popular understanding of the devastating effects of the typhoon “surge”.

Source

For more information, see Brassard, C. and A. Raffin. 2011. “Resilience in Post Disaster Societies: From Crisis to Development.” *Asian Journal of Social Science*. 39(4): 417-424.

effectively outsourcing the full-time task of long-term thinking, short-term aggregation and troubleshooting to a designated individual and department. The equivalent in governments is the growing interest in the possible appointment of cabinet-level national risk officers, as was proposed and discussed at the 2012 G20 in the context of disaster risk-financing practices.⁴¹

While there will always be a temptation to prioritize short-term concerns over long-term ones, both firms and governments can seek to nurture an institutional culture of valuing those in charge of thinking about risk, through remuneration, such as contingent bonuses, and other indications of prestige, such as high-level access.

Incentive structures need to be closely analysed and, if necessary, overhauled to encourage long-term thinking. For instance, a culture that rewards decisions made quarterly or annually will likely trigger short-term thinking, while a knowledge management strategy is likely to contribute to longer-term thinking. To foster long-term thinking and commitment to the firm, a significant portion of bonuses in a number of companies is now based on the effectiveness of programmes and recommendations made 5-10 years back.

Despite encouraging trends around the world, discussions with chief risk officers still reveal some frustration in their attempts to get board members to take seriously risks that are perceived as low-probability. Given that the cognitive

biases discussed above affect even senior executives and directors, reframing issues can be surprisingly important. Spreading upfront costs over time is another common technique: amortizing the cost of investments in resilience-enhancing measures over a number of years can make the upfront cost seem less forbidding. This strategy can be combined with negotiating long-term insurance contracts that have lower premiums to reflect investment in protective measures as part of a risk-management strategy. If the premium savings exceed the annual costs of a long-term loan to finance the investment, the mitigation measures will be cost-effective and financially attractive to undertake.

Offering long-term loans to cover investments in resilience is a strategy with wider applicability, being used, for instance, by the World Bank to aid developing countries take steps to reduce risks from adverse events. These could include enforcing building codes to reduce losses from earthquakes, floods and other natural disasters.

Many risk officers have also found that focusing on salient events – describing concrete experiences rather than relying on abstract statistics – is an effective tool to concentrate the attention of high-level decision-makers. This strategy, however, needs to be combined with efforts to ensure there is no undue fixation on specific recently experienced risks.

Ultimately, leaders in both the public and private sectors need to be able to ask themselves concrete questions. The following checklist may provide guidance:

1. What are the top five risks facing the organization and what does its risk appetite suggest with respect to managing them?
2. What are the exposed assets, and how vulnerable are they?
3. What options can address these risks relative to what is being done currently?
4. What support is needed, and from whom?

Despite recent progress, many leaders are still unable to answer these questions confidently. When all can, the world will be better equipped to meet global, systemic risks.

Endnotes

¹ Renn 2008.

² Wynne and Dressel 2001.

³ Bremmer 2012 and World Economic Forum 2013a.

⁴ For a 2016 prediction, see OECD 2013. For a 2022 prediction, see Standard Chartered 2013 and US National Intelligence Council 2013.

⁵ University of Pennsylvania: The Wharton School 2013a.

⁶ Obe 2013.

⁷ Symantec 2013.

⁸ Booz & Company 2010 used the term Generation C (C for “connected, communicating, content-centric, computerized, community-oriented, always clicking”) to depict the “digital natives” born after 1990, which by 2020 will constitute the largest group of consumers and make up 40% of the population in the US, Europe and the BRIC countries, and 10% in the rest of the world.

⁹ PricewaterhouseCoopers (PwC) 2011. The term “Generation Z” is avoided in this chapter as definitions vary for the exact age cohort included (often: born after 1995) and because it is following an alphabetical logic (Generation X, Y, Z) which applies to Anglo-Saxon Western countries only (the UK and the US to be precise) and is rooted in consumer surveys and political opinion research.

¹⁰ See ILO 2013a.

¹¹ According to OECD 2013, a quarter of workers aged 15-24 in OECD countries are on temporary contracts, increasing to over half in Spain and also, more surprisingly, in Germany and Switzerland. See “OECD project on Jobs for Youth”, available at www.oecd.org/employment/youth.

¹² See <http://www.census.gov/prod/2009pubs/p95-09-1.pdf>.

