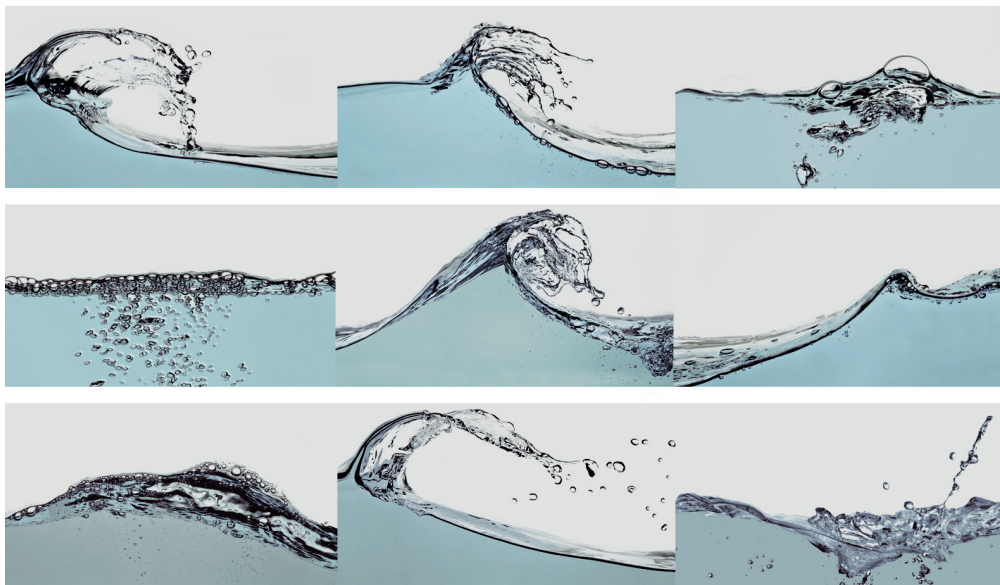


Jan Arpe, Holger Glockner, Helmut Hauschild, Thieß Petersen,  
Andreas Schaich, Tim Volkmann

# The Economic Risks of Globalization

Expert and Public Opinion Survey Results

Global Choices 1 | 2012



## **Global Choices**

The world is changing at breathtaking speed. Global challenges, from climate change to cyber crime, are growing increasingly complex. Emerging economic powers in Asia and Latin America are assuming greater roles in geopolitical matters. The shift of economic power to the east is creating new dependencies. In short, the ground rules of international cooperation are being rewritten.

The “Global Choices” publication series takes a closer look at these changes and how they affect politics, business and society. By facilitating an informed understanding of these changes, this series aims to contribute constructively to debates regarding the principles of a new global order and the reforms needed to improve international cooperation. “Global Choices” is also a call to action because globalization is not a matter of immutable fate; its trajectory can be shaped. “Global Choices” therefore underscores the fact that the power to make sound choices lies within our hands.

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# Overview of the Surveys

Helmut Hauschild

## Introduction

Globalization has brought greater wealth to many. Since the publication of American economist Theodore Levitt's visionary article in the "Harvard Business Review" predicting the era of global markets trading standardized consumer goods, which brought the concept of globalization to a wider audience (Levitt, 1983), global trade has increased more than eightfold (WTO 2011). Real per capita income (adjusted for inflation) grew by more than 50 percent over the same period, despite the dramatic increase in the world's population. The thesis proposed almost two centuries ago by British political economist David Ricardo – that trade would make participating national economies wealthier – has so far proven resoundingly true.

However, the increasingly close economic ties between countries and continents have also resulted in significantly greater risks. Within just a few years, the bankruptcy of Lehman Brothers plunged global financial markets into the most serious turmoil since the Great Depression, the excessive liabilities of the small eurozone member Greece triggered a sovereign debt crisis that threatens the very existence of the European monetary union, and an oil spill in the Gulf of Mexico and a nuclear catastrophe in Japan alerted the world to the risks of the seemingly insatiable global demand for energy.

Has the globalization growth model reached its limits? Have globally networked systems become too complex and ungovernable? Where are the biggest risks to be found? And is the political sphere in a position to take the necessary countermeasures in time? At the beginning of the second decade of the 21st century, the world economy is facing an uncertain future. The number and scope of potential dangers has increased, ranging from the loss of drinking water reserves in many of the world's regions, to a possible blackout at the very heart of globalization, the Internet. Furthermore, some risks have

probably not yet even been identified as such.<sup>1</sup> The growing mutual interdependence between national economies has significantly increased the risk of contagion should undesirable developments occur. Regional crises have become global risks.

It is evident that national governments are no longer able to overcome the challenges of globalization single-handedly. However, when it comes to multi-lateral attempts at providing solutions, the track record gives little cause for hope. Despite decades of negotiations, the prospects of a new global climate protection agreement are poor, the Doha world trade-negotiation round, a source of hope for developing nations it when began ten years ago, has to all intents and purposes failed. Even the G20 group of the 20 most important industrialized and emerging countries has disappointed the high hopes initially invested in it.

These developments prompted the Bertelsmann Stiftung to address the issue of current and future risks to the global economy, with the aim of developing effective risk management strategies before it is too late. The present publication is based on the results of a worldwide survey of politicians, economic leaders, scholars and representatives of civil society organizations. It was carried out in cooperation with Z\_punkt The Foresight Company, a consultancy focused on strategic future issues. The results provide information about how decision makers and experts from 35 countries view the risk to the worldwide economy in coming years and how likely they consider successful risk management at a global level to be. Data was collected for eleven risk areas, each of which covers multiple individual and interdependent risks.<sup>2</sup>

<sup>1</sup> See the contribution “Globalization and its Complexity” by Jan Arpe.

<sup>2</sup> See the contribution “Risk Concept, Selection of Risk Areas and Expert Survey Methodology” by Holger Glockner and Tim Volkmann, which describes in detail the method used to select the eleven risk areas.

## Structure of the survey

The eleven risk areas were selected in a multi-stage procedure on the basis of 20 global megatrends, such as population trends and climate change forecasts.

**Table 1: The eleven risk areas in the surveys of expert and public opinion**

<b>Food and water scarcity</b>
<b>Energy and resource scarcity</b>
<b>Socioeconomic inequality</b>
<b>Uncontrolled mass migration</b>
<b>International terrorism</b>
<b>Aging societies</b>
<b>Sovereign debt/default</b>
<b>Financial market collapse</b>
<b>Protectionism/trade wars</b>
<b>Pandemic outbreaks</b>
<b>Technology infrastructure failure</b>

The expert opinion survey took place from 20 May to 13 June 2011. The participants, who were selected in advance, were given access during this period to a detailed online questionnaire. Seventy experts and decision makers from Africa, Asia, Europe, North and Latin America, and Oceania took part in the survey.

Participants answered the same eleven questions on each of the eleven risk areas. In seven of those questions, respondents were asked to provide a quantitative assessment on a scale of 1 to 6 and on another question they were asked to provide an assessment on a scale of -2 to +2. Three of the questions allowed participants to provide a qualitative evaluation of the risk area (light blue).

Table 2: The questionnaire for the expert opinion survey

Indicator	Question
<b>Potential global impact</b>	How high is the potential impact of risk area xxx on the global economy?
<b>Regional impact</b>	How high is the potential impact on your country of origin in relation to that on the global economy?
<b>Key consequence</b>	What is the most serious consequence of risk xxx taking effect?
<b>Priority</b>	Internationally, what priority should be given to finding an effective means of averting or mitigating the risks of xxx?
<b>Comprehension</b>	How well are the causes, mechanisms and possible effects of risk area xxx understood by global decision-making elites?
<b>Level of concern</b>	How high is the level of concern regarding risk area xxx among global decision-making elites?
<b>Solution probability</b>	How probable is it that an effective means of averting or mitigating the effects of risk area xxx will be found?
<b>Risk management</b>	How effectively are global decision-making elites addressing risk area xxx?
<b>Key barriers</b>	What stands most in the way of finding an effective means of averting or mitigating the effects of risk area xxx?
<b>Consensus on measures</b>	How strong is the consensus among global decision-making elites on the appropriate measures to be taken to avert or minimize the effects of risk area xxx?
<b>Risk-mitigation measures</b>	Which measure is most effective in addressing the potential impact of risk area xxx on the global economy?



In Germany, there was also a representative survey of public opinion regarding the eleven risk areas. From 22 June to 24 July 2011, the infas Institute for Applied Social Sciences, acting on behalf of the Bertelsmann Stiftung, asked a total of 1,011 people aged 18 and over about the probability of the eleven risk areas occurring and the impact this would have on their lives. An overview of the results is shown at the end of the next chapter and the details are presented in subsequent chapters.

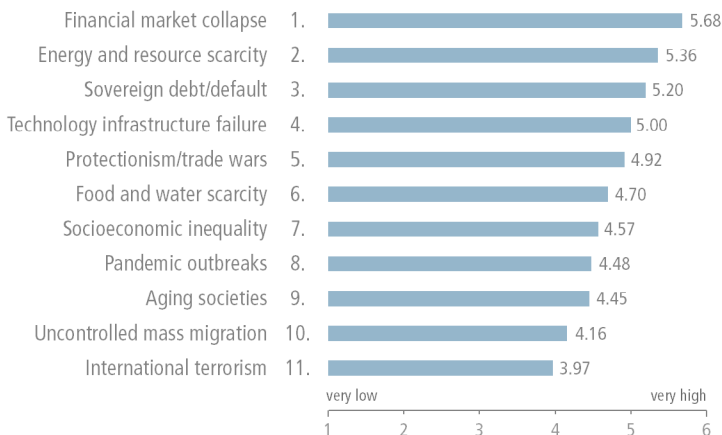
## The results of the worldwide survey of experts

### Potential impact on the global economy

The experts and decision makers surveyed identify multiple, simultaneous risks to the global economy, with severe potential impact (Fig. 1). They expect the most serious damage from a global collapse of financial markets, followed by energy and resource scarcity. In third place comes sovereign debt and default of a major economy.

The international experts and decision makers consider the global economy to be vulnerable in all eleven risk areas, making it susceptible to crisis. In all eleven risk areas, the replies concerning the expected economic impact score significantly higher than the average of 3.5 on a scale from 1 (very low) to 6 (very high).

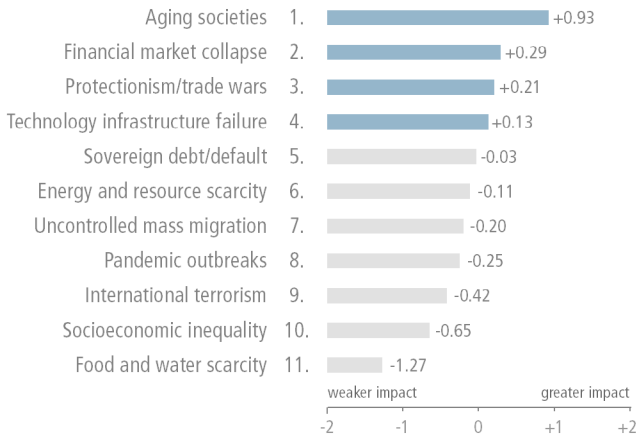
**Fig. 1: Potential impact of risk areas on global economy (all respondents)**



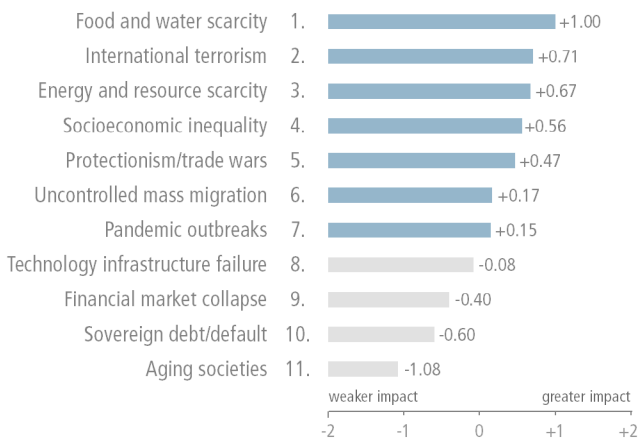
If we compare the potential economic impact in the respondents’ country of origin to the potential impact expected worldwide, we find significant regional deviations from the global average in most of the eleven risk areas. Decision makers and experts from the developed, industrialized nations of Europe, North America and Asia (OECD countries) see the main threat to their national economies in their aging societies, crises in the financial markets and protectionism (Fig. 2).

Respondents from developing and emerging countries (non-OECD states) expect their national economies to suffer from food and water crises, international terrorism, scarcity of energy and resources and the consequences of socioeconomic inequality (Fig. 3). One striking aspect is that representatives of non-OECD states appraise the potential economic damage to their countries as higher overall than representatives of the developed industrialized nations.

**Fig. 2: Economic impact on the respondent’s country of origin in relation to the impact on the global economy (respondents from OECD countries)**



**Fig. 3: Economic impact on the respondent's country of origin in relation to the impact on the global economy (respondents from non-OECD countries)**



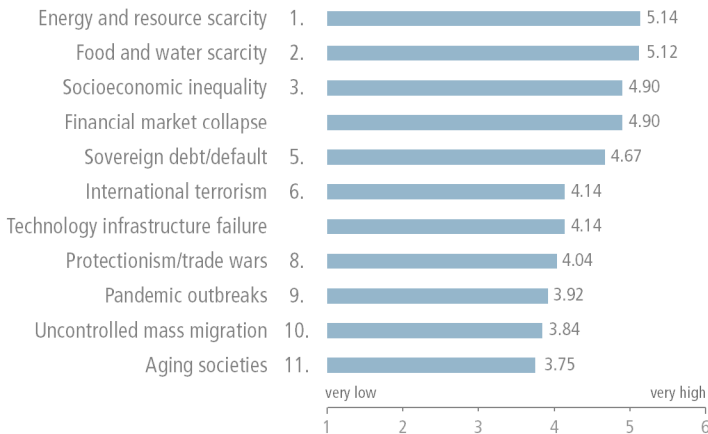
### Urgency of global risk prevention measures

The survey sends out a clear message: the international community needs to take action soon, and implement measures to avoid and protect against risk. The decision makers and experts questioned assign all eleven risk areas an above-average priority on the international agenda (Fig. 4). The average score for each of the eleven risk areas, assessed on a scale of 1 to 6, is over 3.5. From the point of view of the respondents, the most urgent issues are measures to avoid a worldwide energy and resources crisis, as well as ensuring food supply and drinking water reserves. Tied for third place are the risk of a growing gap between rich and poor and the risk of a collapse of the financial markets.

The risk posed by national debt, currently dominating the headlines because of the euro crisis, comes in a somewhat distant fifth. However, it is worth considering here that the survey took place in June 2011. Given the escalation of the euro crisis in the second half of 2011, it is conceivable that the respondents would now give greater priority to finding a solution to the

problem of sovereign debt. At the time the questionnaire was completed, the emerging and developing countries were still hardly feeling the effects of the European sovereign debt crisis. The representatives of non-OECD states considered the economies of their countries of origin to be comparatively unaffected by the risk of excessive national debt, rating it tenth, as seen in Figure 3. By the start of 2012, the situation had fundamentally changed. The global drop in demand caused by the euro debt crisis is now also slowing down the economies of emerging and developing countries. Some of these, such as Brazil, found themselves in recession at the start of 2012 for the second time since the global financial crisis began.

**Fig. 4: Recommended priorities in averting/mitigating risks (all respondents)**



Respondents considered all top-five rated risk areas to be of more or less equal urgency in terms of the need for the international community to agree on solution strategies. There are two explanations for this:

Firstly, the global economy’s weakened resistance to crisis. After the crises of recent years, governments in Europe and the United States have significantly diminished financial and political reserves for handling further crises. Another financial market crash, an oil price shock caused by the Iran

conflict or a sovereign default would have a major potential impact, with disastrous effects on an already stricken world economy. For this reason, the respondents consider it essential to minimize these risks.

Secondly, all five of the prioritized risk areas, as drivers of other global risks, are of major economic significance. For example, the availability of reserves of fresh water has a considerable influence on food production and even power generation, because power plants need cooling water, for instance. This means that water scarcity can also play an important role in the occurrence of famine and temporary failures in the electricity supply. Or, to take another example, financial markets: default by a eurozone country and the resultant withdrawal of private credit would severely exacerbate the risk of another highly indebted eurozone country declaring insolvency.

### **Probability of successfully averting/mitigating risk**

The world is not completely at the mercy of these global risks. The decision makers and experts surveyed are cautiously optimistic that, in the case of seven of the eleven risk areas, there is a good chance that suitable preventive and safeguarding measures can be employed to successfully reduce the potential risk to the global economy (Fig. 5). This includes the three risk areas that the respondents consider to be the greatest potential source of economic damage: collapse of the global financial markets, sovereign default, and food and water scarcity.

Nevertheless, for some of the risks, the respondents differed considerably on the chances of finding solutions, determined largely by where the respondents came from. For example, decision makers and experts from industrialized nations were far more optimistic than respondents from non-OECD states that large sovereign debt can be brought under control (Fig. 6). Admittedly, this could be seen as premature praise: the current debt crisis primarily affects Europe, Japan and the United States.

**Fig. 5: Probability of averting/mitigating risks in the future (all respondents)**



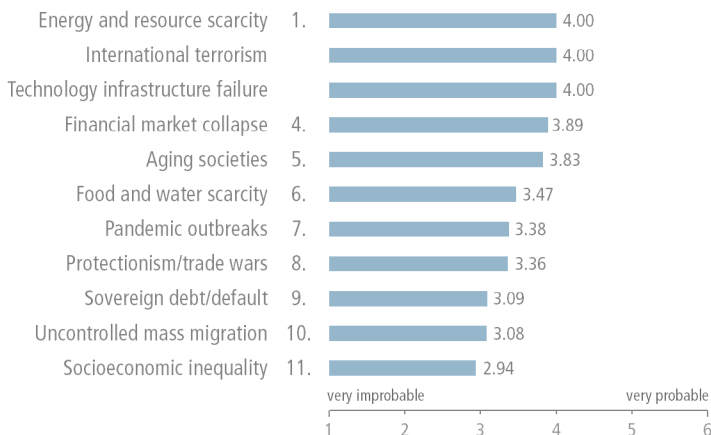
**Fig. 6: Probability of averting/mitigating risks in the future (respondents from OECD countries)**



Decision makers and experts from developing and emerging countries have far less confidence that the industrialized nations have the strength and determination to balance their budgets (Fig. 7). They consider a solution to the

problem of sovereign debt to be “somewhat improbable.” On the other hand, respondents from developing and emerging countries are markedly more optimistic than those from industrialized nations as regards a solution to the problems of energy and resource scarcity, terrorism and the failure of infrastructures of systemic importance.

**Fig. 7: Probability of averting/mitigating risks in the future (respondents from non-OECD countries)**



All respondents are most skeptical about the possibility of minimizing the causes of uncontrolled mass migration and, by extension, curtailing mass migration itself. International flows of refugees are seen as the consequence of other risks, such as water and food crises, and they can therefore only be indirectly stemmed. The respondents also consider solutions to the problems of socioeconomic inequality in the world to be rather unlikely. The risk of growing inequality between the rich and the poor not only affects the developing and emerging nations but increasingly also the industrialized states.

A recent study by the Organization for Economic Cooperation and Development (OECD) concludes that the income gap has widened in almost every Western industrialized country over the past decade (OECD 2011). As



such, there is a paradox at the heart of globalization: as the world grows closer economically, it is growing apart socially.

### Quality of risk management

The survey shows a clear correlation between the probability of successful risk prevention or mitigation (Fig. 5) and the quality of risk management (Fig. 8). The more negatively the decision makers and experts evaluate the political approach to avoiding a risk and safeguarding against its effects, the more pessimistic they are about the probability of actually averting the risk and its expected consequences. This is particularly true of the risks posed by uncontrolled mass migration, food and water scarcity and socioeconomic inequality: all three risks score the worst in terms of both the probability of finding a solution and risk management.

**Fig. 8: Quality of risk management for the risk areas (all respondents)**

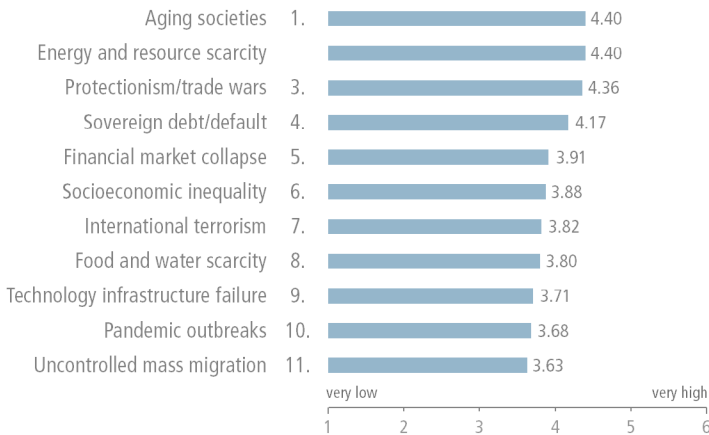


Overall, the survey suggests that risk management around the world is of moderate quality, at best. The most positive assessment is given to the areas of terrorism and financial markets. But even here, risk management only achieves a score of “somewhat effective.” While the probability of successfully averting

or limiting the damage of a financial markets crisis comes in first, terrorism is placed only seventh.

One of the many prerequisites for successful risk management is for those involved to understand the causes, mechanisms and effects of each risk (Fig. 9). Overall, the decision makers and experts are cautiously optimistic in this area. All eleven risk areas rank above the scale's average value of 3.5. Those surveyed believe that the risks of aging societies, energy and resource scarcity, and protectionism are the best understood. The respondents reserve their greatest criticism for the comprehension of uncontrolled mass migration.