¹³ See two recent Swiss Re studies, “Urbanisation in emerging markets: boon and bane for insurers” and “Mind the risk: A global ranking of cities under threat from natural disasters, 2013”, available at <http://www.swissre.com/sigma/>.

¹⁴ See http://www.africaneconomicoutlook.org/en/in-depth/youth_employment/.

¹⁵ ILO 2013a.

¹⁶ McKinsey & Company 2013.

¹⁷ For a recent account on the situation in Great Britain, see O’Connor 2013.

¹⁸ Gouglas 2013.

¹⁹ For example, South Korea’s systems of “Meister Schools” teach industry-supported curricula, focusing on actually demanded skills. Case study available at http://mckinseyonsociety.com/e2e_casestudy/meister-high-schools-south-korea/.

²⁰ The “*Swiss Re 150 Years – Risk Perception Survey*” is conducted by Gallup Europe. Results can be accessed at <http://riskwindow.swissre.com/>. The survey covers 19 countries in four regions (South and North America, Europe, the Middle East and Africa, Asia Pacific), using samples representative of the 15+ year-old national population.

²¹ Networks at the same time have the disadvantage of creating reinforcing loops on certain topics and of being relatively homogeneous.

²² Coinage of the term digital native is being ascribed to American educator Marc Prensky, who thought about educational reforms in the digital age. See Prensky 2001.

²³ “*Swiss Re 150 Years – Risk Perception Survey*”.

²⁴ For an investigation on what shaped the mindset of “Generation Z”, see <http://rainmakerthinking.com/assets/uploads/2013/10/Gen-Z-Whitepaper.pdf>.

²⁵ Swiss Re and IIF 2013.

²⁶ For a profiled set of recommendations, which have been partly adopted here, see the Oxford Martin Commission for Future Generations 2013, available at <http://www.oxfordmartin.ox.ac.uk/commission>.

²⁷ A statistical table for country capacity to retain talent is given in *The Global Competitiveness Report 2013-2014* of the World Economic Forum 2013b, p. 495.

²⁸ Stoll 1988.

²⁹ The term “electronic Pearl Harbor” dates to a 1991 testimony by author Winn Schwartau to the US Congress. For a longer discussion of this dynamic, see Healey and Grindal 2013.

³⁰ Quote from Lt Col Roger Schell (USAF), “Computer Security: The Achilles Heel of the Electronic Air Force”, *Air University Review*, January-February 1979, available at <http://www.airpower.maxwell.af.mil/airchronicles/aureview/1979/jan-feb/schell.html>.

³¹ The Boston Consulting Group 2010.

³² World Economic Forum 2012a.

³³ World Economic Forum 2012b.

³⁴ World Economic Forum 2012c and for more on hyperconnectivity, see <http://www.weforum.org/issues/hyperconnectivity>.

³⁵ CHEW was coined by former White House cybersecurity “czar” Richard A. Clarke.

³⁶ NSTAC 2008.

³⁷ UNIDIR 2011.

³⁸ CISCO 2010.

³⁹ Some of this section is taken from Healey 2011.

⁴⁰ Kunreuther et al. 2013.

⁴¹ Michel-Kerjan 2012.