**Fig. 9: Comprehension of risk areas on the part of global decision-making elites (all respondents)**



However, a proper understanding of the problem is in itself no guarantee of successful risk management. This also requires consensus between the international parties involved regarding the measures for averting, mitigating and safeguarding against risks (Fig. 10). Respondents fundamentally differentiated between short-term and long-term countermeasures. In their view, short-term measures should be aimed at minimizing economic damage that has already occurred or is imminent. Long-term measures, by contrast, should aim to alter the behavior of consumers and enterprises, for example by

changing incentive structures and creating new measures of well-being that are less narrowly focused on economic growth.

**Fig. 10: Global decision-making elite consensus on appropriate risk-mitigation measures (all respondents)**



The respondents are noticeably pessimistic when it comes to assessing the chances of a global consensus on appropriate countermeasures for almost all the risk areas. The experts identify particular disagreement when it comes to risks that can be mitigated or averted only by sharing the burden between the parties involved, making it difficult to agree on who should bear which costs. Influx of refugees falls into this category, for example. This situation frequently triggers international dispute about who is responsible for receiving the refugees. Efforts to alleviate social inequality often falter on the issue of financing social equalization. Food and water crises lead to conflicts about the use of rivers that cross national borders. For these risks, the decision makers and experts see the worst prospects of consensus on risk management.

Coping with the risks of sovereign debt, systemic financial market crises and scarcity of energy and resources is also highly dependent on whether it is possible for all those involved to agree on an acceptable sharing of the burden.

As elsewhere, the respondents perceive less agreement on suitable solution strategies for these risks. The serious conflicts that are currently being waged at a global level regarding measures to reduce these risks tend to confirm the pessimism identified in the survey.

The respondents see slightly better chances of a global consensus being reached on measures to counter the risks of protectionism and trade wars, even though conflicts about sharing the economic consequences of free trade are built into these issues. One reason for the greater optimism here could be that an internationally recognized institution for settling disputes already exists – the World Trade Organization – which is not the case with the risk areas mentioned above. The survey identifies the greatest consensus on the subject of terrorism. Here, it would seem from the responses, every state feels equally threatened and risk management is similar across the board.

The greatest obstacle to effective risk management at a global level identified by the respondents, in almost every risk area, is politics. They all deplore an unwillingness to reach political consensus. The exception to this is the risk of a pandemic, where half of those surveyed identify a lack of knowledge as the biggest obstacle. When it comes to the risk of systemic infrastructure failing, limited awareness of the problem and political disagreement are listed as the key impediments to successful risk prevention or minimization. The most important barrier to successful risk management of energy and resource scarcity is also, in the eyes of most respondents, political disagreement, although 30 percent identify a lack of appropriate technology as the principal obstacle.

## Reciprocities between risks

Many of the eleven risk areas influence each other. The survey addresses these reciprocities by asking international decision makers and experts about the most serious consequences, for each risk area, should that risk occur. In many instances they point to exacerbation of other risk areas. From the answers supplied by the experts and decision makers, two risk clusters characterized by strong interdependence emerge (Fig. 11).

The “threatened livelihoods” cluster is largely made up of the risk areas food and water scarcity, socioeconomic gaps and uncontrolled mass migration. Those consulted believed that the risk of terrorism was closely related to these other risk areas. The risks of energy and resource scarcity and aging societies exacerbate the “endangered livelihoods” cluster.

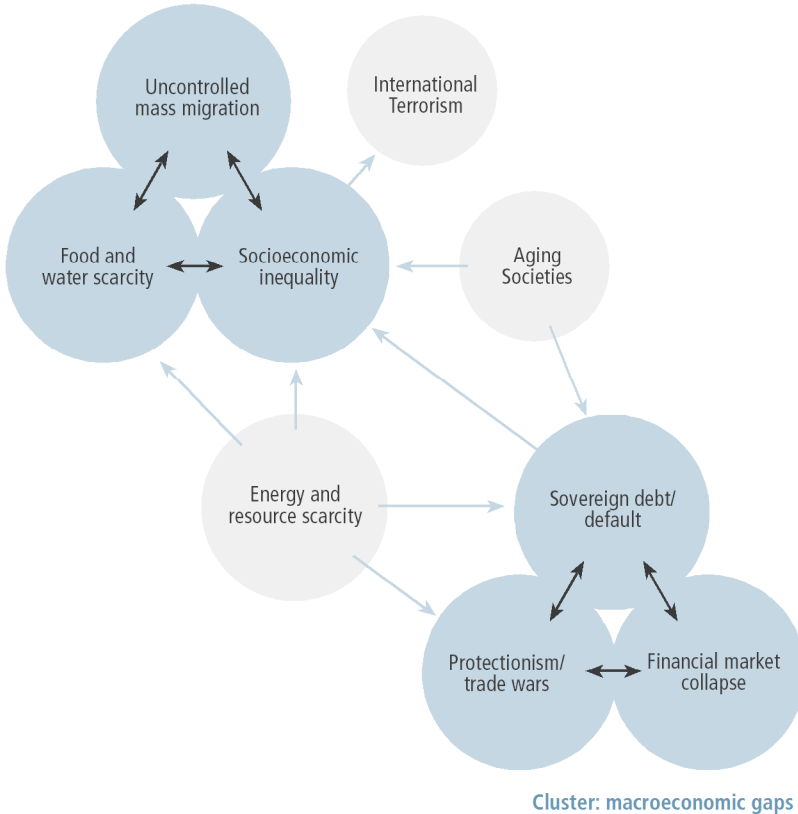
The “macroeconomic gaps” cluster largely comprises the risk areas systemic financial market collapse, sovereign debt/default of a major economy and protectionism/trade wars. The risks in the “macroeconomic gaps” cluster would also be exacerbated by the effects of energy and resource scarcity as well as aging societies.

There are also reciprocities between the two clusters. Thus, high sovereign debt can deepen the divide between rich and poor in a society because the public sector is not in a position to reduce income differentials through state welfare payments.

The “threatened livelihoods” cluster represents a risk nexus typical in many developing and emerging countries. Poorer social groups find it harder to access food sources and water supplies, which are often insufficient in these countries. Population growth and reduced fresh water reserves increase supply problems and consequently increase the divide between rich and poor. The United Nations predicts that by 2050, worldwide demand for food will increase by 70 percent, energy demand by 40 percent. An increase in food and energy production means higher fresh water consumption. According to these forecasts, two-thirds of the world’s population will live in regions with insufficient water reserves by 2030. At the same time, ever more agricultural land will be used for energy generation measures, such as the cultivation of energy crops.

Fig. 11: Major reciprocities between risk areas

## Cluster: threatened livelihoods



Failure to increase agricultural productivity and reduce water and energy consumption will increase the risk of famine and deepen the divide between the richest and poorest population groups. One probable consequence of insufficient food and water supply as well as socioeconomic discrimination is an increased flow of international refugees. These uncontrolled waves of migration are in turn associated with the risk of a growing socioeconomic gap in receiving countries, which are also usually themselves developing and

emerging countries. The threat of a vicious cycle looms – poverty, flight and renewed poverty. Socioeconomic discrimination and social exclusion often affect ethnic and religious minorities. This creates a breeding ground for political and religious extremism which can, in its most acute form, foster terrorism.

In most cases, the risks at the heart of the “threatened livelihoods” cluster are relatively slow to intensify. Those who are most affected, as in the case of water and food crises, tend to be poorer population groups without a strong lobby. Political decision makers at the global level are therefore under comparatively little pressure to act. This leads to low scores in risk management and a greater likelihood that solutions will aim at reducing the potential for damage in the global economy. The risk areas of mass migration, insufficient supplies of food and drinking water as well as socioeconomic gaps achieved the poorest scores in terms of solution opportunities and risk management in the respondents’ opinion. Decision makers and experts believe there should be a higher priority given to finding solutions for most problems in the “endangered livelihoods” cluster to break the vicious cycle within this cluster.

The risks in the “macroeconomic gaps” cluster are directly apparent in the global economy in the form of high prices. They affect population groups with much greater political influence and tend to manifest more often in sudden, drastic crises than the risks in the “threatened livelihoods” cluster. This is especially true of the risk of collapse in global financial markets and the risk of highly indebted countries becoming insolvent. Decision makers and experts see a close link between the two. They also have the potential to rapidly impact on the global economy. Therefore they receive much more attention on the global political agenda than the insidiously worsening risks in the “threatened livelihoods” cluster.

The central causes in the “macroeconomic gaps” risk cluster are high economic growth rates and significant cash reserves in emerging markets, above all China, and comparatively low growth rates coupled with massive public and sometimes private debt in industrialized countries.

The expansive monetary policies implemented by central banks throughout the industrialized regions (United States, eurozone, Japan) has led to excessive global liquidity which has formed the basis of “itinerant speculative bubbles” (Hoffmann, Schnabl, 2009). Complex financial products with highly opaque risk structures have encouraged these speculative bubbles and associated risk of sudden, drastic losses in value which could lead to a collapse of the global financial system.

Events of recent years have demonstrated the mutually reinforcing reciprocities between financial market crises and sovereign debt crises. The looming collapse of the financial market following the insolvency of U.S. investment bank Lehman Brothers in September 2008 forced the governments of the United States and the EU member states to allocate billions to saving banks of systemic importance to prevent collapse of financial systems in their countries, which might have pulled the entire real economy down with it. This scenario may well have occurred if crisis-ridden banks had withheld essential credit from companies across the board.

While most economists agree that rescuing banks of systemic importance prevented a worse recession in the short term, it also led to a dramatic increase in national debt in the United States and most European countries, which was already very high. The financial crisis was thus a major factor in the financial markets’ loss of confidence in European government bonds, and a significant trigger for the current European sovereign debt crisis. Creditors suddenly doubted the ability of several eurozone countries to pay back their debts.

Despite intervention by eurozone countries and the European Central Bank amounting to hundreds of billions of euros, in early 2012 it is still not certain if all eurozone countries will remain in the single currency. Worldwide economic prospects have significantly deteriorated as a result of the euro crisis. The International Monetary Fund (IMF) warned of a looming global recession in December 2011, along with the danger of a worldwide economic downturn increasing protectionism in global trade (Frankfurter Allgemeine Zeitung, 2011). The IMF’s diagnosis underscores the results of the survey, which suggests close reciprocities between the three risk areas of financial crisis, sovereign debt and protectionism.



Closely connected with the “macroeconomic gaps” cluster is the risk area of aging societies. Aging populations in Western industrialized countries result in a reduction in the work force coupled with a greater number of pensioners. Fewer tax and welfare contributions payers are therefore obliged to finance greater demands on state pensions, health systems and care facilities. For most industrialized Western nations, maintaining current social policy quickly increases debt and consequently leads to even greater global macroeconomic imbalance with the emerging countries of Asia, Latin America and, in the long term, Africa, with its significantly younger population. The greater the sovereign debt, however, the lower the budgetary capacity to finance social benefits, further increasing the divide between rich and poor. This links the risk fields of aging societies and sovereign debt to the “threatened livelihoods” cluster.

Scarcity of energy and raw materials could exacerbate the global macroeconomic gap. They increase the risk of protectionist measures and foster trade imbalances: Countries with minimal energy resources and raw materials are dependent on expensive imports, with the corollary danger of habitual trade deficits. Countries rich in energy and raw materials export at high prices and regularly record trade surpluses. The risk of sovereign debt can also increase if governments try to artificially lower prices of energy and raw materials with state subsidies. Developing and emerging nations in particular are often confronted with a dilemma. If they stop subsidizing higher energy prices, the poor can no longer afford energy and the risk of a socioeconomic gap increases. Expensive energy and raw materials also have negative consequences for agricultural yields because the use of fertilizer, for example, decreases, and the cost of operating irrigation pumps increases.

According to the decision makers and experts, the risk area of energy and raw material scarcity is a central driver in endangering livelihoods as well as worsening the macroeconomic gap. Respondents acknowledge this central status in the interaction of risk areas by nominating energy and resource scarcity as the risk area with the second-highest potential for damage in the global economy, and the highest among those requiring urgent risk-reduction measures.

The experts believe other risk areas barely influence the probability of technology infrastructure failure and pandemic outbreaks occurring. These risks occur suddenly and have drastic effects. Both the probability of their occurrence and their potential for damage are, in the view of decision makers and experts, beset with major uncertainty. In the survey they rate knowledge about causes and consequences of global pandemics and systemic infrastructure failure as relatively low. There is also little reciprocity with the two central clusters of other risk areas. The dangers for globalization through highly infectious diseases and the failure of essential networks such as the Internet and logistics chains haven't yet been sufficiently researched. A knowledge base must first be created before any successful risk management can be implemented.

## Risk perception in the German public

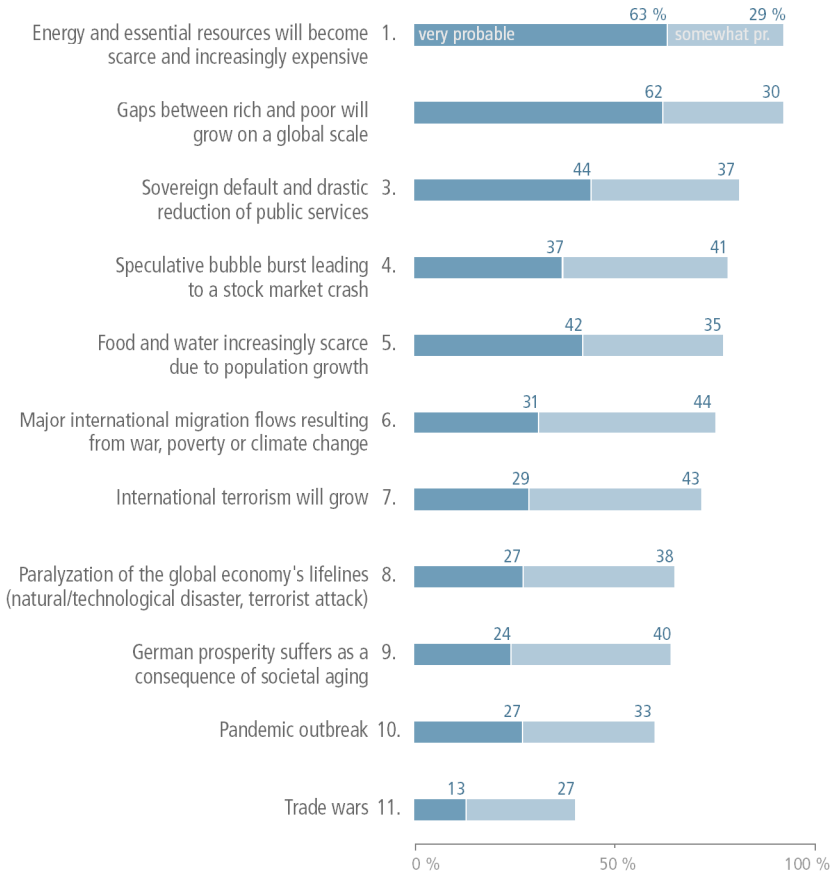
The majority of Germans think it is very probable that almost all of the eleven global risks will come to pass (Fig. 12). While they see themselves as less likely to be affected, they expect significant consequences for their personal lives if these risks occur (Fig. 13). This is shown in a public opinion poll commissioned by the Bertelsmann Stiftung and conducted by opinion pollsters infas.

Germans believe that the greatest impact on their personal lives will come from a worldwide energy and raw materials crisis. A total of 76 percent of respondents assess the consequences for themselves as “very high” or “somewhat high.” Moreover, the large majority of Germans fear that an energy and raw material crisis will in fact occur. A total of 92 percent regard it as “very probable” or “somewhat probable” that energy and essential raw materials will become “scarce and increasingly expensive.”

They regard the further growth in the divide between rich and poor as equally probably. But here Germans are less likely to see themselves as personally affected. In any case almost every second German continues to believe that increased imbalance in the world will also have significant consequences for their own lives.

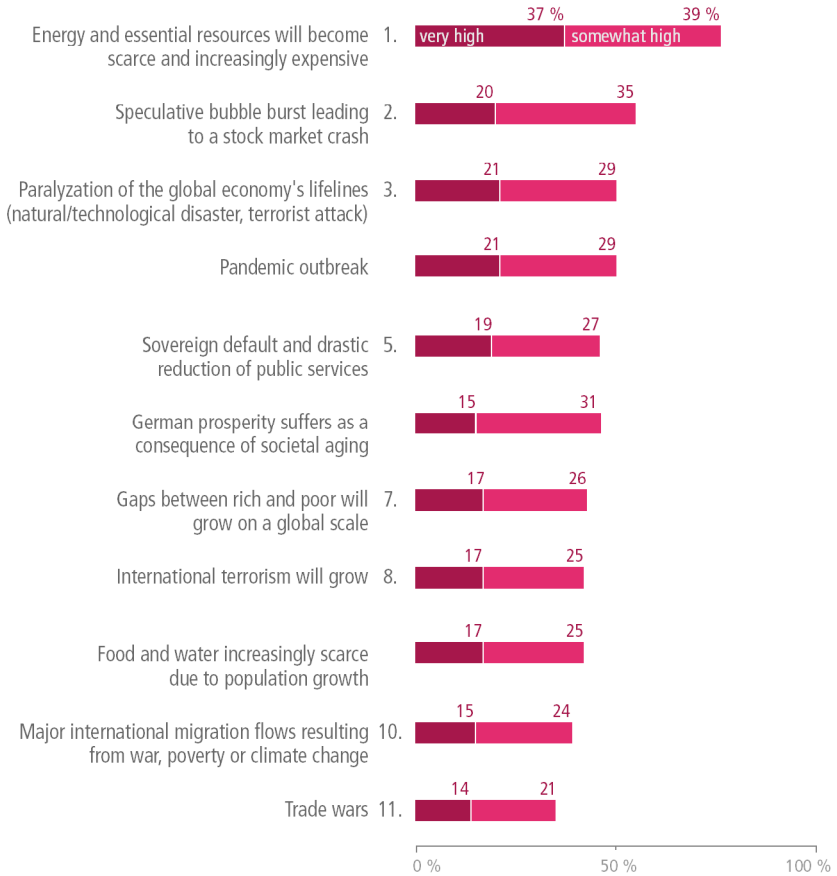
Germans also consider a sovereign default, with drastic consequences for the provision of public services, a stock market crash caused by the bursting of a speculative bubble as well as increasing scarcity of water and food as very probable. In the export nation of Germany, the least probable occurrence is held to be the outbreak of a trade war. The extent to which the respondent would be personally affected is also regarded as relatively low, although the German labor market is dependent to a large degree on global trade.

**Fig. 12: Probability of occurrence in the eleven risk areas: percentage of assessment of “very probable” and “somewhat probable”**



Note: Respondents (German public) had four options to choose from in assessing impact: very probable – somewhat probable – somewhat improbable – very improbable.

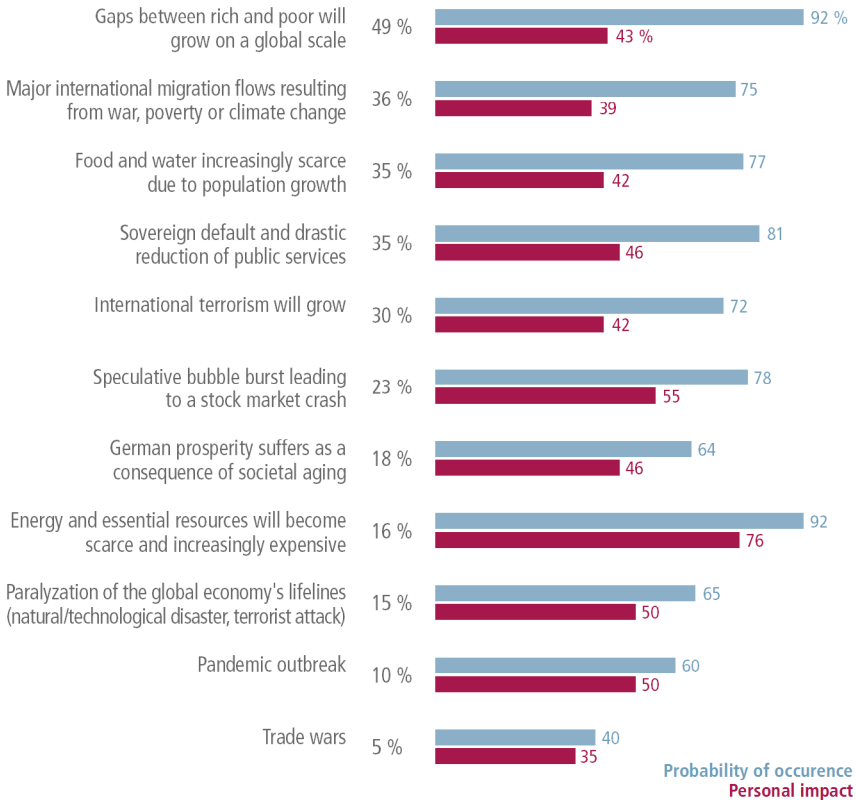
**Fig. 13: Impact on personal life in case of risk occurring: percentage of assessment of “very high” or “somewhat high”**



Note: Respondents (German public) had four options to choose from in assessing impact: very high – somewhat high – somewhat low – very low.

Comparing the answers regarding probability of occurrence with the expected impact on personal lives shows that whereas respondents regard many risks as very probable, they see themselves as less likely to be impacted. The following graphic shows this clearly (Fig. 14).