References

- Booz & Company. 2010. *The Rise of Generation C: Implications for the World of 2020*. Available at http://www.booz.com/media/uploads/Rise_Of_Generation_C.pdf.
- Boston Consulting Group. 2010. *The Digital Manifesto: How Countries and Companies Can Win in the Digital Economy*. Available at <http://www.bcg.com/documents/file96476.pdf>.
- Brassard, C. and A. Raffin. 2011. "Resilience in Post Disaster Societies: From Crisis to Development." *Asian Journal of Social Science*. 39(4): 417-424.
- Bremmer, I. 2012. *Every Nation for Itself: Winners and Losers in a G-Zero World*. London: Portfolio.
- CISCO. 2010. *The Evolving Internet: Driving Force, Uncertainties, and Four Scenarios to 2025*. Available at http://newsroom.cisco.com/dlls/2010/ekits/Evolving_Internet_GBN_Cisco_2010_Aug_rev2.pdf.
- Goldin, I. and M. Mariathan. *The Butterfly Defect: How globalization creates systemic risk, and what to do about it*. Princeton University Press. Forthcoming Spring 2014.
- Gouglas, A. 2013. "The Young Precariat in Greece: What Happened to 'Generation 700 Euros'?" *Journal on European Perspectives of the Western Balkans*. 1(8):30-49.
- Healey, J. 2011. *The Five Futures of Cyber Conflict and Cooperation*. Atlantic Council Issue Brief. Available at <http://www.atlanticcouncil.org/publications/issue-briefs/the-five-futures-of-cyber-conflict-and-cooperation>.
- Healey, J. and K. Grindal (eds). 2013. *A Fierce Domain: Conflict in Cyberspace, 1986 to 2012*, Cyber Conflict Studies Association.
- International Diabetes Federation (IDF). 2013. *IDF Diabetes Atlas. Sixth edition*. Available at <http://www.idf.org/diabetesatlas/download-book>
- International Energy Agency (IEA). 2013. *World Energy Outlook 2013*. Paris: IEA.
- International Labour Organization (ILO). 2013a. *Global Employment Trends for Youth 2013: A generation at risk*. Geneva: ILO. Available at http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_212423.pdf.
- International Labour Organization (ILO). 2013b. "Global youth unemployment trends and projections from 2007 to 2013." Available at http://www.ilo.org/global/research/global-reports/global-employment-trends/youth/2013/WCMS_212430/lang--en/index.htm
- Kammermann, M. 2010. "Job or further training?: Impact of the Swiss Basic Federal Vocational Education and Training (VET) Certificate on the careers of low achieving young people", *Education + Training*, 52(5):391-403.
- Kunreuther, H., E. Michel-Kerjan and M. Useem. 2013. "Corporate Strategies for Managing Catastrophic Risks in the S&P 500: Linking Intuitive and Deliberative Thinking." The Wharton School, University of Pennsylvania. Interim Report.
- McKinsey & Company. 2013. *The \$250 Billion Question: Can China Close the Skills Gap?* Available at <http://mckinseysociety.com/can-china-close-the-skills-gap/>.
- Michel-Kerjan, E. 2012. "How Resilient Is Your Country? Extreme events are on the rise. Governments must implement national and integrated risk-management strategies." *Nature*. 491.
- National Security Telecommunications Advisory Committee (NSTAC). 2008. *NSTAC Report to the President on Commercial Communications Reliance on the Global Positioning System (GPS)*. Available at http://www.dhs.gov/sites/default/files/publications/NSTAC%20GPS%20Report_0.pdf.
- Obe, M. 2013. "Japan Exports to China at 4-Year Low." *The Wall Street Journal*. Available at <http://online.wsj.com/news/articles/SB10001424127887324139404579012481067770274>.
- O'Connor, S. 2013. "Graduate data reveal England's lost and indebted generation", *The Financial Times*, 18 November.
- Oliver Wyman. 2012a. "Fed Proposes Major Shift in Regulation of Foreign Banks." Available at http://www.oliverwyman.com/media/12-19_Oliver_Wyman_Fed_Proposes_Major_Shift_in_Regulation_of_Foreign_Banks.pdf.