**Fig. 14: Probability of occurrence and personal impact: Comparison of summarized answer frequency for “probable occurrence” and “high impact”; difference in percent**



Note: The bars summarize both upper answer options from Fig. 12 and Fig. 13 as a percentage.

Germans see the greatest discrepancy between probability of occurrence and personal impact in the growing divide between rich and poor, international flow of refugees as well as water and food crises. But even the risk of a national default, which due to the debt crisis in the eurozone was rated very highly and is more or less at hand, fewer members of the public expect a “very high” or “somewhat high” impact on their personal lives.

While Germans see high risks for the global economy, far fewer expect major personal impact. The public is significantly more optimistic than decision makers and experts from developed, industrialized countries (OECD countries). They believe that the costs for industrialized nations will be significantly higher than the global average for the risk areas of sovereign debt, financial market crisis, aging societies and failure of systemic infrastructure. If they’re right, then the potential damage to Germany if these risks occur is particularly high. Politics and business in German should take this as a wake-up call. They should ensure that they place particular emphasis on successful risk management measures – especially in these four risk areas.





## The Results, in Detail

Holger Glockner, Thieß Petersen, Andreas Schaich

The following eleven sub-chapters present in detail the results of both the expert and public opinion surveys for each risk area. Each section is structured in the same manner.

Each sub-chapter begins with *facts and figures*, in which the underlying data describing the state of a given risk is provided and *key statements*, in which the expert survey results are summarized. This is followed by sections assessing first the experts' views on the *global relevance* of a risk area and, second, their opinion regarding the *comprehension of a problem and potential risk-mitigation measures*. Each sub-chapter concludes with a summary of public opinion in Germany regarding the risk area in question.

<b>Food and water scarcity</b>	page 36
<b>Energy and resource scarcity</b>	page 45
<b>Socioeconomic inequality</b>	page 53
<b>Uncontrolled mass migration</b>	page 60
<b>International terrorism</b>	page 67
<b>Aging societies</b>	page 75
<b>Sovereign debt/default</b>	page 83
<b>Financial market collapse</b>	page 91
<b>Protectionism/trade wars</b>	page 99
<b>Pandemic outbreaks</b>	page 107
<b>Technology infrastructure failure</b>	page 114

## Food and water scarcity

### Facts and figures

Die According to United Nations forecasts, the world's population will climb from a current total of 7 billion people to 7.66 billion in 2020 and to 9.31 billion in the year 2050. In 1990, by comparison, the planet had 5.31 billion occupants (UN 2010).

This continued growth in the world's population also increases global demand for water and food. Nonetheless reserves, particularly of drinking water, have remained at essentially the same levels. This means that between 1992 and 2007 the amount of accessible, renewable fresh water reserves dropped by 17.5 percent per person (World Bank 2010).

Arable land is also limited and in many emerging nations, in particular, its use is increasingly contested by the competing land needs of growing populations, expanding cities and industrialization. While the arable proportion of the world's land increased from 34.2 percent in 1961 to 38 percent in 2000, it has since dropped steadily to its current proportion of 37.6 percent. Farmland amounts to just 11.7 percent of the world's land surface, with no appreciable increase since the late 1980s (FAO 2011).

Regularly recurring famines and droughts such as those which affected the Horn of Africa in 2011 are a tragic indication of the consequences of food and water scarcity. Along with the natural borders of fresh-water areas and agricultural land, institutional factors ply a major role here, including misappropriation of funds intended for infrastructure projects and corruption which undermines trust in state institutions.

The effects of climate change are likely to worsen already difficult supply conditions, especially in the world's least developed countries. The

Intergovernmental Panel on Climate Change (IPCC) forecasts an increase in flooding and droughts with an adverse impact on food production (IPC 2007).

Anthropogenic environmental pollution caused, for example, by extraction of mineral resources in contravention of environmental standards, can also have a catastrophic effect on supplies of clean drinking water and agricultural cultivation, at the local level at least.

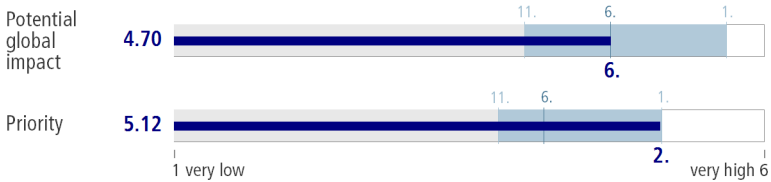
These problems lead to malnutrition and a further growth in poverty-related illnesses in the affected regions. Inhabitants are often forced to orient their resources to pure survival, weakening their economic power in the long term and greatly reducing their future prospects.

Rising food and water prices have the greatest negative impact on the poorest levels of society – the consequence of an increasing social gap within the societies in question. If the desertification of fertile land increases significantly, regional and international battles for agricultural land and water supplies can no longer be ruled out.

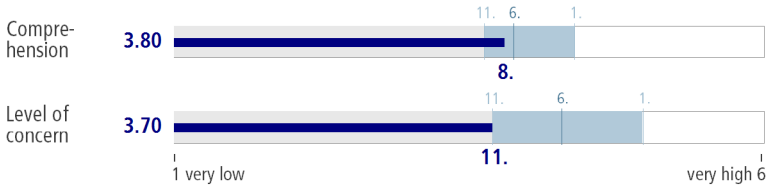
**Key statements on “food and water scarcity”**

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

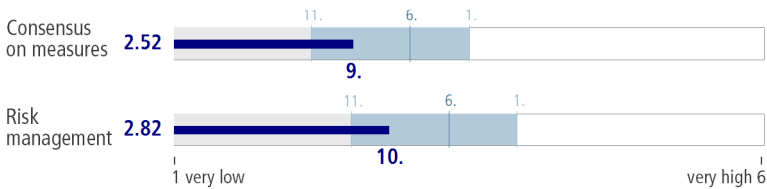
**1. The risk holds a middling rank in terms of potential global impact but is accorded the second highest priority in terms of finding a solution.**



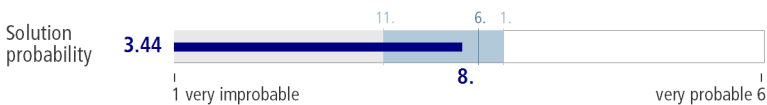
**2. The risk is understood relatively poorly in comparison with other risks and is accorded the lowest level of concern among decision makers.**



**3. The risk ranks low in terms of consensus on mitigation measures and quality of risk management.**



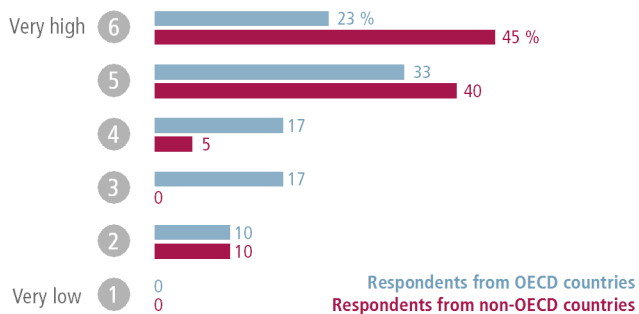
**4. Food and water scarcity is considered to have a somewhat lower probability of solution than most other risk areas.**



## Global relevance of the risk area

The experts' view of risks associated with food and water crises are highly diverse in comparison with results from other risk areas. Overall they attribute a medium level of potential impact for the global economy, but were far from united in their assessments (Fig. 1).

Fig. 1: Impact of food and water crises on the global economy: percentage distribution of respondents' assessments



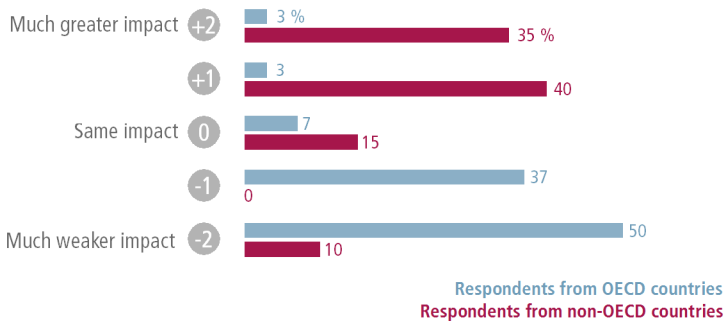
Experts from wealthy OECD regions assess the problem as having far less economic impact than their counterparts in non-OECD countries. Of the latter, 85 percent believe the problem has a high or very high potential impact. As expected, experts from non-OECD countries regard their respective homelands as far more affected than OECD experts (Fig. 2). However, the respondents largely agree that the problem of food and water scarcity urgently requires a swift solution.

As for the open question of the gravest economic consequences of food and water crises, responses confirm the relevance that respondents ascribe to the topic. At the same time, they perceive the risk area as strongly regional in nature.

Immediate consequences in the affected regions frequently cited by the experts include loss of economic performance, worsening of general health

conditions and, particularly in less developed countries, an increase in social inequality. This leads to resource allocation conflicts which could result in social unrest or even a loss of political stability.

**Fig. 2: Impact of food and water crises on respondents' country of origin compared to impact on global economy: percentage distribution of respondents' assessments**



Many experts cite distribution problems and unequal economic and social participation as a primary cause of food and drinking water scarcity, thus highlighting two dimensions of the term “scarcity.” Scarcity in the sense of an actual shortage must be differentiated from structural or even artificial forms of scarcity. The experts regard countries and regions with weak economic, political and social structures as far more susceptible to shortages of drinking water and food than more stable countries.

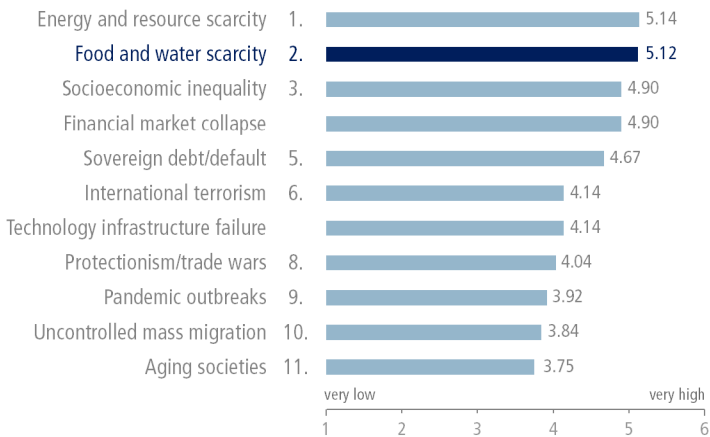
The respondents regard the probability of water shortages and food scarcity as closely related to factors like quality of political leadership and the institutional framework. However this by no means indicates that consequences are confined to the regional level. For instance, the majority of respondents expect such outcomes as an increased gap between the world’s rich and poor, increase in political conflicts and migration, and a greater terrorist threat. Some respondents associate water scarcity with a threat of war.

At the same time, survey participants foresee increased compartmentalization of markets in the agricultural sector and an increase in trade conflicts.

### Comprehension of the problem and risk-mitigation measures

The experts interviewed rate the topic of food and water scarcity as the second most urgent risk area and see a pressing need for action (Fig. 3).

Fig. 3: Recommended priorities in averting/mitigating risks (all respondents)



According to respondents, however, this urgency stands in stark contrast to comprehension of the problem among the decision-making elite and their determination to find a solution. Food and water crises come last in the scale of concern (Fig. 4). According to respondents, topics such as international terrorism and financial market crises were of far greater concern to decision makers.

**Fig. 4: Level of concern about the risk areas on the part of global decision-making elites (all respondents)**



How can we explain this low level of concern? A lack of knowledge and associated underestimation of the problem are clearly not the cause. Survey participants feel that the causes, effects and consequences of food and water crises are generally understood. As this risk represents a problem above all for developing and emerging nations, it is possible that the experts interviewed have the industrialized nations' decision-making elite in mind when they assume a low level of concern.

This assumption accords with their assessment of potential economic impact: experts from OECD countries rate the risk area as far less dangerous than do their colleagues from non-OECD countries.

Responses regarding the quality of worldwide efforts to reduce the risk of food and water shortages follow the same pattern. These risks are regarded by respondents as very low in comparison to other risk areas. Despite the basic level of understanding as to the causes and interdependency of food and water scarcity, the experts interviewed rate the probability of a solution with an average of 3.44, just under the middle of the scale (3.5). This stems from a lack



of political consensus: almost three quarters of the respondents cite this as the leading cause.

The respondents believe that solutions which will reduce the risk of food and water crises require globally coordinated action, while the effects remain regionally confined to non-OECD countries and so the major decision makers in the most developed societies are not unduly concerned. The greater the political disagreement, the more negatively the respondents regard solution efforts already undertaken.

There are noticeable differences of opinion among the experts in the case of food and water crises. Approximately the same number of participants regard a future solution as very improbable as those who see it as very probable. There is a very clear differentiation according to the profession of the respondent: Whereas politicians see food and water crises in a very negative light, those with a business background are far more optimistic about a future solution.

Most experts are of the opinion that fighting corruption and increasing distributive justice worldwide are the best solution strategies. Interviewees see opportunities to overcome purely subsistence-based economies in the establishment of local economic cycles in line with the “bottom of the pyramid” principle. This maintains that inhabitants of the largest and poorest socioeconomic level in developing and emerging nations, who live on less than two dollars a day, should be regarded as fully valid consumers and re-educated so that they might become small business operators.

On the global level, the majority of experts call for stronger participation in global trade for weaker market participants and easier market access for developing nations. They see traditional, short-term-oriented development aid as an ineffective means of solving the problem as it offers no prospects for sustainable economic development. According to the experts, long-term solutions can only be found if politics and business work in tandem.

Concrete proposals focus on the global development agenda and internationally binding regulations for world trade and credit as well as a more sustainable framework for development cooperation. Survey participants cited global institutions such as the WTO and the World Bank by name.

Other proposed solutions include improving education in the affected regions and expanded knowledge transfer from industrialized countries to developing and emerging nations. Some participants called for an end to water privatization. Technological approaches, such as high-yield, disease-resistant seeds, could also contribute to a solution according to some experts.

### **Public opinion in Germany**

Of the members of the German public canvassed by infas, 77 percent regarded increased scarcity of food and water as “very probable” or “somewhat probable.” This risk area consequently ranks in the upper middle of risks most often cited as (highly or somewhat) likely to occur. The personal impact of this eventuality for people in Germany is however seen as relatively low. A total of 42 percent of respondents thought it would have a “very high” or “somewhat high” impact on their personal lives. Increased food and water scarcity is thus one of the dangers where the discrepancy between perceived probability of occurrence and assessment of personal impact is the highest.

## Energy and resource scarcity

### Facts and figures

With the world's population increasing and global economic output constantly expanding, the demand for energy and natural resources is growing stronger worldwide. Efforts to reduce consumption of resources, and energy in particular, have only been partially successful until now (SERI 2010). The global economy grew by around 164 percent between 1979 and 2008, adjusted for changes in purchasing power (IMF 2011b). Worldwide energy requirements may have grown at a slower rate, with an increase of 70 percent (IEA 2010a), however this increase was still much too high, especially given the challenges of climate change.

The energy requirements of large emerging powers such as China, India and Indonesia are expected to greatly increase in the coming decades: The "Current Policies" scenario produced by the International Energy Agency (IEA) assumes that the entire primary energy demand of non-OECD countries will almost double from 6,516 Mtoe (megatons of oil equivalents) in 2008 to 11,696 Mtoe in 2035 (IEA 2010b).

Demand for coal, in particular, will rise sharply if current political conditions remain largely unchanged: In the same scenario, the IEA predicts worldwide demand for coal to rise from an annual 3,315 Mtoe in 2008 to 4,307 (5,281 Mtoe) in 2020 (2035), with non-OECD countries accounting for the entire increase (IEA 2010b). China's "coal hunger," especially, is immense, with the IEA predicting it will represent over half of excess consumption. Consequently the price for thermal coal has been rising for some time and since the early 1990s has almost tripled in real terms (IMF 2011b). The strong growth of emerging markets also contributes to the shortage and thus rising costs of other energy sources. The Energy Price Index (coal, gas, crude oil) has risen by 300 to 400 percent since 1990 (IMF 2011b).

Renewable energies and nuclear power represent possible solutions to the raw material dilemma, however since the Fukushima catastrophe nuclear power is more contentious than ever, and the development of renewable energies lags behind rapidly increasing energy demands.

Global raw material reserves – both energy and non-energy sources – are nonetheless limited. If green electricity generation can establish itself on a sufficient scale, this would mean a sharp increase in demand for certain raw materials such as rare earths. Demand is expected to increase from 130,000 tonnes (2009) to 210,000 tonnes (2015) worldwide (Bloomberg 2010). The likely growth of the “bottom of the pyramid,” that is, the largest and poorest sector of the world’s population, as well as the steady growth of the global middle class would also massively increase worldwide resource demands if they follow conventional growth paradigms.

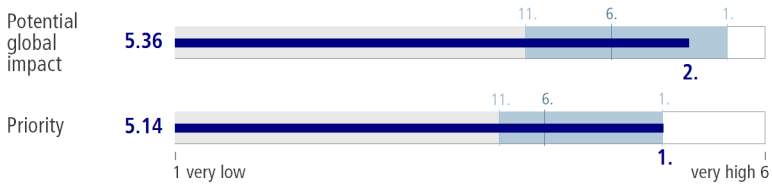
Reserves of raw materials required for industrial production are finite and limited to a few countries, which in turn has negative consequences for security of supply. Costs for raw materials have increased sharply since the start of the millennium with the price index for primary industrial products (agricultural products and metals) rising from 78.39 points in January 2000 to 208.36 points in July 2011 (IMF 2011c). In the future raw material costs may increase further, and with greater volatility, increasing the risk of geopolitical resource conflicts.

On the one hand raw materials are in short supply, on the other hand environmental damage and other effects of resource exploitation can’t be underestimated, although this will presumably be more readily tolerated in the light of rising raw material prices. However, the threat of climate change also brings opportunities, if for example developing countries are able to move beyond the West’s energy-intensive economic model.

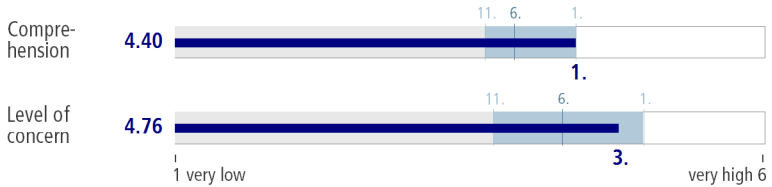
### Key statements on “energy and resource scarcity”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

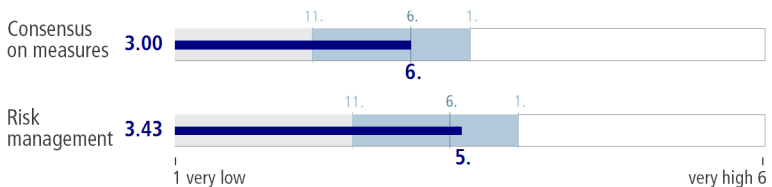
**1. Respondents attribute the second-greatest potential global impact to this risk and believe it should be accorded the highest priority.**



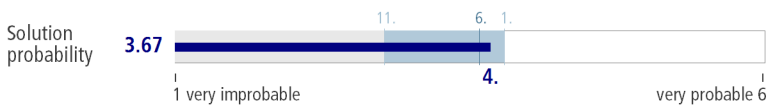
**2. Respondents consider this risk to be best understood and observe a high level of concern among decision makers.**



**3. The risk holds a middling rank in terms of consensus on mitigation measures and quality of risk management.**



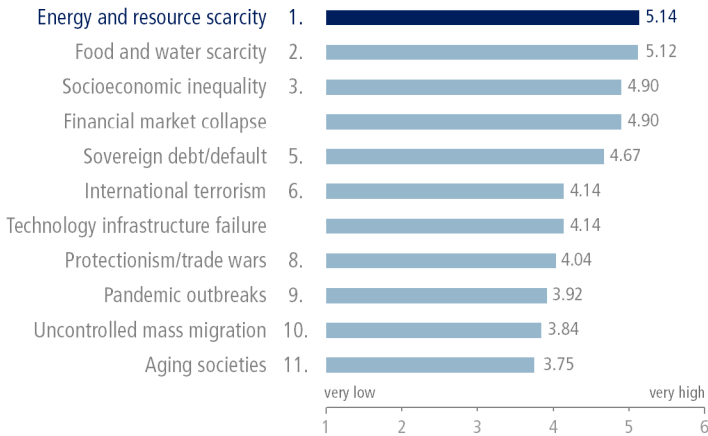
**4. Energy and resource scarcity is considered to have a somewhat higher probability of solution than most other risk areas.**



## Global relevance of the risk area

The experts' opinions confirm the major significance that natural resources have for the global economy, as outlined in the introduction. They regard energy and resource scarcity as a risk area with high potential impact for the global economy, giving it an average of 5.36 on a scale of 1 (very low) to 6 (very high) – only the collapse of finance markets (5.68) scored higher. The respondents also feel there is a pressing need to act – they see the quest for effective measures in dealing with energy and raw material scarcity as the highest priority among all the risk areas (Fig. 1).

**Fig. 1: Recommended priorities in averting/mitigating risks (all respondents)**



The experts assume that the major significance of energy and raw material scarcity will be recognized at the decision-making level. They regard concerns related to risks and challenges as very high, giving an average rating of 4.76 (where 1 stands for the lowest level of concern). Only international terrorism and the potential collapse of finance markets are assumed to be of greater concern to decision makers.

The experts give a wide variety of answers to the open question of the gravest economic consequences of energy and raw material scarcity, at times incorporating consequences not strictly economic in nature.

Many experts believe the global economy would be directly affected in the form of rising costs and falling productivity. One German economist sees value creation transferring at least in part from the service sector back to industrial production. Higher macroeconomic costs may have to be factored into goods production, with correspondingly fewer resources available to the service sector.

Respondents see the widening worldwide gap between rich and poor as a danger for economic performance. They expect new political dependencies and more unstable political conditions overall, giving rise to protectionist tendencies as well as international resource conflicts, increasing social inequality (both within and between countries) and military conflicts over raw materials. Experts see the poorest of the poor as the main losers, and the danger of uprisings as a likely outcome.

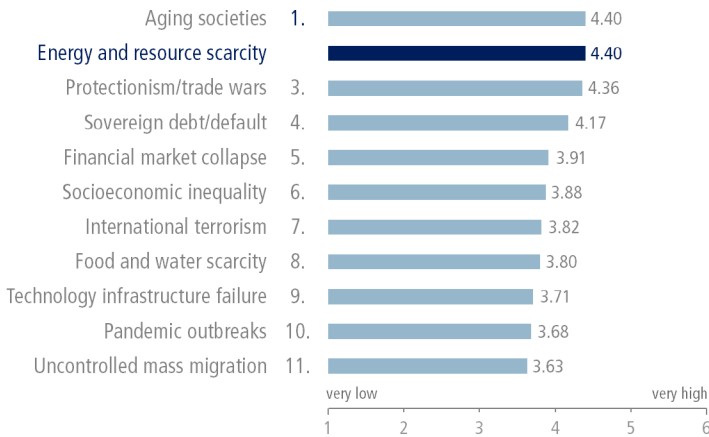
The risk to the environment is often cited along with social consequences. Some respondents speculate that exploitation of resources will be accompanied by ever greater risks in the future, with an increase in environmental pollution as a consequence. One expert describes the possibility that nuclear energy might play a larger role in future electricity generation as a negative outcome.

Some of the experts interviewed also see opportunities in the resulting pressure to adapt. More research and development in the field of alternative energies and energy efficiency as well as breakthroughs in the field of material efficiency could have positive consequences of energy and raw material scarcity.

### **Comprehension of the problem and risk-mitigation measures**

Those interviewed regard concern among decision makers regarding energy and resource scarcity as very high. They evaluate comprehension of the causes, effects and consequences as relatively high, with an average rating of 4.40 on a scale from 1 to 6 (Fig. 2). This makes energy and resource scarcity the risk area with the greatest comprehension (along with aging societies) according to the experts, but even here they see information deficits.

**Fig. 2: Comprehension of the risk areas on the part of global decision-making elites (all respondents)**



The respondents regard the quality of present solution strategies for energy and resource scarcity more positively than in other risk areas while at the same time seeing significant room for improvement: They evaluate efforts at solving this problem with an average rating of 3.43 on a scale of 1 (very poor) to 6 (very good).

The primary cause of this modest rating presumably lies in comprehension and knowledge deficits. In contrast to most other risk areas there is no correlation in responses to the two questions: Respondents who regard the quality of risk management negatively rarely believe comprehension to be low as well. It can be further assumed that the experts blame mediocre solution strategies on technological shortfall on the one hand and a lack of political consensus on the other. Consensus on effective risk-mitigation measures is indeed very low – a cause for concern in light of its relevance not just for the global economy, but for the global climate as well.

Of the experts interviewed, 57 percent see a lack of political consensus as the main obstacle to a solution, while 30 percent put the lack of appropriate technologies at the top – more than with any other risk area. This result corresponds with the at times bitter debate about expansion of renewable



energies, which the lack of political consensus vividly demonstrates. The issue of price, often cited as an argument against renewable energies, results from a lack of reasonably-priced technologies suitable for mass market usage.

Nonetheless the respondents regard the probability of a future solution about as highly as, for example, the prospects for solving the threat of financial market collapse or excessive state debt – on a scale of 1 (very low) to 6 (very high), the average probability rating is 3.67.

A glimpse at the data shows that those experts who cite a lack of appropriate technologies as the main obstacle are particularly optimistic – they evidently assume that the required technology will become (cheaply) available sooner or later, and that it will also be implemented. On the other hand, participants who see a lack of political consensus as the greatest obstacle are highly pessimistic about the possibility of a future solution to the issue.

Responses to the open question of best approaches demonstrate widespread agreement among the experts. Well over half of their responses relate to the area of renewable energies and energy efficiency: Recommendations range from the search for alternative energy sources and greater promotion of renewable energies to the abolition of false incentives, such as the hidden subsidization of energy consumption in the transport and agricultural sectors. One expert proposes an internationally coordinated energy and raw material distribution mechanism which would no longer disadvantage poorer states. There were isolated calls for additional investment in coal and gas, particularly in Africa, as well as securing free trade in energy sources.

A further oft-cited approach emphasizes the importance of general scarcity consciousness. This approach aims at raising awareness among the general population, as well as politicians, of the finite nature of the resources they use every day, so that a more frugal approach becomes second nature sooner or later. To this end politicians, and ideally companies as well, would intensively promote sustainable lifestyles. The respondents see the G20 countries as particularly responsible here.

Overall, a global consensus on common interests and living standards is required for the significance of the finitude of natural resources to anchor in the consciousness of decision makers and the general population.

### **Public opinion in Germany**

The growing scarcity of energy and raw materials is – together with the danger of the gap between the world’s rich and poor increasing – the risk that according to most members of the public canvassed by infas will actually occur: 92 percent believe that it is “very probable” or “somewhat probable” to occur. It is also an eventuality that most members of the German public believe will have an impact on their own lives: 76 percent believe that growing scarcity of energy and raw materials will have a “very high” or “somewhat high” impact on their lives. This puts it at the top of the eleven risk areas for both the probability of its occurrence as well as its personal impact.

## Socioeconomic inequality

### Facts and figures

Extreme socioeconomic inequality has an immense capacity to tear societies apart, for various reasons. In particularly unequal societies, long-term unemployment, poverty and complete dependence on state welfare payments (if available) exclude many people at the bottom of the social structure from taking part in society, while the upper classes live in a comparatively luxurious parallel world. Above all, it is in the large urban centers of emerging countries that socioeconomic contrasts collide.

In Brazil, for example, the most common measure for social inequality, the Gini coefficient (ranging from 0 to 1) is a relatively high 0.55,<sup>1</sup> despite a slight drop in recent years. In China, inequality has increased significantly since the mid 1980s and the Gini coefficient has risen from 0.3 to 0.4 (The Economist 2011). Various Latin American and African countries are beset by inequality (CIA 2011a).

However, socioeconomic inequality is increasingly also becoming an issue in developed economies. In the United States, the share of national income earned by those in the top income brackets has grown rapidly since the early 1980s, as shown in a study by Berkeley professor Emmanuel Saez. According to his research, the proportion of total income earned by the top ten percent

<sup>1</sup> The Gini coefficient measures the deviation between actual distribution and equal distribution, which in the economic context generally refers to wealth or income. Equal distribution, in which all citizens have exactly the same wealth or income, would have a Gini coefficient of 0; Gini coefficient 1 would be reached if one person owned all the wealth and other citizens had none.

rose from about 33 percent in 1977 to almost 50 percent in 2007, with the top one percent recording a massive gain from ten percent to about 22 percent (Saez 2010). According to the CIA, the Gini coefficient has recently risen from 0.41 in 1997 to 0.45 in 2009 (CIA 2011b).

The potential consequences of social and economic inequality are diverse and complex. Strong socioeconomic inequality can lead to differences in health between social classes, for example – health then becomes a clear indicator of wealth (Siegrist, Marmot 2008). Additionally, children from poor backgrounds often have markedly less access to education and, later, to the job market.

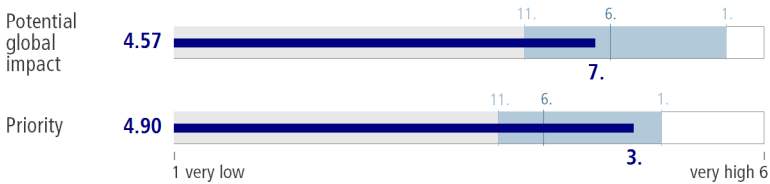
Socioeconomic inequality therefore has a self-reinforcing effect – it prevents or limits social mobility, which in turn further entrenches social divisions.

An unequal society is more susceptible to violent conflict, political extremism and criminality. This is shown in two examples from Europe: the civil unrest in the suburbs of French cities in 2005 or the violent clashes in London in the summer of 2011. When large sections of the population lack access to education, the economy suffers from a lack of qualified workers – an unsustainable situation, especially given the impending global shortage of skilled workers (Deloitte 2010). Overall, a society that suffers from wide social and economic gaps has to make great efforts to alleviate the consequences of this division.

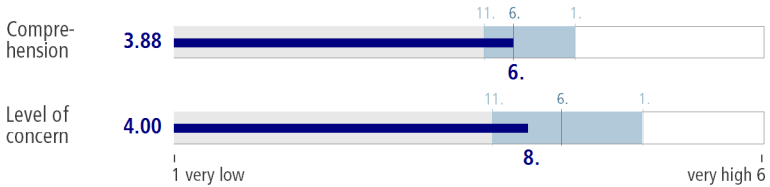
### Key statements on “socioeconomic inequality”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

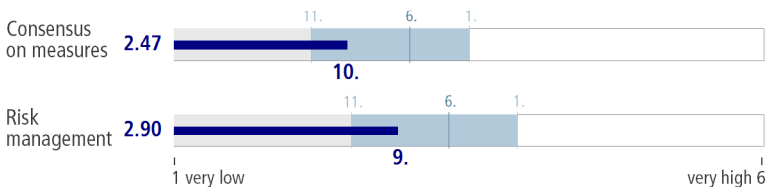
- 1. The risk holds a middling rank in terms of potential global impact, but respondents believe it should be accorded the third highest priority.**



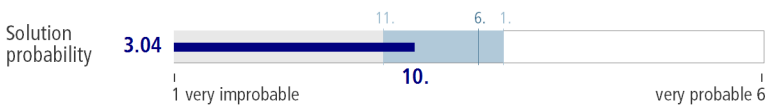
- 2. This risk is accorded a middling rank in terms of how well it is understood and the level of concern among decision makers alike.**



- 3. The risk ranks low in terms of consensus on mitigation measures and quality of risk management.**



- 4. Socioeconomic inequality is considered to have a considerably lower probability of solution than most other risk areas.**

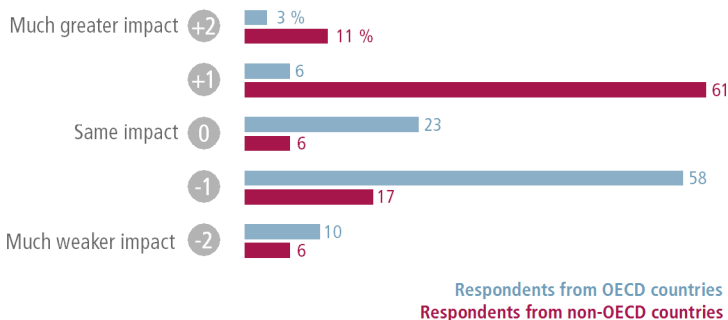


## Global relevance of the risk area

Growing socioeconomic equality is not at root an economic phenomenon, but the experts assign a strong economic relevance to the risk area. They give the potential impact on the global economy a score of 4.57 on a scale of 1 (very low) to 6 (very high), which is roughly equivalent to the potential impact of food and water scarcity and aging societies, but significantly lower than the impact of a financial market collapse, for example (5.68).

Nonetheless, once again it is clear that the respondents are not only concerned with the potential economic impact: finding a solution to growing socioeconomic inequality in societies should, according to the experts, be almost as high on the global agenda as avoiding a financial market collapse and dealing with energy and resource scarcity. The respondents therefore attach the greatest urgency to the problem of socioeconomic inequality. Participants from non-OECD states, in particular, prioritize a solution to this set of problems and consider their own region to be worse affected than the global average (Fig. 1).

**Fig. 1: Impact of socioeconomic inequality on the respondent's country of origin compared to impact on the global economy: percentage distribution of respondents' assessments**



In response to the open question of what the most serious economic effects of growing socioeconomic inequality would be, the experts mainly draw attention to the grave consequences of inequality in the social arena.

The respondents emphasize the fact that socioeconomic imbalances push large sections of the working age population to the edges of society, robbing these people of prospects. This leads to frustration and entrenches social divisions. Seen from an economic perspective, a lack of options for large segments of the society also represents a considerable waste of human capital. Inner cohesion weakens in the affected societies, the rich increasingly wall themselves off and the likelihood of social unrest, revolution and even wars and terrorism increases, according to some experts.

Respondents often raise the argument that extreme inequality is a burden on national finances – either because of high redistribution costs or due to the high costs of public security.

### **Comprehension of the problem and risk-mitigation measures**

As with the case of food and water scarcity, despite the severe potential impact outlined by the experts, they perceive only limited concern for the problem on the part of decision makers, when compared to other risk areas. The respondents rated the level of concern with an average of 4.0 on a scale of 1 (very low) to 6 (very high). In the eyes of respondents, the decision makers' agenda is dominated, instead, by the issues of international terrorism (4.97), upheavals in financial markets (4.82) and energy and resource scarcity (4.76).

Comprehension of this risk area among academics and decision makers is also apparently average, at best. Nevertheless, this is not particularly meaningful because the experts rate most risk areas at the same mediocre level.

Whereas the imputed average comprehension of the risk area is therefore not a particular cause for concern, the experts' pessimism regarding current efforts to solve the problem of inequality should be heeded. On average, the respondents rate the quality of endeavors to find a solution with a score of 2.90 on a scale of 1 (very poor) to 6 (very good), that is, poor overall.

Even more alarming, however, is the pessimism displayed by experts when it comes to a consensus on appropriate risk-mitigation measures: on average, they evaluate the level of current consensus with a score of just 2.47 on a scale of 1 to 6. Some experts believe that there is not even a rudimentary consensus, assigning the lowest available score of 1. In line with this, the respondents consider the probability of finding a future solution to be slight, with an average rating of 3.04 (Fig. 2).

**Fig. 2: Probability of averting/mitigating risks in the future (all respondents)**



For the risk area “socioeconomic inequalities,” as with the “food and water scarcity” risk area, there is a clear discrepancy between the experts’ perception of the problem on the one hand and the level of concern they impute to decision makers on the other. Although respondents classify the issue as highly relevant in both the social and economic contexts and believe a solution urgently needs to be found, they see only a low level of concern among decision makers and consider the proposed measures to be in need of considerable improvement.

When asked about the best approach, most experts mention redistribution measures (to counteract the present distribution of wealth). They propose fairer tax systems and stress the importance of a sense of social solidarity. All



the proposals are aimed at increasing levies on higher incomes and capital income. Negative income tax, higher taxation of top income, inheritance or property taxes and taxing financial transactions are all mentioned. In addition to fiscal redistribution instruments, the experts also consider education and health policy to be a suitable arena for reducing social inequality.

An expert from Pakistan explicitly calls for effective legal equality of poor and wealthy citizens. In terms of developing and emerging countries, the suggestions point towards Amartya Sen's capability approach, which includes factors such as political freedom, education, health and social security among the instrumental functions of freedom (Kuklys 2005).

Purely economic solutions are also mentioned: many experts call for stronger competition in order to prevent the formation of monopolies, free market access for goods or unrestricted labor mobility. A business representative from South America believes that promoting entrepreneurship would be an effective measure. Some experts also propose spreading democracy as a solution to the problem of inequality.

However, the most fundamental proposals are aimed squarely at politicians and other decision makers: in the eyes of many experts, there is not only a need for a stronger awareness of inequality, more importantly there needs to be an express political will to tackle the problem – and to put the well-being of the whole society before the well-being of the “top ten thousand.”

### **Public opinion in Germany**

More than 90 percent of German citizens believe that the gap between rich and poor will grow, worldwide. Together with the risk of increasing energy and resource scarcity, the growth in global income disparities is the risk that the greatest number of those surveyed by infas believe likely to occur. Nevertheless, only 43 percent believe that this development will have any impact on their own life. A global widening of the gap between rich and poor is therefore the risk with the greatest discrepancy between how likely the German public believes the danger to be and how much those same people believe this issue will affect them personally.

## Uncontrolled mass migration

### Facts and figures

The famine in the Horn of Africa in the summer of 2011 showed dramatically how drought-related water and food crises can deprive an entire region of the foundations of life. It also provided a hint of the explosive force contained in the forced migration of millions of people. According to U.N. estimates, 12 million people in Ethiopia, Somalia, Djibouti and Kenya were sufficiently undernourished to be considered starving or at risk of starving (UN 2012). The economically underdeveloped Kenya was overwhelmed by the situation. By August 2011, the country's Dadaab refugee camp was hopelessly overcrowded with around 400,000 refugees, with at least 116,000 people having arrived between January and August 2011 alone (GfbV 2011).

Conflicts and wars, a prostrate economy, the effects of climate change or – as in the Horn of Africa – a combination of these factors is rendering some regions of the world increasingly uninhabitable. Directly or indirectly, they deprive local residents of the foundations of economic life, or even present a mortal danger. If possible, therefore, those individuals affected leave their homes in the hope of finding a better life elsewhere. Between 2000 and 2010, the number of worldwide migrants consequently rose from 150 million to 214 million (UN 2008). At a total of 15 million, the share of climate-related refugees remains relatively low today, but according to Stern Review, this figure may climb as high as 200 million by the year 2050 (Stern 2006).

Mass migration can in addition exacerbate social and economic problems both in refugees' countries of origin and in those where they seek to build a new life – particularly in developing countries such as Kenya. Although economically more powerful countries also fear an influx of refugees – as for instance Italy, which early in 2011 requested European Union help in handling

15,000 Tunisian refugees – but in general refugee issues play a much larger role in developing countries.

Italy's claim was perhaps exaggerated, but it does show that large, uncontrolled refugee flows can create serious short-term problems in destination countries. If future climatic conditions worsen, particularly in arid areas, living conditions would be further undermined, and the frequency and extent of famines such as that in the Horn of Africa could also increase. Even countries that to date have been little or not all affected could see themselves confronted with refugee flows.

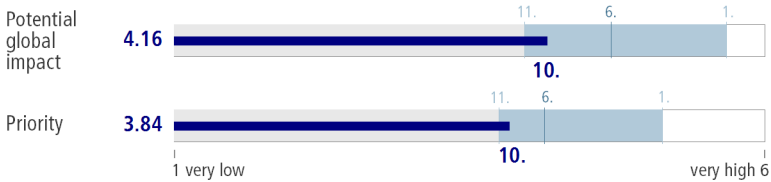
For the world community, this presents an immense challenge. From a moral perspective, events of this scale demand action such as disaster relief. But precarious living conditions also serve as a breeding ground for extremist ideas, both in refugees' countries of origin and in destination countries. Uncontrolled mass migration therefore has both moral and security-policy implications.

Large-scale migration – if it takes place over a longer period of time rather than abruptly – can also be an advantage for the destination countries, and can contribute to a shift in global power relations. Historical examples include the waves of emigration from Europe to the United States, particularly between the 17th century and the end of World War II.

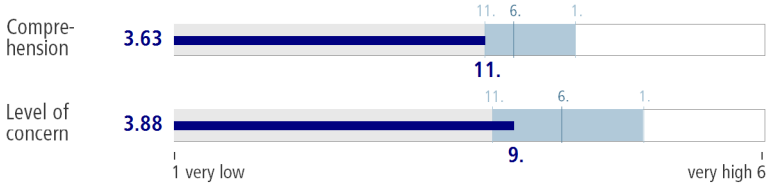
**Key statements on “uncontrolled mass migration”**

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

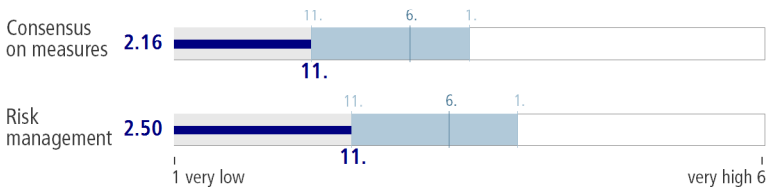
**1. Despite rather high absolute values, the risk holds the next-to-last rank both in terms of potential global impact and solution priority.**



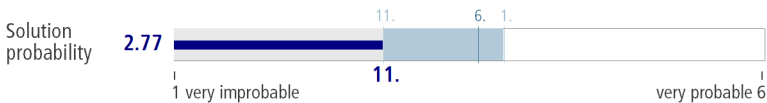
**2. Respondents rate uncontrolled mass migration as the most poorly understood of all risks and attribute comparatively low levels of concern to decision makers.**



**3. The risk falls at last place in terms of consensus on mitigation measures and quality of risk management.**



**4. Among all the surveyed risks, finding a solution to uncontrolled mass migration is believed to be least likely.**



## Global relevance of the risk area

Experts rate the potential for damage to the world economy associated with uncontrolled mass migration as significantly lower than is the case for most other risk areas. However, given an average rating of 4.16 on a scale of 1 (very low) to 6 (very high), this does not mean they see mass migration as economically unproblematic.

The experts considered uncontrolled mass migration to be comparatively less urgent than other risk areas – indeed, they accorded a lower priority only to the solution of problems associated with aging societies. In their answers to the open question on the most serious economic consequences of uncontrolled mass migration, the experts' concerns related both to migrants' potential destination countries and countries of origin.

In the destination countries, respondents warned of rising social inequality and social unrest generated by the lack of integration of a large number of immigrants. As specific problems in this context, they identified a rise in unemployment, high levels of pressure on social systems, the formation of ghettos and a rise in crime.