- Oliver Wyman. 2012b. "The Volume-To-Value Revolution." Available at http://www.oliverwyman.com/media/OW_ENG_HLS_PUBL_Volume_to_Value_Revolution.pdf.
- Organisation for Economic Co-Operation and Development (OECD). 2013. *OECD Economic Surveys: CHINA*. Available at <http://www.oecd.org/eco/surveys/Overview%20China%202013-Eng%20modified.pdf>.
- Premsky, M. 2001. "Digital Natives, Digital Immigrants." *On the Horizon*. 9(5):1-6.
- PricewaterhouseCoopers (PwC). 2011. "Millennials at work: Reshaping the workplace." Available at <http://www.pwc.com/millennialsatwork>.
- Renn, O. 2008. *Risk Governance: Coping with Uncertainty in a Complex World*. London: Earthscan.
- Standard Chartered. 2013. *The super-cycle lives: EM growth is key*. Available at <http://www.standardchartered.com/en/resources/global-en/pdf/Research/The-super-cycle-lives-06-11-13.pdf>.
- Stoll, C. 1988. "Stalking the wily hacker." *Communications of the ACM*. 31(5):484-497. Available at http://faculty.cs.tamu.edu/pooh/course/CPSC665/Spring2001/Lessons/Intrusion_Detection_and_Response/p484-stoll.pdf.
- Swiss Re and IIF. 2013. *Strengthening the role of long-term investors. The crucial role of long-term investor is at risk – Eight fact sheets on issues and challenges*. Available at http://media.swissre.com/documents/A12919_IIF+Publications_DavosFactsheets_web.pdf.
- Symantec. 2013. *Internet Security Threat Report 2013*. Available at http://www.symantec.com/content/en/us/enterprise/other_resources/b-istr_main_report_v18_2012_21291018.en-us.pdf.
- Thompson, G. 2013. "The Transatlantic Trade and Investment Partnership (TTIP) – Commons Library Standard Note (SN06688)", UK House of Commons Library. Available at [http://www.parliament.uk/briefing-papers/SN06688/the-transatlantic-trade-and-investment-partnership-\(ttip\).pdf](http://www.parliament.uk/briefing-papers/SN06688/the-transatlantic-trade-and-investment-partnership-(ttip).pdf).
- United Nations Institute for Disarmament Research (UNIDIR). 2011. *Cybersecurity and Cyberwarfare – Preliminary Assessment of National Doctrine and Organization*. Available at <http://www.unidir.org/files/publications/pdfs/cybersecurity-and-cyberwarfare-preliminary-assessment-of-national-doctrine-and-organization-380.pdf>.
- United States Trade Representative (USTR). 2011. "Outlines of the Trans-Pacific Partnership Agreement". Available at <http://www.ustr.gov/about-us/press-office/fact-sheets/2011/november/outlines-trans-pacific-partnership-agreement>
- University of Pennsylvania: The Wharton School. 2013a. "Emerging Markets Lose Their Punch." *Knowledge@Wharton*. Available at <http://knowledge.wharton.upenn.edu/article/mauro-guillen-emerging-markets-lose-punch/>.
- University of Pennsylvania: The Wharton School. 2013b. "Why the Brazilian Insurance Market Hasn't Taken Off." *Knowledge@Wharton*. Available at <http://knowledge.wharton.upenn.edu/article/why-the-brazilian-insurance-market-hasnt-taken-off/>.
- "US Energy Information Administration. 2013. Annual Energy Outlook". Available at [http://www.eia.gov/forecasts/aeo/pdf/0383\(2013\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf).
- US National Intelligence Council. 2013. *Global Trends 2030: Alternative Worlds*. Available at http://www.dni.gov/files/documents/GlobalTrends_2030.pdf.
- World Economic Forum. 2012a. *Risk and Responsibility in a Hyperconnected World – Pathways to Global Cyber Resilience*. Geneva: World Economic Forum. Available at http://www3.weforum.org/docs/WEF_IT_PathwaysToGlobalCyberResilience_Report_2012.pdf.
- World Economic Forum. 2012b. *Partnering for Cyber Resilience – Risk and Responsibility in a Hyperconnected World – Principles and Guidelines*. Geneva: World Economic Forum. Available at http://www3.weforum.org/docs/WEF_IT_PartneringCyberResilience_Guidelines_2012.pdf.

Part 3: Towards Ten Years of the Global Risks Report

Since it was introduced in 2006, the *Global Risks* report has provided a unique analysis of the risks that are shaping the global environment, and the potentially cascading negative consequences of their interactions. The overall goal is to provide a platform for dialogue among business, government and civil society on how countries, businesses and people can prepare for, mitigate and build resilience in the face of risks.

As the report nears its 10th edition in 2015, this section reflects on the insights gathered from past reports on how to map and address global risks. These reflections provide a basis to reassess and update the approach and methodology, to ensure that the report remains at the cutting edge of collective understanding of global risks.

Defining and Identifying Global Risks

The number of global risks included in the *Global Risks* report series has changed over time. While 25 risks were included in 2006, 50 were identified in 2012 and 2013 and were then streamlined to 31 in this report. The systemic nature of global risks has been emphasized since the beginning, while the report's 10-year time horizon has allowed for a focus on strategies and policies to anticipate and manage potential risks, rather than merely react to them.

In the coming year, a number of expert workshops will be held to review the definition of global risk – currently seen as an *occurrence that causes significant negative impact for several countries and industries* – to identify and understand their nature, and to enhance comprehension of the interconnections between them.

One challenge is to distinguish between a risk and a *trend* or a *vulnerability*. Technically, a risk is something that has not happened yet, whereas a trend or a vulnerability is already under way. Some global risks in this year's report, such as severe income disparity, may be more accurately viewed as a trend or a vulnerability. In many cases, the distinction is far from clear – for example, opinions may differ on whether major loss of biodiversity is an event that could yet happen or a process that is already happening.

Another challenge is to determine a common level of granularity among global risks: Is a political collapse of a nation of geopolitical importance at the same conceptual level as overall global governance failure? Can the failure to mitigate climate change that threatens to make the earth increasingly uninhabitable be placed at the same level of gravity as a one-off, large-scale cyber attack?

Mapping Global Risks

Throughout the *Global Risks* report series, risks have been analysed on two dimensions: likelihood and impact. Both can be important when aiming to prioritize which risks to attempt to prevent (i.e. reducing the likelihood of the event) and/or mitigate (i.e. reducing the severity of the impact).

Experience has shown, however, that neither can be measured definitively. Initially, the report attempted to measure impact by assigning (when possible) actuarial values such as an estimated number of deaths or the economic impact in US dollars, based on expert input. This arguably had the advantage of being as objective a measure as possible, but had the disadvantage of relying heavily on assumptions and being unable to account for a range of outcomes – there are, for example, widely varying estimates of the financial impact of climate change depending on the level of temperature rise. Also, this approach cannot be extended to all risks: it is impossible to estimate the likely financial and human cost of, for example, biodiversity loss or geopolitical conflict.

Since 2009, the report has used expert surveys that ask respondents to estimate impact and likelihood. This has the advantage of being more applicable to risks of different natures, allowing for greater ease of comparison. On the downside, perception data can be skewed by cognitive biases of the kind discussed in Part 2.5 of this report, which predispose people to be more concerned with current headlines and recently-experienced risks. Nonetheless, this approach can highlight areas that are of most concern to different stakeholders, and potentially galvanize shared efforts to address them.

Towards a Multistakeholder Approach

The responsibility of preparing for, mitigating and building resilience against many of the risks discussed in this report remains fragmented and unclear. People in the best position to influence solutions to a risk may not be the ones who have most to lose from it. Questions surrounding who can and should take ownership of planning for the risk, and what is an acceptable level of risk, remain difficult to answer.

With these concerns in mind, the *Global Risks* report series has increasingly emphasized the importance of interconnectivity and the systemic nature of global risks, with the possibility of multiple simultaneous or sequential shocks. By their nature, global risks cross borders. No country, industry or organization can deal with them in isolation. They require collective thinking and responses, taking a long-term perspective. The report has increasingly moved towards providing a basis for discussion among stakeholders on how to mitigate risks, prepare for them and strengthen resilience in a collaborative fashion.

Looking Ahead to the 10th Anniversary

The adjustments to the survey and analysis in this year's report are part of the ongoing efforts to provide a solid base for the World Economic Forum's work on global risks in the future, and mirror the evolving nature of global risks. Drawing on the Forum's multistakeholder community of business, academia, government and civil society, the methodology and analysis will be reviewed and improved during the course of 2014, in preparation for the report's 10th anniversary in January 2015.

Conclusion

This report has explored how a wide range of global risks – from the possibility of fiscal crisis in an important economy to the fallouts from new technologies, social tensions and changing geopolitical relations – could have long-lasting and far-reaching systemic impacts.

In exploring the global risks landscape for 2014, this report has highlighted the importance of several underlying themes in tackling global risks:

- **Trust** is necessary if stakeholders are to work together to tackle global risks, but trust is being undermined in some systemically important areas. For example, much of the younger generation lacks trust in traditional political institutions and leaders, while recent revelations about cyber espionage have undermined trust in the Internet in general and the governance of cyberspace in particular.
- **Long-term thinking** is a prerequisite for any approach to global risks. This report has explored strategies through which corporations and governments can attempt to incentivize a shift from short-term to long-term time horizons.
- **Collaborative multistakeholder action** is required as businesses, governments, or civil society alone do not have both the tools and the authority to tackle systemic risks. We hope that the mapping of global risks and their interconnections will provide a common base to better understand risks and their consequences, and for dialogue as a first step towards collective action.
- **Global governance** is key to addressing global risks such as climate change or cybersecurity, but new models are urgently needed as the world's increasing multipolarity renders its current global governance structures unwieldy and outdated.