Consequences in migrants' countries of origin are naturally somewhat different. Experts see a particular danger of brain drain, or a mass exodus of well-educated people abroad; initially, this further exacerbates conditions within the country of origin, but in extreme cases can destabilize an entire region, foster the emergence of failed states, exacerbate inequalities between countries and lead to further deterioration in security conditions.

Several experts pointed to a lack of “refugee management” in destination countries as bearing a share of responsibility for the problems. An expert from Africa explicitly places opportunities for migrants in the foreground of analysis, particularly if these have been the subject of anticipation. In this view, migration is simply a form of labor mobility. This interpretation emphasizes long-term effects and opportunities related to migration, and it is probable that the expert conceives migration to be a continuous rather than a disruptive phenomenon.

### Comprehension of the problem and risk-mitigation measures

In the view of the survey respondents, uncontrolled mass migration provokes only moderate levels of concern among decision makers. On a scale of 1 (very low) to 6 (very high), the experts rated the level of concern at an average value of 3.89. Decision makers were more concerned about most other risk areas, in the eyes of the survey respondents.

Uncontrolled mass migration is perceived to be the most poorly understood risk area (Fig. 1). One reason could be that this risk area, as noted briefly above, is strongly driven by other phenomena, and is thus primarily a consequence of other high-risk developments at the global level.

**Fig. 1: Comprehension of risk areas on the part of global decision-making elites (all respondents)**



Solutions proposed by the experts suggested that social inequality, war, climate change, but also factors such as protectionism could in the final analysis lead to mass migration; this risk area is thus characterized by a complex weave of cause-and-effect relationships. For this reason, experts assess comprehension of the area to be as low as for the outbreak of global pandemics or the failure of technological infrastructures.

Survey respondents correspondingly assessed current efforts to manage mass migration as poor – on a scale of 1 (very poor) to 6 (very good), they gave solution strategies an average rating of 2.5. This may be a result of the minimum level of consensus ascribed to decision makers, which experts saw as lower here than in any other risk area (Fig. 2). The average rating of 2.16 indicates that consensus levels are very low indeed (1 represents no consensus, while 6 indicates a maximum level).

**Fig. 2: Global decision-making elite consensus on appropriate risk area mitigation measures (all respondents)**



Fittingly, the experts assess the probability of averting or mitigating this risk as the lowest among all risk areas. The reason for this result is probably that uncontrolled mass migration is perceived to be an issue embedded in a complex interdependent array of numerous other factors, and is correspondingly difficult to address.

The experts' responses to the open question as to the potentially most effective risk-mitigation measures fell into two main categories: addressing the root causes in migrants' countries of origin on the one hand, and "managing" migrant flows in destination countries on the other. The former has been the object of development policy for many years, with moderate success –

however, the question of its effectiveness is quite controversial. This may help explain the experts' fatalism. Solution proposals ranged from comprehensive knowledge transfer to the alleviation of damage caused by climate change to more economically oriented approaches such as the promotion of foreign direct investment and ensuring ample credit supply for small borrowers – experts thus focused largely on the sustainable support of economies in migrant origin countries. In this context, some respondents also mentioned the establishment of democracy and free market economies in migrant origin countries.

In the second category, measures deemed potentially effective focused on the contrary on strategies enabling destination countries to adapt to migration. In addition to a clear, internationally valid, and above all transparent set of rules, the survey respondents called for better handling of migrants in destination countries, through means such as providing education for migrants in training centers, or seeking to reduce antagonisms through appropriate campaigns.

### **Public opinion in Germany**

The majority of Germans expect a strong increase in global refugee flows. Three-quarters of citizens canvassed by the infas opinion researchers said that major global migratory movements due to war, poverty and climate change were “somewhat probable” or “very probable.” In terms of probability of occurrence, this placed the refugee issue in the middle of the 11 risk areas. By contrast, Germans assessed the potential impact on their personal lives as being comparatively minimal. Thirty-nine percent of poll respondents expected that the emergence of large refugee flows would have a “very high” or “somewhat high” impact on their personal lives. Only the outbreak of trade wars had a lower assessed value (just 35% said a trade war would have very large or somewhat large effects on their personal life).



## International terrorism

### Facts and figures

With religious fundamentalism on the rise and increasing ethnic extremism, terrorism has become a serious threat to public security and political stability in many regions of the world. Since the early 1990s, the number of deaths per year caused by fatal terrorist bombings has risen dramatically, from an average high of 500 to about 3000 today (CSP 2011). Whereas in 2005, a total of about 6,300 people died as a result of terrorism (excluding deaths in Iraq), the statistic for 2009 was over 11,300 (NCTC 2010).

Nevertheless, the number of victims killed by international terrorists is significantly lower: between 1990 and 2000, an average of 269 people died annually, while between 2002 and 2009, the figure was 522 (the 2001 attacks in the United States, which claimed about 3000 victims, are not included in this count).

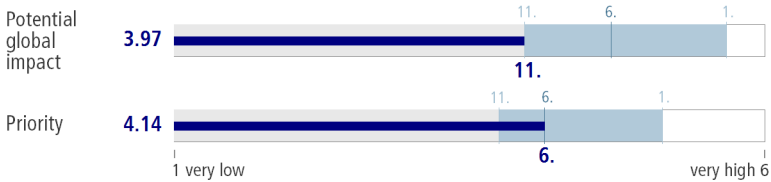
From an economic perspective, it is above all the psychological effects of international terrorism that pose a hazard. The attacks on the World Trade Center and the Pentagon on 11 September 2001 show that a single act of terrorism is enough to trigger protracted wars and fundamentally alter global alliances and geopolitical objectives. The causes of terrorism are various and complex. Poverty and low levels of education on the part of the terrorists have a significant role to play. However, political circumstances play a more crucial role, such as oppression of the population by authoritarian regimes, long-standing feelings of frustration and humiliation, as well as the concomitant lack of prospects, as shown in a study of the causes of terrorism (Krueger, Maleckova 2002).

Purely economic consequences of terrorism include the rising costs of public security and defending against terrorist attacks. A climate of fear has a negative impact on a society's vitality and economic power – not to mention immediate losses in quality of life. Large-scale terrorist attacks can lead to diplomatic tension, military interventions or even wars.

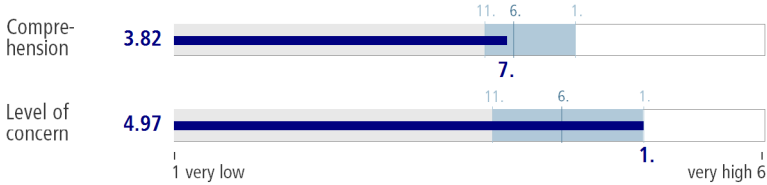
**Key statements on “international terrorism”**

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

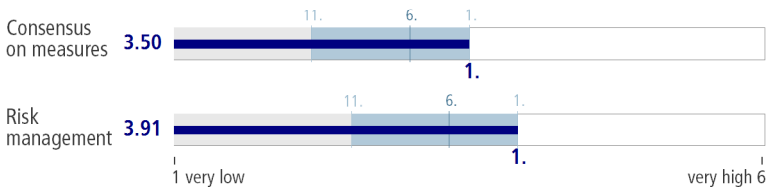
- 1. Among all surveyed risks, this risk is believed to have the lowest potential global impact. In terms of solution priority, it is accorded a middling rank.**



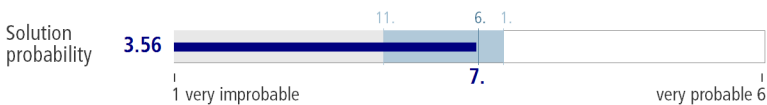
- 2. Whereas respondents observe the greatest level of concern among decision makers for this risk, they believe it is only moderately well understood.**



- 3. Among all surveyed risks, international terrorism is accorded the strongest consensus and quality of risk management alike.**



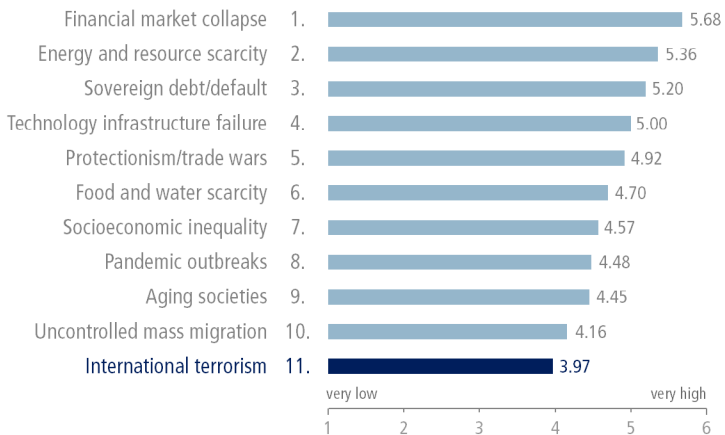
- 4. Finding a solution to international terrorism is accorded a middling rank.**



## Global relevance of the risk area

The experts consider international terrorism to have the lowest potential economic impact of all the risk areas (Fig. 1). On a scale of 1 (very low) to 6 (very high), they give it an average score of 3.97.

Fig. 1: Potential impact of risk areas on global economy (all respondents)



According to the respondents, finding a solution to the problem of international terrorism should be assigned middling priority (place 6 out of 11). Respondents from the world of business assign a significantly higher priority to this risk area than academics do. The obvious conclusion here is that the psychological effects of terrorist attacks appear serious to representatives from industry and commerce and therefore damaging to business, whereas scholars are perhaps affected less and therefore see less reason for concern.

In answer to the open question of what the most serious economic consequences of international terrorism would be, the experts mention a range of factors. They foresee the risk of growing instability and increasing political extremism, resulting in a restriction of democracy and civil rights in favor of

public security. Terrorist attacks could weaken the social cohesiveness of societies and undermine the foundations of economic interaction.

Two experts point to the danger of military disputes between states in regions such as the Middle East – a scenario that is more than possible, given the Iraq War. In general, by exacerbating religious and cultural misunderstandings, international terrorism aggravates the risk of diplomatic conflicts and military conflicts.

In the experts' view, rising expenditure on public security is to be expected, thereby limiting financial latitude for other portfolios. Furthermore, there is a risk of overspending by states when combating terrorism.

In addition to the above direct reactions to states affected, or apparently affected, by terrorism, the respondents also expect international terrorism to have serious psychological consequences, such as increasing uncertainty and a general loss of confidence. Both could lead to lower trade volumes and diminished interaction, eventually resulting in a drop in national income worldwide. Other economic consequences named by the experts include decreased tourism in countries targeted by terrorists and the loss of foreign direct investment.

### **Comprehension of the problem and risk-mitigation measures**

On average, the experts consider the potential impact on the global economy to be weak and therefore they assign a comparatively low priority to fighting terrorism. This is in stark contrast to the high level of concern that the experts see the subject evoking in decision makers around the world (Fig 2). According to the respondents, international terrorism places a greater burden on decision makers than even a possible collapse of financial markets or excessive sovereign debt.

**Fig. 2: Level of concern about the risk areas on the part of global decision-making elites (all respondents)**



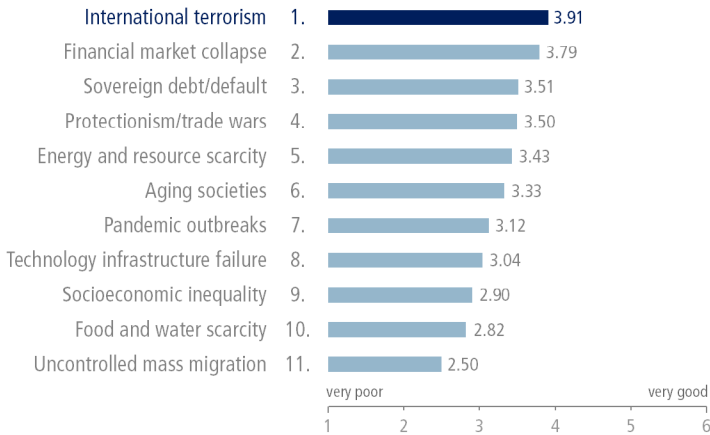
The respondents here are presumably reflecting the levels of alarm felt by politicians, who are forced to act or at least make the right noises due to the overbearing presence of terrorism in the media and the associated perceived danger to the life and limb of citizens.

When it comes to the question of how well the causes, mechanisms and effects of international terrorism are understood, the experts are skeptical. They rate the knowledge of decision makers and academics with an average score of 3.82 on a scale of 1 to 6, the latter representing a very high level of knowledge. As such, the respondents believe that comprehension of international terrorism is unexceptional and at about the same level as comprehension of food and water scarcity.

This would suggest that the respondents are not guided by the strong media presence of certain risk areas when assessing the expertise and knowledge available – for example, although the risks of a financial market collapse are currently a subject of intensive debate in the press, the experts do not consider the issue to be particularly well understood.

In the eyes of respondents, current efforts to solve the problem of international terrorism score top out of all the risk areas, despite the mediocre comprehension of the problem (Fig. 3). They give current solution strategies a score of 3.91 on scale of 1 to 6 (where 6 is “very good”).

**Fig. 3: Quality of risk management (all respondents)**



One obvious explanation is that the experts primarily link comprehension of the risk area to an understanding of its causes, whereas they mainly understand a good approach to be one that prevents attacks. According to this interpretation, weak comprehension and good solution strategies represent consistent replies for the issue of international terrorism.

With an average score of 3.50 on a scale of 1 (very low) to 6 (very high), the experts see only limited consensus on appropriate risk-mitigation measures, but this is nevertheless the greatest consensus among decision makers that the respondents attribute to any of the risk areas (Fig. 4).

**Fig. 4: Global decision-making elite consensus on appropriate risk area mitigation measures (all respondents)**



However, they see the probability of finding a future solution to be about as modest as it is with almost all the other risk areas – even a high level of concern among decision makers and a comparatively far-reaching consensus on risk-mitigation measures are not enough to inspire optimism in the majority of respondents.

Replies to the question of the most effective risk-mitigation measures to counteract international terrorism can be divided into two categories: in addition to solutions geared toward preventing serious attacks, the experts also propose measures intended to deprive terrorism of its foundations. For example, the replies include calls for greater public security. Experts also place emphasis on international cooperation between intelligence services, as well as controls on the arms and drug trades.

Respondents believe terrorism to be rooted, above all, in the terrorists' world view and in their values. For this reason, greater research is needed into the causes and determinants of terrorism, according to the experts. Many participants consider that it is the duty of politicians to promote tolerance around the world and advocate free and humane education free from restrictions on the grounds of politics, race or religion. Additionally, the

enormous economic inequalities between and within states need to be reduced. Combating poverty is also an important element in containing terrorism. Last but not least, the experts mention regional conflicts such as those in Kashmir, Palestine or Korea, which, if pacified, could remove at least some of the basis for terrorism.

### **Public opinion in Germany**

Seventy-two percent of German citizens consider an increase in international terrorism and a rise in the number of devastating terror attacks to be “very probable” or “somewhat probable.” This places the risk near the middle of the probability ranking for the eleven risks. In terms of personal impact, by contrast, the risk of increasing international terrorism figures less strongly: 42 percent of those surveyed by infas believe that this trend will have “very high” or “somewhat high” consequences for themselves. In the ranking of personal impact, this risk is placed third to last, together with the risk of increasing food and water scarcity. Only when it comes to the danger of international flows of refugees and the outbreak of trade wars does a smaller proportion of the German public fear a major impact on their life, at 39 and 35 percent, respectively.



## Aging societies

### Facts and figures

In most countries, life expectancy at birth has risen dramatically in recent decades (ZDWA 2005). Worldwide, it rose from just under 48 years for those born between 1950 and 1955, to 69 for people born today. This trend is expected to continue, resulting in an average life expectancy of about 76 years by 2050 (UN 2010). Increasing wealth, advances in medicine and hygiene and changing lifestyles all play a part in this.

This development has different consequences in different regions. In less developed countries, this increased longevity is combined with a high birth rate and only a slow growth in the percentage of elderly people, with the end result that a longer life expectancy has also increased the general population's earning capacity.

In developed areas of the world, particularly Europe and Japan, a somewhat different picture emerges. While life expectancies continue to rise, fertility rates are low. In Europe, for example, a woman has an average of 1.59 children, whereas in Japan the figure is only 1.42. Consequently, the median age in Europe has risen from about 32 years in 1970 (Japan: 29) to around 40 today (Japan: almost 45). The proportion of over 65s is already 15.9 percent today (22.7% in Japan) and, according to the United Nations, is set to increase to 22.4 percent (30.3%) by 2030 (UN 2010). As a result, society is aging rapidly in countries with low birth rates.

While the population of India continues to soar (the United Nations forecasts India's population to be as large as China's by 2020, at 1.387 billion), China will also have to face up to the effects of an aging demographic in the long term. The fertility rate in China has also fallen to a little over 1.5 children

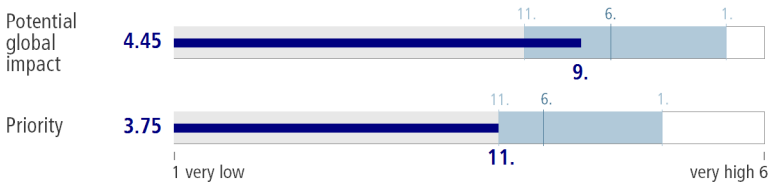
per woman, while life expectancy has risen from about 29 years in the 1950s to 73.8 today (UN 2010).

In the affected national economies, a shrinking working age population is faced with an ever growing number of elderly people whose health and livelihood have to be provided for. As a result, there is increasing pressure on social security systems. A failure to integrate older people into the world of work could impair a national economy's ability to innovate. Furthermore, intergenerational conflicts within societies could intensify if an ever decreasing number of young people are expected to provide for an ever growing number of the elderly.

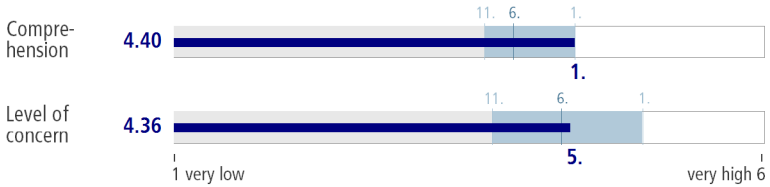
### Key statements on “aging societies”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

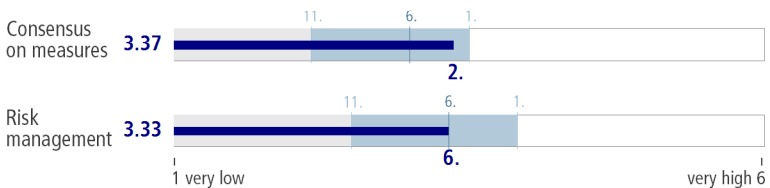
**1. Respondents attribute a comparatively low potential global impact to this risk and believe it should be accorded the lowest priority.**



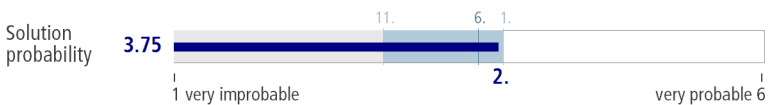
**2. Respondents consider this risk to be best understood and accord it a middling rank in terms of the level of concern among decision makers.**



**3. A comparatively strong consensus is observed for this risk. The risk is accorded a middling rank in terms of the quality of risk management.**



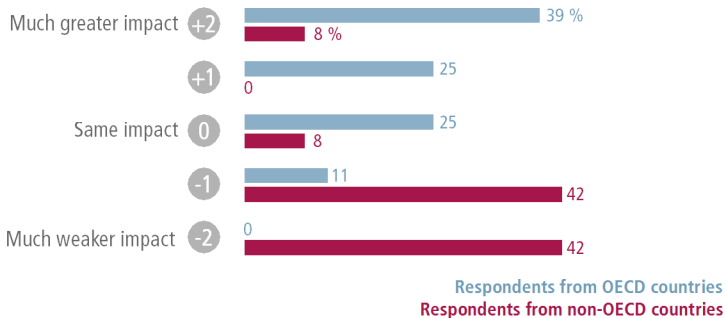
**4. Aging societies are considered to have a slightly higher probability of solution than most other risk areas.**



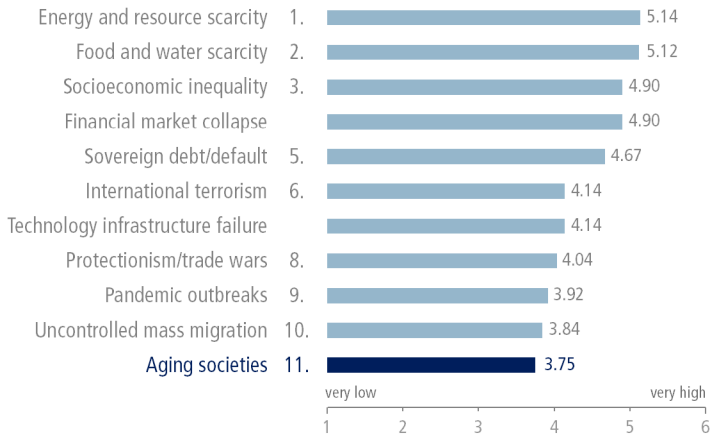
## Global relevance of the risk area

The experts give the economic impact of aging societies a score of 4.45 on a scale of 1 (very low) to 6 (very high). Although this is quite high in absolute terms, compared to most of the other risk areas, the experts see the potential global impact as less noteworthy. For example, the respondents consider the risks of excessive sovereign debt or energy and resource scarcity to be of far greater economic significance than aging societies. Participants from OECD states assign slightly greater importance to the economic impact of aging societies than experts from non-OECD countries – above all, however, they consider their respective country of origin to be disproportionately affected in comparison to the rest of the world (Fig. 1).