This report has aimed to increase awareness of and inspire action on the most important risks the world faces over the next 10 years, in the hope of addressing the most pressing of these challenges. The World Economic Forum will continue to provide a platform for leaders to work together on preparing for risks, mitigating them and strengthening resilience.

Appendix A - Definitions of Global Risks 2014

	Global Risk	Description
Economic Risks	Fiscal crises in key economies	Excessive debt burdens generate rising interest rates, inflationary pressures and sovereign debt crises
	Failure of a major financial mechanism or institution	A financial institution or currency regime of systemic importance collapses, with implications throughout the global financial system
	Liquidity crises	Shortages of financial resources from banks and capital markets become extreme and recurring, while the ability to sell assets is reduced
	Structurally high unemployment/underemployment	A sustained high level of unemployment that is structural rather than cyclical in nature coincides with a rising skills gap and high underemployment, especially among youth populations
	Oil-price shock to the global economy	Sharp and/or sustained oil price increases place further economic pressures on highly oil-dependent industries and consumers, while raising geopolitical tensions
	Failure/shortfall of critical infrastructure	Chronic failure to adequately invest in, upgrade and secure infrastructure networks leads to a major breakdown, with system-wide implications
	Decline of importance of the US dollar as a major currency	A shift away from the US dollar as the world's reserve currency impacts the global economic and financial system, and changes the geopolitical balance
Environmental Risks	Greater incidence of extreme weather events (e.g. floods, storms, fires)	Property, infrastructure and environmental damage linked to development in hazard-prone areas increases, as does the frequency of extreme weather events
	Greater incidence of natural catastrophes (e.g. earthquakes, tsunamis, volcanic eruptions, geomagnetic storms)	Existing precautions and preparedness measures fail in the face of geophysical disasters such as earthquakes, volcanic activity, landslides, tsunamis or geomagnetic storms, causing widespread disruptions in interconnected supply chains and communication networks
	Greater incidence of man-made environmental catastrophes (e.g. oil spills, nuclear accidents)	Existing precautions and preparedness measures fail to prevent man-made catastrophes, causing greater harm to lives, human health, infrastructure, property, economic activity and the environment
	Major biodiversity loss and ecosystem collapse (land and ocean)	Degradation of biodiversity results in severely depleted resources for industries such as fishing and forestry, with potentially irreversible consequences for the environment
	Water crises	A significant decline in the quality and quantity of fresh water combines with increased competition among resource-intensive systems, such as food and energy production
	Failure of climate change mitigation and adaptation	Governments and businesses fail to enforce or enact effective measures to protect populations and to help businesses impacted by climate change to transition
Geopolitical Risks	Global governance failure	Weak or inadequate global institutions, agreements or networks, combined with competing national and political interests, impede attempts to cooperate on addressing global risks
	Political collapse of a nation of geopolitical importance	One or more systemically critical countries experience significant erosion of trust and mutual obligations between states and citizens, leading to state collapse, internal violence, regional or global instability and, potentially, military conflict
	Increasing corruption	The widespread and deep-rooted abuse of entrusted power for private gain (by businesses and public officials) undermines the rule of law and governance

	Global Risk	Description
Geopolitical Risks	Major escalation in organized crime and illicit trade	Highly organized and very agile global networks commit criminal offences while the illegal trafficking of goods and people spreads unchecked throughout the global economy
	Large-scale terrorist attacks	Individuals or non-state groups successfully inflict large-scale human or material damage, which is particularly problematic when decentralized and widespread
	Deployment of weapons of mass destruction	The availability of nuclear, chemical, biological and radiological technologies and materials leads to major international crises
	Violent inter-state conflict with regional consequences	International disputes escalate into armed conflicts
	Escalation of economic and resource nationalization	States move unilaterally to ban imports or exports of key commodities, stockpile reserves and expropriate natural resources
Societal Risks	Food crises	Access to appropriate quantities and quality of food and nutrition becomes inadequate or unreliable
	Pandemic outbreak	Inadequate disease surveillance systems, failed international coordination and the lack of vaccine production capacity lead to the uncontrolled spread of infectious disease
	Unmanageable burden of chronic disease	Increasing burden of illness and long-term costs of treatment threaten recent societal gains in life expectancy and quality while overburdening strained economies
	Severe income disparity	Widening gaps between the richest and poorest citizens threaten social and political stability as well as economic development
	Antibiotic-resistant bacteria	Growing resistance of deadly bacteria to known antibiotics inhibits the ability to control deadly diseases
	Mismanaged urbanization (e.g. planning failures, inadequate infrastructure and supply chains)	Poorly planned cities, urban sprawl and associated infrastructure amplify drivers of environmental degradation and cope ineffectively with migration, demographic and health challenges
	Profound political and social instability	Military actions or aggressive foreign or trade policies on the part of global or regional powers disrupt political or social stability, negatively impacting populations, investment and financial markets
Technological Risks	Breakdown of critical information infrastructure and networks	Systemic failures of critical information infrastructure (CII) and networks negatively impact industrial production, public services and communications
	Escalation in large-scale cyber attacks	State-sponsored, state-affiliated, criminal or terrorist cyber attacks increase
	Massive incident of data fraud/theft	Criminal or wrongful exploitation of private data takes place on an unprecedented scale

Appendix B - Global Risks Perception Survey and Methodology 2014

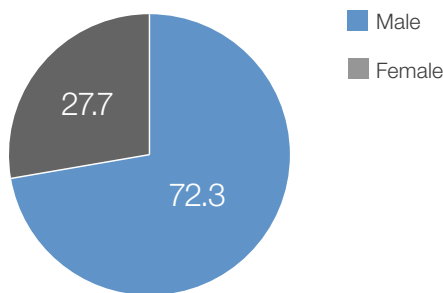
As discussed in Part 1, the *Global Risk 2014* report has adjusted the list of global risks to take into account learnings from past editions as well as developments in the global risks landscape. As a result, the set of global risks was streamlined with a view to improving the fit of the individual risks with the definition introduced in this year's report. The Global Risks Perceptions Survey has been adjusted accordingly. The following section describes the survey and methodology in greater detail.

The Global Risks Perceptions Survey

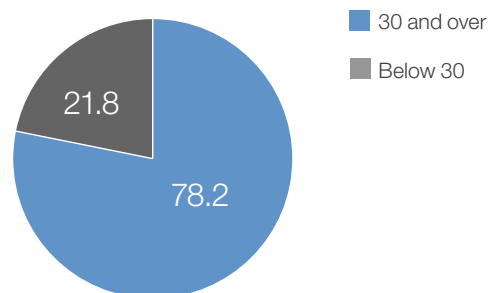
The Global Risks Perception Survey, discussed in Part 1, is the main instrument for assessing global risks in this report. The survey was conducted between October and November 2013 among the World Economic Forum's multistakeholder communities of leaders from business, government, academia and non-governmental and international organizations. The graph below shows the profile of the survey respondents. To capture the voice of youth, the survey also targeted the World Economic Forum's community of Global Shapers. Under-30s accounted for approximately one-quarter of the respondents.

Figure A.1: Survey Sample Composition (per cent)

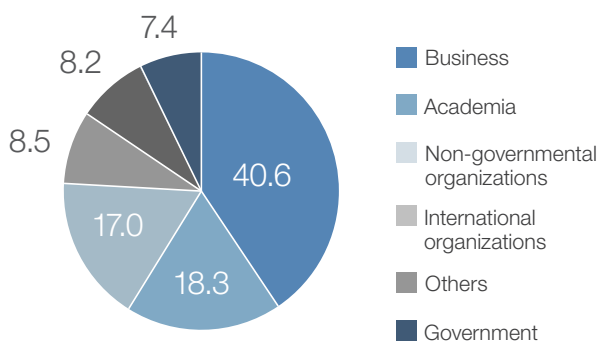
Gender



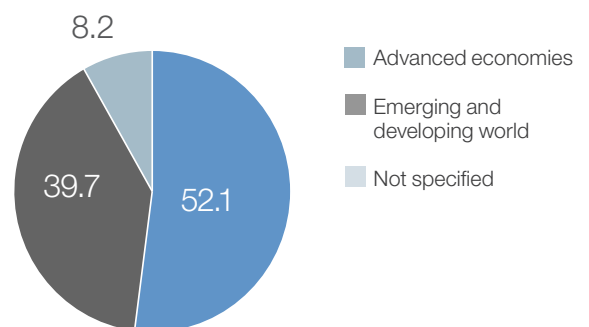
Age



Stakeholder group



Geography



Source: Global Risks Perception Survey 2013-2014.