**Fig. 1: Impact of aging societies on the respondent's country of origin compared to impact on the global economy: percentage distribution of respondents' assessments**



Moreover, the experts do not consider aging societies and their diminishing productivity to be a problem that urgently requires a solution, ranking it last (Fig. 2). This evaluation can be explained by the characteristics of the process by which societies age: Societies do not age overnight – it is a slow, steady and foreseeable process and, as such, national economies can adapt gradually.

**Fig. 2: Recommended priorities in averting/mitigating risks (all respondents)**

Most experts regard the most serious economic consequence of aging societies to be the increasing pressure on welfare systems, which are in need of long-term reform. They fear a further burdening of public finances that will either drive states further into debt or lead to successive cutbacks in state support for the elderly, who would drift into poverty. Some experts foresee the danger of a complete collapse of the pension schemes.

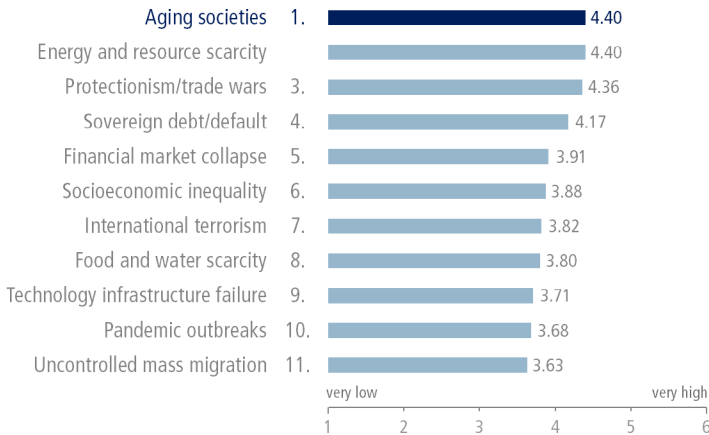
Other immediate economic consequences of aging societies frequently identified by respondents include a shortage of qualified workers and shrinking growth rates or the diminishing vitality of economies, the risk of increasing social and intergenerational inequalities and resultant social tensions. A strong growth in national savings is also mentioned as a consequence of aging populations.

### Comprehension of the problem and risk-mitigation measures

The experts consider the risks relating to aging societies to be better understood than any other risk area (apart from energy and resource scarcity, with which it shares top spot, see Fig. 3), awarding an average score of 4.40 to comprehension of the problem on a scale of 1 to 6. The respondents assume that although concern for the problem is quite high among decision makers, it

is only moderate compared to the other risk areas. On average, they assign a score of 4.36 on a scale of 1 to 6 (with 1 representing the lowest level of concern). On the one hand, it is evident that aging populations are a serious challenge for the societies in question, on the other, however, the problem is one that will emerge slowly and is therefore not a major cause for concern.

**Fig. 3: Comprehension of risk areas on the part of global decision-making elites (all respondents))**



As such, aging societies and their consequences are considered to be a well understood problem. Solutions will only be needed a few years or decades from now, so decision makers are significantly less concerned with this area than they are with international terrorism or financial market crises, for example.

The experts are unanimous in thinking that current measures to counter the problems of aging societies are in need of significant improvement, even if the measures are not exceptionally poor – the respondents give them an average score of 3.33 on a scale of 1 (very poor) to 6 (very good). When it comes to global consensus on how to handle the risk area, the experts also take a rather poor view, with a score of 3.37 on a scale of 1 (very low) to 6 (very high),

although this is a markedly more positive evaluation than that of almost any other risk area.

Nevertheless, in the eyes of the experts, a consensus on how best to address the problem has no bearing on the probability that solutions will be found in the future for the problems associated with the risk of aging societies. Unlike the other risk areas, there is no correlation here between the experts' responses – those who take a positive view of the consensus on risk-mitigation measures do not necessarily have a correspondingly positive view of the probability of a future solution.

The fact that, unlike elsewhere, there is no correlation here is probably due to the nature of the issue of aging societies and its megatrend status: the development is recognized, entrenched and manifests itself over long periods of time – accordingly, the current state of discourse is immaterial to the probability of a future solution.

This interpretation is also consistent with responses given to the question of identifying the key barrier to a solution. Whereas in most of the other risk areas, the respondents point to the lack of political consensus as the principal obstacle, in the case of aging societies, fewer than half (45% of the responses) select this option. The remaining experts consider a lack of aware-ness (21%) or a dearth of suitable technologies (16%) as the key barriers to developing a solution.

When asked about the most effective measures to counter the effects of aging societies, most of the experts responded with variations and combinations of two approaches: adaptation and migration. The manifold proposals for adaptation strategies include raising the retirement age, better integration of the elderly into working life, making it easier to combine a career and children and greater investment in education. There are also demands to overhaul the pensions systems in favor of funded pension insurance schemes in order to avoid the risk of increasing sovereign debt.

In addition to merely adapting to an aging society, some experts also propose an active migration policy. After all, many developed countries suffer from a shortage of young people, while other countries are unable to offer satisfactory opportunities to large swathes of their younger population.

Measures that are frequently mentioned include qualified immigration and strengthening global solidarity between aging and young societies. Appropriate concepts would have to involve more than just migration of qualified workers; for example, “old societies” could provide assistance to “young” ones in the areas of education and social affairs.

In the view of many of the experts, all effective risk-mitigation measures are conditional on raising public awareness. The public needs to be made aware that, as life expectancies increase, people will gradually have to work for longer – between 1980 and 2009 in Germany, the retirement age was raised by just half a year for men and one year for women (University of Duisburg-Essen 2010), while the median age of the population rose from 36.4 to 44.3 years (UN 2010). Public acceptance of measures that are painful in the short term but necessary in the long term also has to be reinforced.

### **Public opinion in Germany**

In the ranking of probabilities for the eleven economic risks, the danger of a drop in living standards in Germany as a consequence of an aging society comes in somewhere near the bottom, as perceived by the general public. In the infas survey, 64 percent of respondents consider this development to be “very probable” or “somewhat probable.” Only when it comes to the probability of trade wars and pandemics do fewer citizens consider the scenario to be probable. On the issue of personal impact, an aging-related fall in wealth ranked somewhere in the middle: for 46 percent of those surveyed, this macroeconomic trend would have “very high” or “somewhat high” impact.



## Sovereign debt/default

### Facts and figures

The crisis in the eurozone is primarily a sovereign debt crisis. Without the support of the European Union, countries such as Greece, Portugal and Ireland would have been forced to default – with unforeseeable consequences for the euro. The cuts in spending and the tax increases made necessary by the crisis place a burden on these hard hit national economies. At the start of August 2011, the United States was facing insolvency. Only a last-minute compromise between Republicans and Democrats enabling a two-stage raising of the legal debt limit from 14.3 to 16.4 billion dollars prevented illiquidity.

However, these rescue attempts did not eliminate the underlying causes of the debt. In combating the negative effects of the 2007/2008 financial crisis, in particular, many states that were already highly indebted have sunk even further into debt in recent years. The rescue operations merely allowed the governments in question to continue to accumulate debt on the international financial market at affordable interest rates.

These rescue operations have further raised the level of debt. In the crisis years between 2007 and 2010, gross sovereign debt in the G7 countries (G20) rose from about 82.3 percent of GDP (60.6 %) to 108.8 percent (74.5 %) and the International Monetary Fund (IMF) forecasts a rise to almost 122 percent (78.8 %) in 2015. At a global level, the financial crisis increased the debt level from 57.6 percent of global GNP in 2007 to 71.2 percent in 2010 (IMF 2011a). In real terms, this means a global sovereign debt of about 54 billion dollars at the end of 2011. Three quarters of this debt is owed by the United States, the EU and Japan (IMF 2011b).

The IMF considers the critical debt limit to be 90 percent of a country's economic output. The larger the debt, the more funds the state in question has

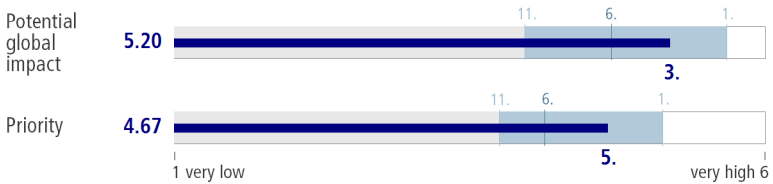
to dedicate to servicing that debt in the future. This reduces financial leeway, making it harder to maintain state services without taking on new debt. Added to this, many industrialized countries are facing increasing financial outlay in their social and health systems due to their aging societies, while simultaneously receiving lower tax revenue because of a shrinking workforce.

The insolvency of a major national economy could decimate the assets of many private and institutional investors and result in a crisis of confidence in the financial markets, which could spread to previously solvent and healthy countries, plunging them into crisis. Banks of systemic importance could get into difficulties. A sovereign debt and financial crisis could also endanger the international monetary system and, not to be overlooked, a high level of public debt increases the risk of inflation because the real value of the debt can be reduced by (deliberate) inflation.

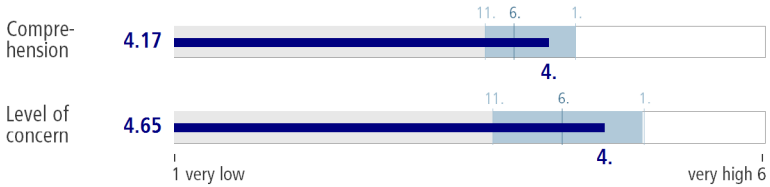
### Key statements on “sovereign debt/default”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

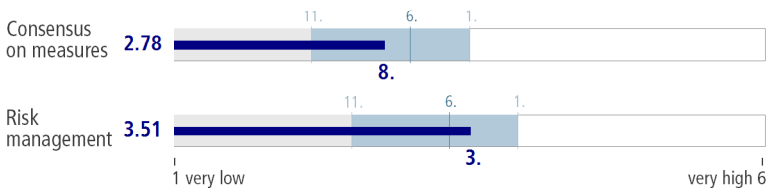
- 1. The risk ranks high in terms of its potential global impact. Despite high absolute values, the risk is accorded moderate priority.**



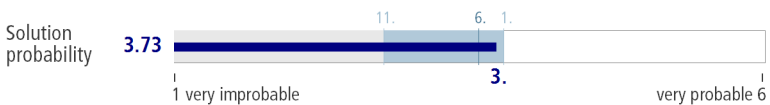
- 2. The risk holds a high middling rank in terms of how well it is understood and the level of concern among decision makers.**



- 3. In terms of consensus on mitigation measures, the risk ranks in the low middle range; in terms of the quality of risk management, it ranks high.**



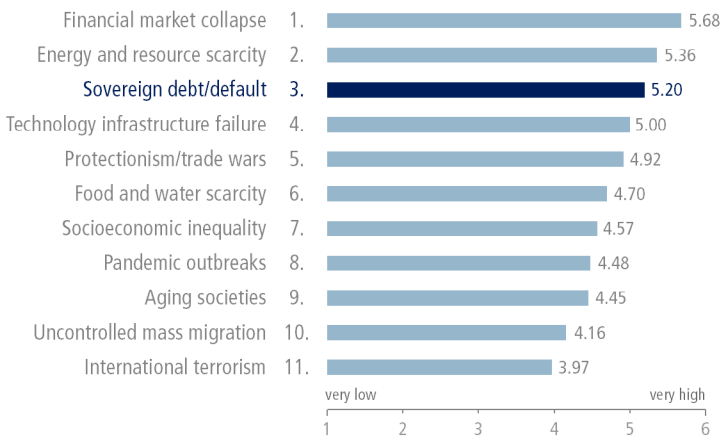
- 4. Sovereign debt/default is considered to have a somewhat higher probability of solution than most other risk areas.**



### Global relevance of the risk area

Those who took part in the survey consider the potential global economic impact of a major national economy collapsing to be very serious (Fig. 1). This view is largely shared by respondents from all the various regions of the world – participants from Asia and Africa, like respondents from Europe and the United States, believe the increasing debt levels of yet more national economies to be very harmful.

Fig. 1: Potential impact of risk areas on global economy (all respondents)



This is also reflected in the question of the urgency of finding a solution: the risk of a major economy collapsing is one of the risk areas for which the experts assign the highest priority to finding a solution, again with a broad consensus.

The answers given by the experts to the open question of what the most serious economic effects of excessive sovereign debt or sovereign default would be show that they do not regard debt as a purely economic issue. In fact, their replies suggest that they see it as a possible cause of violent social upheaval.

The respondents consider that the most important direct economic consequences for the economies in question are a downturn in economic productivity and a slump in growth, while the most critical indirect consequences are the social and political fallout of sovereign default. First and foremost, they view the exacerbation of social inequality as a very serious problem that could lead to conflicts over distribution and therefore social unrest and political instability. In the eyes of respondents, states could even completely lose the ability to function.

The experts are in disagreement on the global consequences of a sovereign default, brought about by the intermeshing of national economies. According to one view, the loss of confidence on the financial markets would automatically drag down other “healthy” economies, setting in motion a global down-ward spiral. By contrast, other experts believe that the effects would remain manageable. In this view, sovereign default by a major economy would shift the global balance of power but it need not necessarily lead to a collapse of the global economy.

The respondents are particularly wary of self-reinforcing effects on the financial markets, which are largely beyond the scope of political control. The experts are in agreement on the fact that a lasting debt crisis and the threat of default would depress global economic output and aggravate worldwide inequality of income and wealth. A rise in protectionism and political conflicts, coupled with worsening trade relations, are also mentioned by the experts as further possible consequences of the collapse of a major economy.

### **Comprehension of the problem and risk-mitigation measures**

The experts believe that the subject of sovereign debt/default is relatively well understood. At the same time, they unanimously presume that decision makers are very concerned about the matter. The level of concern is at a similarly high level to the risk of a systemic collapse of the financial markets or increasing energy and resource scarcity. The timeliness and political explosiveness of the subject no doubt play a significant role here.

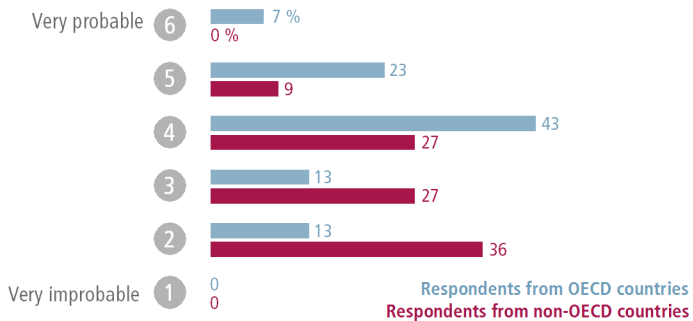
Despite the high level of concern regarding large sovereign debt and a good comprehension of the connections and interrelations, the respondents perceive only minimal consensus on suitable countermeasures. On average, they give this a score of 2.78 on a scale of 1 (very low) to 6 (very high). When asked about the effectiveness of current efforts to find solutions, the experts give a similarly moderate response: they award an average score of 3.5, where 6 represents a very effective approach.

In terms of a future solution to the problem of debt, the respondents display cautious optimism: on average, they assess the probability of finding a future solution with a score of 3.73 on a scale of 1 (very improbable) to 6 (very probable), giving it one of the highest scores of all the risk areas. However, the differences here are slight: nine of the eleven risk areas are clustered together (between 3.44 and 3.79).

In the case of sovereign debt, the respondents deviate significantly from their standard response pattern: whereas for most of the risk areas, how the experts rate the quality of current efforts to find a solution has a strong bearing on how probable they consider a future solution to be, there is no connection when it comes to sovereign debt/default. Additionally, those experts who consider the issue of sovereign debt to be well understood do not find a fast and effective solution to be any more probable.

Almost 83 percent of those surveyed consider political consensus to be a critical factor on the road to successfully combating the problem of debt. Participants from OECD countries are substantially more optimistic about a future solution than experts from non-OECD countries (Fig. 2).

**Fig. 2: Probability of averting/mitigating the risk of sovereign debt/default: percentage distribution of the respondents' assessments**



The analysis of the open question about possible solutions shows very limited scope for economic approaches, in particular. Although the respondents believe that a stable national economy is an important prerequisite for over-coming debt crises, they consider economic productivity mainly to be a de-pendent factor – they are unanimous in stating that the solution must be a political one, given that the problem of debt is in itself a political issue. Furthermore, it is clear that approaches at the national level can only form part of the solution, at best.

A majority of the experts emphasize the need for political consensus between economically influential states on how to handle the problem of sovereign debt. For example, there should be binding upper limits on sovereign debt for all countries, and national debt policies need to be made more trans-parent.

Last but not least, the experts see stronger regulation of international financial markets as a possible solution. According to this theory, the global community should set up a global financial market supervisory authority and financial market transactions should also be taxed. The experts are optimistic about the prospects of success for regulations arising from globally coordinated initiatives.

### **Public opinion in Germany**

According to the German citizens surveyed by infas, the likelihood of sovereign default occurring somewhere around the world, leading to public services cutbacks to the bare minimum, is “very probable” or “somewhat probable.” After the risks of a growing gap between rich and poor and increasing energy and resource scarcity (both of which developments 92 % of those questioned believe likely), this is the risk that is most expected by those who took part in the infas survey. Nevertheless, people in Germany believe this will have only a minimal impact on themselves. Fewer than half (46 %) think that this development would have a “very high” or “somewhat high ” impact on their lives. As such, this is one of the dangers with the greatest discrepancy between how probable those surveyed believe the risk to be and how much they think it will affect them personally.



## Financial market collapse

### Facts and figures

With the advance of globalization comes increased integration of world financial markets, already closely enmeshed. The fortunes of the United States and China, for example, are closely tied to each other through foreign exchange markets – China holds (as at June 2011) 1.16 trillion dollars, and Japan’s dollar reserves, at 911 billion, are also enormous (U.S. Treasury Department 2011). The threat of insolvency which loomed over the United States in August 2011 demonstrates the extreme danger inherent in such advanced integration – if the dollar were to collapse China would also find itself in great difficulty.

At the same time the increasing complexity of new financial products in effect reduces the transparency of the markets, without any appreciable strengthening of regulation to compensate. The phenomenon of individual countries or alliances of countries bailing out banks suggests that even in high-risk scenarios, banks “of systemic importance” would not be left to completely collapse. Therefore managers at such banks are presumably prepared to enter into greater risks knowing that the state will serve as guarantor if need be. In a highly integrated financial world, this kind of attitude could bring the guarantor states to the limit of their capacities in crisis situations.

The financial crisis of 2008 indeed demonstrated that isolated phenomena can influence financial markets around the world and in certain circumstances lead to a credit crunch and the large scale write-off of assets. This was exactly what happened in the last financial crisis, which was triggered when bad housing loans in the United States were packaged into complex financial products.

The 2008 crisis showed the economic damage that can result from a massive drop in share prices and a worldwide credit shortage, and also how difficult it is to bring such a situation back under control. Commerzbank estimates the economic losses of this financial crisis at 10.5 trillion dollars, consisting of write-offs and bankruptcies, loss of property value and costs associated with the world economic downturn (Handelsblatt 2009). McKinsey calculated that financial assets shrunk by 27 trillion dollars worldwide from 202 trillion at the end of 2007 to 175 trillion at 2008 year-end (McKinsey 2011).

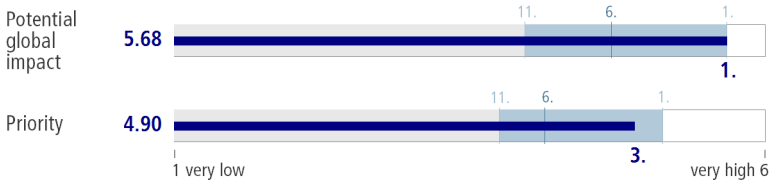
Triggers for a financial crisis include speculation bubbles, as was the case in 2008 (which effectively involved gambling on housing loans), extreme price fluctuations in individual markets or the bankruptcy of a major national economy. Faith in the market is essential for a functioning economy and once impaired it is extremely difficult to reestablish. And until it is, you can usually expect a credit crunch which has a direct impact on the real economic sphere and, along with local monetary policy, carries the risk of hyperinflation as long as central banks respond with cheap money.

In a worst-case scenario, the collapse of banks of systemic importance could lead to a collapse of the global financial system and to a huge loss in worldwide wealth.

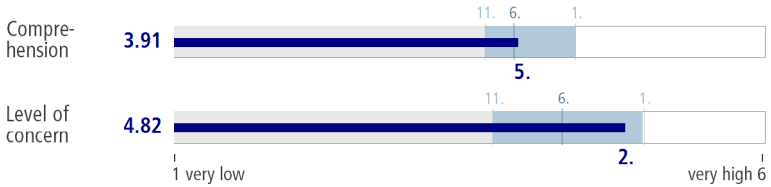
### Key statements on “financial market collapse”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

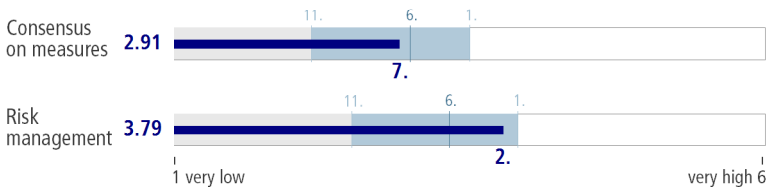
**1. Respondents attribute the greatest potential global impact to this risk and believe it should be accorded the third highest priority.**



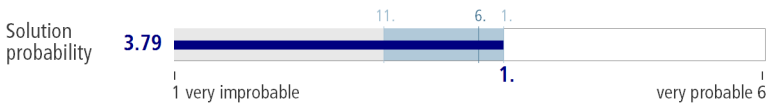
**2. Respondents consider this risk to be moderately well understood and accord it the second highest level of concern among decision makers.**



**3. Although the risk holds only a middling rank in terms of consensus on mitigation measures, the quality of risk management ranks high on comparison.**



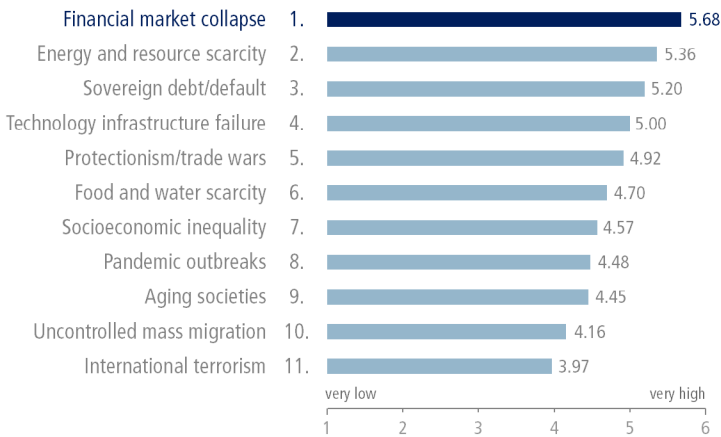
**4. Among all the surveyed risks, financial market collapse is considered to have the highest probability of solution.**



### Global relevance of the risk area

Given the experiences with the 2008 financial crisis, it is hardly surprising that experts rate the potential impact of a financial market collapse the highest among all risk areas (Fig. 1).

Fig. 1: Potential impact of risk areas on the global economy (all respondents)



On a scale from 1 (very low) to 6 (very high) they rate the expected economic cost of systemic collapse of finance markets at 5.68 – almost the maximum. Respondents also accord the priority of finding a solution to the financial market dilemma a correspondingly high rating. While on average they see a solution as less urgent than is the case with food and water shortage or energy and raw material scarcity, the respondents regard a timely response as almost as important – on a scale from 1 (very low) to 6 (very high), the average priority rating for a solution is 4.9.

Questioned as to the gravest economic consequence of financial market collapse, the experts were highly consistent. As they see it such a collapse would see assets disappearing, as it were, into thin air. Further consequences include a rationing of credit and a deep-seated crisis of confidence which would impede investment activities. And so a systemic collapse of financial

markets would soon reach the real economy and, according to the experts, trigger a deep recession or even a long-lasting depression.

Respondents frequently cite a sharp rise in unemployment as well as a loss of faith in economic institutions and (inter-)national politics as likely consequences. One African participant sees a danger recent economic growth in emerging nations might be wiped out as well as a major loss of prosperity in broad sections of the middle class, while a German civil society representative draws a comparison with the world financial crisis of 1929.

The consequences outlined, such as rising unemployment and wiping out of financial assets, imply a particularly strong burden on the middle class and underclass, amounting to redistribution from below to above – the winners from the crisis can only be those who possess capital. That being the case, it is hardly surprising that many experts predict that a collapse of financial markets would be accompanied by social unrest and an increase in social inequality.

### **Comprehension of the problem and risk-mitigation measures**

The experts estimate that a collapse of financial markets would have a very high impact on the global economy. Accordingly they rate the urgency of finding a solution which would reduce financial market risk as very high. In contrast to rising socioeconomic inequality or water and food crises, the experts' evaluation corresponds with the perceived awareness of the risk area on the part of decision makers – the respondents regard them as extremely concerned. In expert opinion only international terrorism causes greater concern.

Despite wide-reaching economic consequences and the recent high media profile of the topic, the experts assume only moderate knowledge on the part of decision makers. In figures this translates as a rating of 3.09 on a scale from 1 (very low) to 6 (very high). For this question, the collapse of financial markets is on a level with water and food crises and the failure of technological infrastructures. Both the significant complexity of many financial products and the multi-level integration of international financial markets may explain this pessimistic assumption.

In the experts' responses, a strong correlation can be discerned between the assumed comprehension of the problem and the priority for finding a solution. The lower the respondent estimates comprehension, the more urgent they regard a solution for the global financial market dilemma to be. So if the experts feel that a high level of comprehension tends to reduce prioritization, this can also indicate that the respondents see a profound understanding of effective mechanisms and contexts as an important step on the path to a solution.

The experts regard current efforts to find a solution to the dilemma of the financial markets rather skeptically, but more positively than for almost all other risk areas. On a scale of 1 to 6 they rate it at 3.79, where 6 is the best possible rating – only measures to fight international terrorism are rated more highly.

A far greater cause for concern is the perceived low level of consensus among decision makers regarding the appropriate solution strategy for the risk of systemic collapse of financial markets – an average rating of 2.91 on a scale from 1 to 6 (where 1 represents “no consensus whatsoever”) attests to the experts' low confidence in the problem-solving capacities and/or willingness to compromise among those responsible. In fact almost 80 percent of survey participants regard a lack of political consensus as the greatest obstacle to a solution.

Presumably it is the high potential economic impact as well as the current medial omnipresence of the subject of finance markets which makes the experts comparatively confident that a solution will be found (Fig. 2). The risk area “financial market collapse” ranks first among risk areas at issue, although the absolute average rating of 3.79 on a scale of 1 (highly improbable) to 6 (very probable) is only just over the middle of the scale. Although respondents assume that decision makers are still far from compromise or consensus in the search for a solution, they clearly regard the pressure to act as so great and awareness of the problem as so high, that they regard a quick solution as very probable.

**Fig. 2: Probability of averting/mitigating risks in the future (all respondents)**

On the question of the best solution strategies, the experts' answers are highly consistent (as they are on the question of the gravest economic consequences). In almost every statement they called for better, stronger regulation of the global financial sector (although a few highlighted the danger of excessive regulation). Basel II and Basel III attracted particularly harsh criticism. On the questions of regulation many experts emphasize the need for globally coordinated action – stricter equity requirements for banks and globally-coordinated crisis management were among the individual proposals.

A ban on particularly complex financial instruments could form part of the solution. Some experts see the need for an international finance supervisory body invested with appropriate authority; one respondent also sees the G20 as responsible in this regard.

The most fundamental proposal questions education and value systems as well as incentive systems in the global economy; the regulatory framework is surely also a decisive factor here. This proposal would further insist compensation be more closely aligned with the social relevance of a given occupation, an approach markets are evidently incapable of implementing.

All of the experts' responses have essentially the same thrust: the call for a stronger state is clear and unmistakable and the respondents perceive finance markets as needing much tighter regulation, regarding current regulations as poor and/or insufficient.

### **Public opinion in Germany**

A little more than three-quarters of the public interviewed by infas expect another speculation bubble: 78 percent of those questioned in Germany regard the emergence and subsequent collapse of a bubble, with an accompanying stock market crash, as "somewhat probable" or even "very probable." This places it in the upper middle of the eleven risk areas in terms of probability. The collapse of a speculative bubble and associated consequences represents an eventuality that 55 percent of the public believe would have a "very high" or "somewhat high" impact on their own lives. Only the growing scarcity of energy and raw materials is perceived by the German public as having more potential impact on their lives.



## Protectionism/trade wars

### Facts and figures

The growth centers of the global economy are increasingly shifting away from the OECD countries to the large emerging countries, particularly to the so-called BRIC countries: Brazil, Russia, India and China. These four national economies have already contributed almost as much to the growth of the global economy in the first decade of this millennium as the G3 (United States, Japan and Germany) and the other eurozone countries.

Goldman Sachs predicts that the BRIC countries will continue to grow stronger in the next ten years, to the extent that they will be responsible for around 45 percent of global economic growth, while the contribution of the G3 will sink to little more than 20 percent (Goldman Sachs 2010). PricewaterhouseCoopers economists forecast the point at which the Chinese economy will overtake that of the United States as 2025, The Economist predicts they will draw level as soon as 2019 (The Economist 2010). Along with the BRIC countries, other emerging nations such as Indonesia, South Korea and Vietnam are growing rapidly – Goldman Sachs has designated eleven of these countries as the “Next Eleven” group (Goldman Sachs 2009).

Such dramatic growth would also alter the structure of these national economies. Labor markets in China and India can already call on a highly-qualified workforce. These countries will increasingly be able to offer knowledge-intensive products and services and increasingly compete with OECD countries. We can also assume that the number of national economies able to compete at a high level will steadily rise. At the same time demand for resources will increase if current growth paradigms remain unchanged.

This may prompt government moves to protect their national economies, workforces and potentially their strategic industries from international (low-

cost) competition, and secure access to resources. To achieve these goals they may employ such measures as raising import duties, paying subsidies for the export economy and manufacturers of import substitutes, influencing the exchange rate of their currency or by erecting other regulatory trade barriers.

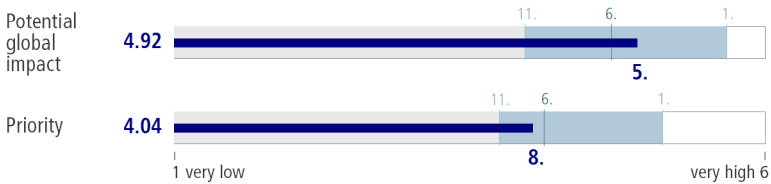
Protectionism could also play a decisive role in the conflict around raw materials. China, for instance, controls almost the entire global market for rare earths, which are essential for many new low-CO<sub>2</sub> technologies (NYT 2011).

Increased protectionism could slow the rate of global economic growth and prosperity which would particularly affect both largely export-oriented economies and those which are poor in raw materials or small in scale. In the event of exchange rate manipulations, painful long-term adjustment responses may be required – the huge dollar reserves of China’s central bank mean that China’s destiny is more closely aligned with that of the United States than either party presumably intended.

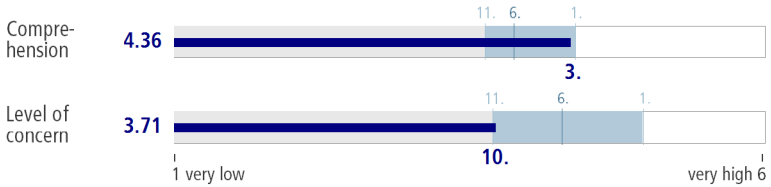
### Key statements on “protectionism/trade wars”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

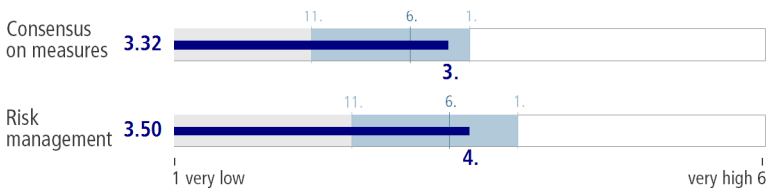
**1. The risk ranks in the upper middle range in terms of potential global impact and in the lower middle range in terms of priority.**



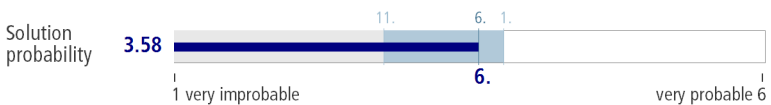
**2. Respondents consider this risk to be comparatively well understood, but it ranks lower than most others in terms of the level of concern among decision makers.**



**3. In terms of consensus on mitigation measures and the quality of risk management, the risk ranks somewhat better than most of the surveyed risks.**



**4. In comparison to all other surveyed risks, protectionism/trade wars is considered to have a moderately good probability of solution.**



### Global relevance of the risk area

The experts are unanimous in evaluating the potential consequences for the global economy of growing protectionist tendencies or even a trade war as high. However this risk area ranks some distance behind the other core economic risks such as the collapse of financial markets or the theme of sovereign debt/default.

The survey results show that purely economic effects are not the sole decisive factor in the experts' evaluation of the urgency of a solution. A solution to protectionism and trade wars is consequently accorded a relatively low priority, although the evaluation of its potential economic impact is relatively high. Here the experts give it an average rating of 4.04 on a scale of 1 to 6 where 6 represents the highest priority; the most pressing risk area as defined by respondents has an average rating of 5.12.

Almost all the experts cite a decline in prosperity as one of the most serious economic consequences of protectionism and trade wars. They warn of a loss in quality, inhibition of global knowledge transfer and a loss in competition and consequently also of innovation. Others emphasize inefficiency and bias as well as a drop in global trade volumes with resulting price rises. Economic performance may fall overall, while two scientists from Europe even see the danger of economic stagnation or collapse.

In the social domain the respondents fear an increase in inequality, rising unemployment and poverty (however without regional differentiation), rising extremism, resentment towards other countries and political isolationism. The survey participants also warn of a return to nationalism, while one expert even sees war as a possible consequence of protectionism.

The experts believe that the loss of important foreign markets and reduced knowledge exchange would have a particularly strong impact on poorer, less developed countries.

### Comprehension of the problem and risk-mitigation measures

Despite the high rating given to the potential economic impact and the severity of that impact as outlined by the respondents themselves, they accord a relatively low priority to solution strategies for trade wars and protectionism. This possibly stems from the high level of comprehension at the decision-making level assumed by the experts in this area. Statistically speaking, responses to the question of current solution efforts in the case of protectionism and trade wars assume a close link between the quality of those efforts and the state of knowledge of the issue.

In any case, the experts judge concerns among decision makers with respect to protectionism and trade wars as the second highest among all the risk areas (Fig. 1). Theoretically this could be the reason that solution efforts and approaches are evaluated slightly higher than average across all risk areas: 3.5 on a scale of 1 (very poor) to 6 (very good) (WTO 2011a).

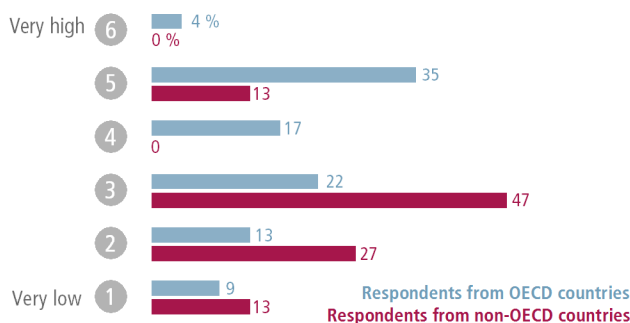
**Fig. 1: Level of concern about the risk areas on the part of global decision-making elites (all respondents)**



Compared to other risk areas, the experts rate consensus on available solution approaches as relatively high. This could also explain why they regard concern among decision makers as relatively low, despite the economic

relevance of the topic. However in absolute terms consensus can be described as at best rudimentary in the experts' estimation, especially as the respondents themselves offer widely differing evaluations of consensus (Fig. 2). While participants from OECD countries rate consensus as fairly high (average of 3.70 on a scale from 1 to 6), other experts see it as considerably lower (average of 2.73).

**Fig. 2: Consensus regarding appropriate measures for mitigating protectionism/ trade wars: percentage distribution of respondents' assessments**



Experts are similarly unsure about the probability of a future solution to this dilemma as they are with other risk areas. The distribution of responses is greater here than for all other risk areas: The graver the respondent assesses the economic impact of protectionism and trade wars, the less likely they regard a future solution.

One reason could be that an assumption of high potential for economic damage can make consensus-building and ultimately finding a solution more difficult, especially as the experts regard political consensus as a critical factor in finding a solution: 32 of the 37 respondents, at 87 percent a higher proportion than any other risk area, chose this answer to the question of the major barrier to a solution.

The experts' response patterns produce a moderately consistent picture overall. They assess potential economic impact as relatively high, 4.92 on a

scale from 1 to 6 (where 6 is the highest priority). While they may not regard current solution strategies particularly positively, they come off better than in most other risk areas. The same applies to consensus on the correct approach: this is rated relatively highly, though in absolute terms only just over the middle of the scale, at 3.5.

Respondents also rated comprehension of the problem as relatively high, which may in part explain why the priority for finding a solution is regarded as relatively low: The experts regard the probability of an increase in protectionist measures or even trade wars as low. Here the consensus, perceived as somewhat greater than for other risk areas, could be one reason why a solution is seen as less urgent.

When asked their opinion on the best solution approaches, most experts point to the as-yet unsolved problem of knowledge and perception. In light of the significance of a political consensus in the eyes of the respondents it can be assumed that this problem of perception relates in particular to the level of political decision-making.

However the respondents also call for public involvement in political decision-making: Comprehension of economic contexts and the harmful impact of protectionism/trade wars must be championed; not just among politicians, but the general population as well. One expert proposes, for instance, making basic economics a compulsory part of the curriculum. Others advocate strong political leadership which won't be overly swayed by public reservations regarding free trade.

On a practical level, the experts call for a stronger WTO. If this isn't possible, their second-best solution is strong, credible, multilateral trade agreements, with the G8 and G20 countries taking the lead.

There are other voices, however: One African economist would allow poorer countries a certain amount of protectionism to accelerate the catching-up process, while richer countries would be required to completely open their national economies. Another expert proposes a paradigm shift from a purely competition-driven economy towards greater cooperation.

### **Public opinion in Germany**

The outbreak of a trade war is the only one of the eleven economic risk which less than half of people interviewed by infas expect to actually occur. Only 40 percent were of the opinion that this eventuality is “very probable” or “somewhat probable.” At the same time trade wars also represent the development which would have the least impact on German interviewees’ own lives: Only 35 percent believed that a disruption of international trade caused by the closing of borders for foreign products would have a “very high” or “somewhat high” impact on their own lives. Consequently trade wars ranks last of the eleven risk areas for the German public both in terms of the probability of it occurring and the level of personal impact.



## Pandemic outbreaks

### Facts and figures

At the start of the 21st century, experts consider the outbreak of a global pandemic to be far more probable than they did in previous decades. The World Health Organization has issued warnings about the rise of pathogens that are increasingly resistant to medication (WHO 2011). This makes it ever harder to treat illnesses and increases fatality rates for previously curable diseases. Humanity is on the point of throwing away its medical advances: “In the absence of urgent corrective and protective actions, the world is heading towards a post-antibiotic era, in which many common infections will no longer have a cure and, once again, kill unabated,” said the Director-General of the World Health Organization, Dr. Margaret Chan, on World Health Day in April 2011.

The probability of global pandemics is growing because of increasingly well adapted, drug-resistant pathogens. In addition, improvements to the worldwide transport infrastructure, the globalization of the economy and the corresponding growth in flows of goods accelerate the spread of germs and viruses around the world. International seaborne trade more than tripled in the period between 1970 and 2007, increasing from 10,654 to 32,932 billion ton-miles (BPP 2009). Worldwide airborne passenger capacity rose from 500 billion passenger-kilometers in 1970 to about 4,100 billion passenger-kilometers in 2007 – commercial air traffic has increased more than eightfold in less than 40 years (BMU 2007).

Decreasing global biodiversity also plays a role in the faster spread of pathogens. Since the mid-1990s, the number of endangered species on the Red List issued by the International Union for Conservation of Nature and Natural Resources (IUCN) has risen from about 10,500 to 19,000 (IUCN

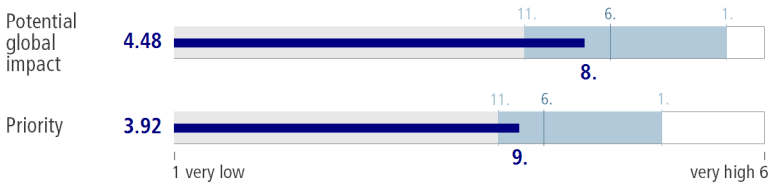
2011). This serious disruption to the natural balance encourages the proliferation of pests and pathogens.

If this results in greater numbers of people being harmed, there will also be indirect consequences for the economy: sick leave increases and health costs soar. If it became necessary to restrict global traffic of goods and people in order to contain a pandemic, national economies that rely on global chains of supply would suffer greatly.

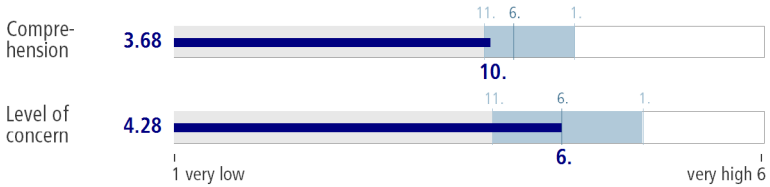
### Key statements on “pandemic outbreaks”

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

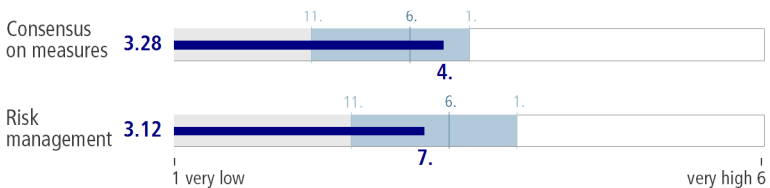
**1. Respondents attribute a relatively limited potential global impact to this risk and believe it should be accorded lower priority.**



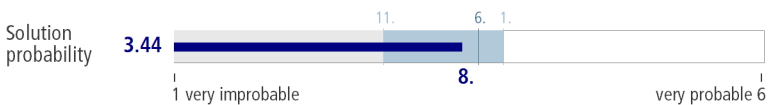
**2. Respondents consider this risk to be the second least-understood and accord a moderate level of concern among decision makers.**



**3. The risk holds a moderately high rank in terms of consensus on mitigation measures, and the quality of management ranks in the middle range.**



**4. Pandemic outbreaks are considered to have a slightly lower probability of solution than most other risk areas.**



### Global relevance of the risk area

Compared to other risk areas, the experts consider the potential impact on the global economy of a pandemic to be below average. Nevertheless, on a scale of 1 (very low) to 6 (very high), they give it an average score of 4.48. This is roughly comparable to the potential global impact that the experts attribute to the diminishing productivity of aging societies or socioeconomic inequality, and significantly more than the impact ascribed to the risk of international terrorism. Despite this, the respondents assign a relatively low priority to finding a solution to the possible outbreak of pandemics; they only consider two risk areas to be even less urgent.