Risks of Highest Concern in 2014

To identify the top 10 global risks of highest concern, described in Part 1, respondents answered the following question: “From the following list of 31 risks, please select the five risks of highest concern globally and rank these from 1 (of highest concern) to 5 (of lowest concern)”. A score was assigned for each answer based on the rank, from 5 points for the first-ranked risk to 1 point for the fifth-ranked. For example, if the risk of water crises was cited as the risk of biggest concern (Rank 1), the answer would be assigned five points; if it was cited as the fifth risk of most concern, the answer would be assigned one point. The score earned by each risk corresponds to the total points earned by that risk across all responses divided by the number of responses. The risks with the 10 highest scores were selected as the risks of highest concern.

Formally, for any given risk i from the list of 31 risks, the score is derived as follows:

$$\text{score}_i = \frac{1}{N} \sum_{n=1}^N (6 - \text{rank}_{i,n})$$

where N is the number of respondents to the survey and $\text{rank}_{i,n}$ corresponds to the rank assigned by respondent n to risk i .

Global Risks Landscape in 2014

Respondents were asked to assess the likelihood and global impact of each of the 31 risks. For each risk, they were asked, “How likely is this risk to materialize globally within the next 10 years?” and “What is the estimated impact globally if this risk were to materialize? (Impact is to be interpreted in a broad sense beyond just economic consequences)”. The possible answers ranged from 1 (“very unlikely” and “low impact”, respectively) to 7 (“almost certain” and “high impact”, respectively). Respondents were given the possibility to leave the answer blank if they felt unable to provide an informed answer (“don’t know”). A simple average for both likelihood and impact for each of the 31 global risks was calculated on this basis. Formally, for any given risk i , its likelihood and impact, denoted respectively likelihood_i and impact_i , are:

$$\text{likelihood}_i = \frac{1}{N_i^1} \sum_{n=1}^{N_i^1} \text{likelihood}_{i,n}$$

$$\text{impact}_i = \frac{1}{N_i^2} \sum_{n=1}^{N_i^2} \text{impact}_{i,n}$$

where N_i is the number of respondents for risk i , and $\text{likelihood}_{i,n}$ and $\text{impact}_{i,n}$ are respectively the likelihood and impact assigned by respondent n to risk i and measured on a scale from 1 to 7. Moreover, $N_i^1 \neq N_i^2$ as, for each risk i , survey respondents could choose not to answer each question (“don’t know”).

Interconnections in 2014

To draw the interconnection map presented in Part 1, survey respondents were asked to identify three to six pairs of risks they believed were connected, disregarding directions of causality. A tally was made of the number of times each pair was cited. This value was then divided by the count of the most frequently cited pair. As a final step, the square root of this ratio was taken to dampen the long-tail effect (i.e. a few very strong links, and many weak ones) and to make the differences more apparent across the weakest connections. The value of the interconnection determines the thickness of each connecting line in the graph, with the most frequently cited pair having the thickest line. Out of the 465 possible pairs, 178 or 38% were not cited. Formally, the intensity of the connection between risks i and j , denoted $\text{interconnection}_{ij}$, corresponds to:

$$\text{interconnection}_{ij} = \sqrt{\frac{\sum_{n=1}^N \text{pair}_{ij,n}}{\text{pair}_{\max}}} \quad \text{with } \text{pair}_{\max} = \max_{ij} \left(\sum_{n=1}^N \text{pair}_{ij,n} \right)$$

where N is the number of respondents. Variable $\text{pair}_{ij,n}$ is 1 when respondent n selected the pair of risks i and j as part of his/her selection. Otherwise, it is 0.

Risks and Trends to Watch in 2014

Survey respondents were asked two open questions: “Which risk of major global concern is missing from the list of the 31 risks (list one risk only)” and “Which additional issue could potentially emerge as a risk of major global concern in the future (list one issue only)?” Given the large range of answers provided by the respondents, answers were manually grouped into broader categories. Figure 1.5 in Part 1 is an illustration of the recurrence of these categories: the larger the category the more often it was mentioned. The purpose of these two questions was to stimulate debate on the identification of future risks and trends.

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¹ Names of report partner representatives are listed in alphabetical order by last name.

² The box contributions by the Global Agenda Councils may not reflect the views of individual members listed here.



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