Assessments of the potential impact of a global pandemic on the global economy range from a reduction in economic activity and productivity, through to a massive economic collapse and the obliteration of certain sectors of the economy. One noteworthy example is poultry farming, which has already suffered in recent years due to outbreaks of bird flu. Some experts also list immobility and diminished social interaction as consequences of a global pandemic. Additionally, the greatly increased number of sick people would impose a heavy financial burden on health systems, which would increase budget deficits in affected countries.

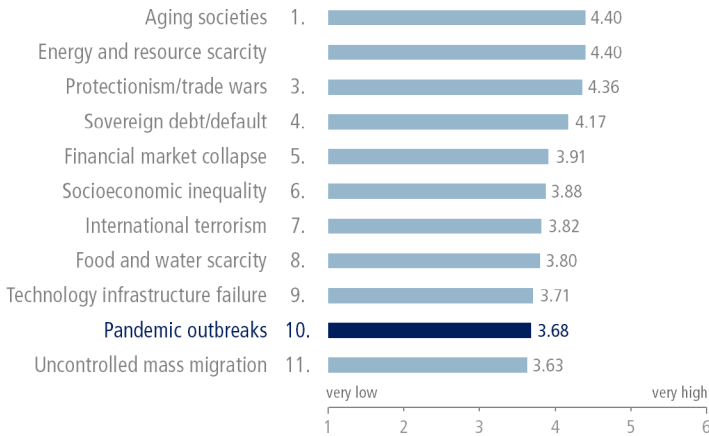
The experts also mention the psychological consequences of a global pandemic. Fear and panic could make the situation worse, according to some respondents. Worst case scenario: large numbers of sick people or fatalities could make it impossible to continue monitoring or operating critical infrastructure.

### Comprehension of the problem and risk-mitigation measures

When it comes to the background knowledge of decision makers and academics, the respondents take a more negative view than with almost any other risk area; according to the experts, only uncontrolled mass migration is less understood (Fig. 1). The respondents also consider the decision makers' level of concern about the outbreak of pandemics to be about average when compared to other risk areas, on a similar level to the risk area "technology infrastructure failure." Possibly, from the experts' perspective, the decision

makers do not sufficiently comprehend the issue to be properly concerned about it.

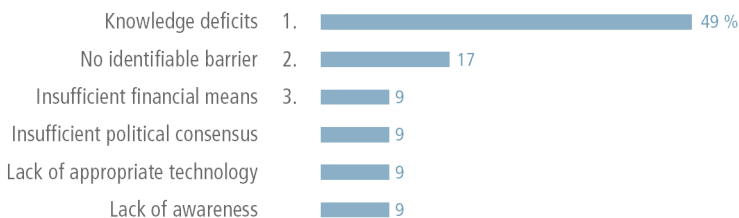
**Fig. 1: Comprehension of risk areas on the part of global decision-making elites (all respondents)**



The poor comprehension of the situation imputed to decision makers and the very inconsistent responses given by the experts suggest that even current attempts to reduce the risk of global pandemics would be rated as moderate, at best. Indeed, the experts take a very poor view of these endeavors, even if they give four other risk areas lower scores. On average, they rate efforts to find solutions with a score of 3.12 on a scale of 1 (very poor) to 6 (very good).

In their responses, the experts implicitly draw a strong connection between comprehension of the problem, on the one hand, and the quality of current approaches, on the other – the respondents tend far more clearly than with the other risk areas to take a negative view of current efforts if they also consider the problem to be poorly understood. This tallies with the fact that most respondents list a lack of knowledge or poor comprehension as the key barrier to finding a solution – almost half of the experts who took part choose this option (Fig. 2).

**Fig. 2: Key barriers to averting/mitigating the risk of pandemics: percentage distribution of all respondents' assessments**



As such, the risk areas “pandemic outbreaks” and “technology infrastructure failure” are an exception because for all the other risk areas, a lack of political consensus is considered the greatest barrier to finding a solution.

Although the experts do not consider there to be much consensus on appropriate measures to counter the outbreak of pandemics, they are noticeably more optimistic here than with many of the other risk areas. On average, they give the probability of finding a future solution a score of 3.44 on a scale of 1 (very improbable) to 6 (very probable), which is more than would be expected given the poor comprehension of the problem. Evidently, the experts assume that this lack of knowledge can be relatively easily overcome. According to these findings, the respondents would appear to consider gaps in knowledge to be less intractable than a lack of political consensus.

The overall picture is coherent. In the eyes of the experts, a fundamental comprehension of the problem and the closely related issue of proper concern at the decision-making level are crucial to finding and implementing effective risk-mitigation measures to deal with global pandemics. A lack of knowledge is the greatest problem, from the experts' point of view, although this would apparently be relatively easy to remedy.

In answer to the open question of which measures they consider particularly effective at reducing the risk of global pandemics, many of the respondents mention intensified research or, more generally, generating knowledge – in this area, too, the replies are very consistent. In addition to increasing research funding, the experts also consider international cooperation in research to be

important here – this would prevent inefficient parallel research and investigators in the various regions of the world would benefit from their colleagues' experience and knowledge of pathogens endemic to other continents.

The second focus of the replies is on promoting better monitoring of global developments, in order to create something approaching an early warning system for the outbreak of pandemics. A constant exchange of information and data must be ensured if the race against the clock is to be won, if and when the worst happens. This would also require the courage to temporarily bring global traffic and transport infrastructure to a standstill.

### **Public opinion in Germany**

Pandemics are among the risks that the German public considers least likely to occur. Sixty percent of those questioned by the infas survey consider the outbreak of a pandemic to be “very probable” or “somewhat probable.” Only the probability of a trade war scores lower, at 40 percent. On the issue of personal impact, however, pandemics rank relatively high up: 50 percent of German citizens believe that a pandemic would have a “very high” or “somewhat high” impact on their lives. Taken together with the potential paralyzation of the global economy's lifelines, it represents the third-highest score for the eleven risks infas asked about. Only the bursting of a speculative bubble and an increasing scarcity of energy and resources would have a significant impact on the lives of a greater proportion of the people surveyed.

## Technology infrastructure failure

### Facts and figures

As the global economy's multifaceted technological infrastructures become more complex, the overall system's resistance to disruptions becomes correspondingly greater. Yet this increasing complexity is simultaneously rendering technological infrastructures ever more vulnerable by creating more potential points of attack and making them increasingly difficult to protect.

Information technology (IT) infrastructures in particular play a key role in this trend. Given the rise of smart phones and the ongoing digitalization of numerous areas of life, it can be assumed that the potential for danger in this area will continue to rise. According to the U.S.-based Internet Crime Complaint Center (IC3), the annual loss associated with Internet crime in the United States has risen from essentially zero in 2001 to more than a half a billion dollars at last tally (IC3 2010). The sophistication of the tools used, and thus also the risk potential associated with individual attacks is rising steadily (CNN 2011).

A number of events in recent years illustrate this development well. The integration of production facilities into information infrastructures enabled the Stuxnet virus to wreak considerable damage in Iran's atomic facilities – and probably beyond – starting in mid-2009. In April 2011, hackers cracked Sony Online Entertainment security systems, forcing the company to admit that the personal data of at least 77 million users had been stolen, including 12,700 credit card numbers (PC World 2011). In 2007, hackers also gained access to the credit card numbers of more than 94 million customers of U.S. retail chain TJX (New York Times, 2007).



A computer virus similar to Stuxnet could also be used to attack trading systems operated by international stock exchanges, international air traffic control systems or power supply networks.

However, it is not only IT infrastructures that are at risk. Technical failures, human error, cyber or terror attacks, natural catastrophes and climate change all pose ongoing threats of damage to other infrastructures, or are associated with prohibitive risk-management costs. Extreme weather phenomena could significantly restrict shipping traffic and global trade; further increases in international piracy could have similar consequences. In areas of significant rainfall, increased flooding would make it difficult to maintain transportation infrastructure in the middle to long term without very considerable effort.

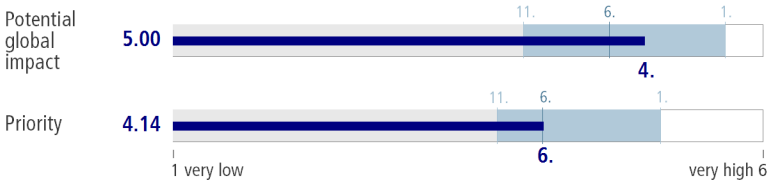
The Fukushima catastrophe showed how extensively a localized event can affect the supply chains of a globally interconnected world. It demonstrated clearly that even highly developed industrial states are ultimately vulnerable to the forces of nature. The failure of technological infrastructures must be deemed a real possibility. The collapse of a critical infrastructure could have far-reaching economic consequences.

Fundamentally, a certain loss of confidence and an associated transitory market paralysis is always to be expected. In addition, a constriction of worldwide mobility is conceivable, perhaps as a result of the failure of air traffic control systems. A collapse or the manipulation of IT infrastructure important to financial markets could lead to unforeseeable turbulence in the financial world. High-risk technologies such as nuclear energy have the potential to make whole regions uninhabitable for long periods of time.

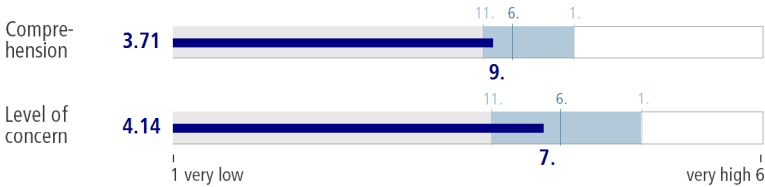
**Key result for “technology infrastructure failure”**

The results for this risk area are in dark blue, with text, value and rank shown. On the 1 to 6 scale, the light blue areas depict the range shown by the other 10 risk areas, running from the lowest value (11th place), through the median (6th place), to the highest value (1st place).

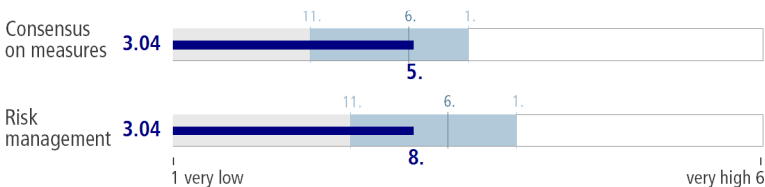
**1. The risk ranks moderately high in terms of its potential global impact. Respondents believe it should be accorded moderate priority.**



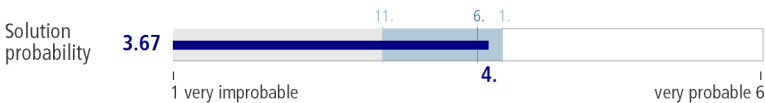
**2. Comprehension of the risk is assessed as being comparatively poor. Decision makers' level of concern falls in the middle of the field.**



**3. In terms of consensus on mitigation measures, the risk ranks in the middle range. In terms of quality of risk management, it ranks in the low middle range.**



**4. In comparison to all other surveyed risks, the probability of solution for technology infrastructure failure ranks in the high middle range.**



### Global relevance of the risk area

Because this survey was conducted shortly after the catastrophe in Fukushima, it can be assumed that the results have been influenced by events there. The experts rated the extent of economic damage associated with the collapse of a technological infrastructure as high, comparable with the effects of excessive sovereign debt or protectionism and trade wars. On a scale from 1 (very low) to 6 (very high), they rated the potential global impact at an average of 5.0.

Nonetheless, by assigning an average value of 4.14 on a scale of 1 to 6 (where 6 represents a very high priority), they give measures aimed at minimizing the vulnerability of technological infrastructures only medium priority in comparative perspective, though this rating is rather high in absolute terms. One reason for this could be the high complexity and rapid change of technological infrastructure, which complicates concrete risk mitigation measures and makes dealing with other risk areas appear more urgent. However, it is also conceivable that, having engaged in research on the issue, experts expect companies to produce solutions for technological infrastructures' security problems.

In response to the open question on the most serious economic consequences of the failure of technological infrastructures, the experts identified a range of issues. For instance, damage to the global economy could result from investment barriers raised following a collapse of global supply chains and a loss of confidence in the functioning of economic systems. The collapse of core infrastructures could lead to a period of protracted economic stagnation, as the globalized economy is strongly dependent on functioning information, communication and transportation infrastructures.

Respondents also saw the operational capacity of governments and institutions as being at risk; this in turn could affect global markets that require institutional stability for smooth functioning. The failure of an important infrastructure could lead to the collapse of regional markets, with possible global effects due to the strongly interconnected nature of the global economy.

Along with economic consequences, the experts in some cases also mentioned issues such as terrorism and espionage. The impossibility of perfect protection, particularly of IT infrastructures, significantly facilitates espionage activities. Social unrest was also identified as a possible consequence of the failure of technological infrastructure.

### **Comprehension of the problem and risk-mitigation measures**

Just as they themselves accord solutions to the problem of technological infrastructure failure a comparatively low priority, survey participants see decision makers as devoting only an average level of concern to this theme – indeed, in respondents' eyes, issues such as international terrorism, turmoil in global financial markets, or energy and raw materials shortages dominate the agenda.

On a scale from 1 (very low) to 6 (very high), the experts rate comprehension of the causes, mechanisms and consequences of the failure of technological infrastructures at the comparatively low average level of 3.71 (Fig. 1).

This could help explain the rather moderate level of perceived concern exhibited by decision makers: Across all areas of risk, answers to the questions on risk-area comprehension and decision makers' level of concern showed a strong correlation. Survey respondents may have deemed decision makers to be comparatively unconcerned because they deemed the level of outstanding knowledge on the issue to be fairly low, and thus had little faith in leaders' ability to understand the consequent potential for disruption.

The lack of comprehension also explains the current approach to managing the risk of technological infrastructure failure, and the consensus as to appropriate solutions. The experts gave both areas an average score of 3.04 on a scale of 1 to 6 (with 6 corresponding to very good solution strategies as well as to very broad consensus on appropriate measures).

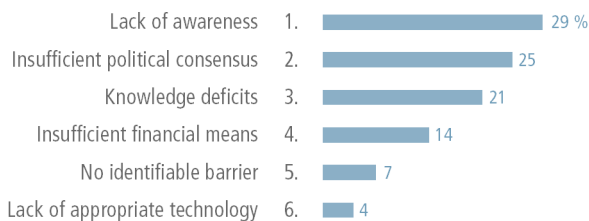
**Fig. 1: Comprehension of risk areas on the part of global decision-making elites (all respondents)**



Given the perception of a rather low level of comprehension, rather poor risk management efforts and a rather low consensus as to the appropriate course of action, it is surprising that the probability of future aversion is in fact rated as highly as in the risk areas of energy and resource scarcity or aging societies. On a scale from 1 (very improbable) to 6 (very probable), experts gave this an average value of 3.67.

One explanation for this might be that in contrast to almost all other risk areas, experts do not see the lack of political consensus as the primary obstacle, but rather see the lack of awareness of the problem as the primary barrier to a solution (Fig. 2). Indeed, in all risk areas, experts saw the average probability of future solutions more optimistically the less they identified a lack of political consensus as the main obstacle to solution.

**Fig. 2: Key barriers to averting/mitigating the risk of technological infrastructure failure: percentage distribution of all respondents' assessments**



When queried as to their opinions on the most appropriate potential solutions, the experts emphasized in particular the importance of raising public and decision-maker awareness of the issues associated with technological infrastructure failure. In this sense, the answers were thus consistent with the frequent mention of a lack of awareness as the main obstacle to a solution. The same applies to a lack of knowledge; many respondents saw better comprehension of the issue as part of any potential solution.

The experts' answers also contained a number of technologically driven potential solutions. One expert, a scholar in Niger, suggested running critical operations on a dual infrastructure system, thus ensuring a maximal level of redundancy and security. The prospect of an enhanced and permanent use of specialists tasked with uncovering vulnerabilities in critical infrastructures – so-called red teams – also drew enthusiasm.

In general, answers to the open question on best potential solutions confirmed the assumption that the technological infrastructure failure risk area has a certain “black-box” character, the understanding of which could be critical to reducing vulnerability, and thus could also contribute to reducing risks.

### **Public opinion in Germany**

About two-thirds of respondents to an infas poll in Germany consider it “very probable” or “somewhat probable” that a natural catastrophe or a terror attack could severely disrupt normal economic activity by severing major economic arteries. This places the issue in the view of German citizens in the lower middle of the ranking of risk probabilities. However, Germans see themselves as being relatively strongly affected on a personal level by such developments. Fifty percent of respondents said the blockage of global economic flows would have a “very high” or “somewhat high” impact on their lives. This is the third-highest value among risk areas, equal to that of pandemic outbreaks. Only the bursting of a speculative bubble and increasing energy and resource scarcity were viewed by a larger percentage of people as likely to have a major impact on their lives.





# Risk Concept, Selection of Risk Areas and Expert Survey Methodology

Holger Glockner, Tim Volkmann

## An expanded understanding of economic risks

### Distinguishing from the classic concept of risk

The economic crises of recent years, from the financial market crisis to the massive debts accumulated by leading Western economies and Japan, testify to the growing interconnectedness and vulnerability of the global economy. Global economic risks have moved increasingly into the focus of public perception. Economic decision-making is increasingly exposed to high levels of instability and uncertainty. Global economic mechanisms often appear to be imperfectly understood, or their considerable complexity seems to be imperfectly captured in mainstream economic thinking and decision-making, as is the case with the “Homo economicus” model of neoclassical economic theory. Does this mean that risks within the global economy will in the future be perpetually incalculable?

The answer depends in large part on what we mean by a global economic risk. For the present study, this issue is of crucial importance. The analysis of systemic risks within the global economy – the potential impacts of which are significantly increased through interaction with other risks – places specific demands on the underlying concept of risk. In order to map the layout of future risk constellations plausibly, one must begin with an analysis that extends beyond the traditional understanding of risk. More specifically, this means including risks that derive from causes lying outside the economic sphere, as well as risks with effects that play out outside this sphere.

At first glance, risk primarily involves one possible form of observation – that is, a risk assessment is dependent on what the observer knows and does not know. Classical risk analysis, as takes place in insurance economics, studies the relationships between specific choices primarily under the assumption that risks can be assessed, in the sense of quantifying uncertainty. For example, in the case of climate change, a calculation of the probability of natural disasters and the potential associated damage is made. However, the non-insured middle- and long-term economic consequences remain unexamined.

The analysis of global economic risks, by contrast, requires a significantly larger frame of reference. The observational perspective consequently shifts from individual risks to complex constellations of risk, which exert considerable influence on the global economic system, and which are quantifiable and assessable to only a limited degree. The study of systemic risks requires a multidimensional understanding of risks that encompasses both *de facto* validity and social validity.

For this reason, in order to be considered an economic risk, something must first be recognized as a *de facto* risk by the scientific community, particularly economists, as well as by political and economic decision makers. There is no objective criterion for the *de facto* validity of an economic risk; it is far more critical whether it is perceived and communicated as such. Ultimately, then, one can speak of an economic risk if it makes a difference in specific decision-making behavior, if the risk is considered as a premise for economic decisions, and if in the event of its occurrence, it has an effect on the economic system.

In addition, we understand economic risks to be problems that affect multiple areas of society. The assessment of risk potential and particularly the handling of risk depends to a large extent on whether or not the individual can have an active influence on the risky choice, and whether or not he or she is personally affected. This circumstance creates an enormous potential for conflict, which is characteristic of the social dimension of risk. The social dimension of risk thus includes the diverging interests of the stakeholders dealing with the risks.

In seeking to understand economic risks, therefore, studying a risk solely from the standpoint of its *de facto* validity is insufficient. Rather, the social

validity of risks must also be kept in focus, as the question of whether decision makers and those who will be (potentially) affected agree on potential solutions has substantial impact on the risk itself.

### **Risk as a micro- and macroeconomic decision-making problem**

Economic risks can initially be divided into microeconomic risks, which primarily affect company business decisions such as investment determinations or strategic positioning, and macroeconomic risks, which affect large-scale economic relationships such as the development of business cycles as well as underlying sociostructural conditions. These two risk contexts can in general be described and assessed using the techniques of business economics and macroeconomics. However, broadening this understanding to include the socioeconomic context enables all risks that are or could be meaningful for economic decisions to be included. These include social and political risks, as well as technological, environmental and economic risks.

Within this complex concept of risk, then, what characterizes a global economic risk? Risks arise wherever decisions are made. The moment that alternatives present themselves, and a choice must be made, a situation becomes risky. From a decision-theoretical perspective, the presence of alternatives distinguishes risk from (alternative-poor) threat. Although threats such as previously unforeseen events or catastrophes can be extremely relevant for the global economy, they do not represent problems of decision-making. If they do become treated as premises for decisions, then they are risks. The 9/11 attacks in New York and Washington represent an example of a threat that following its realization has been increasingly integrated into decision-making processes, thus being treated as a risk.

The distinction between threat and risk is also dependent on the choice of decision-making premises. A known threat can be treated as a risk, because decisions can refer to it. To this extent, a decision's degree of risk ultimately depends on the knowledge available to the decision makers. Because the results of a decision necessarily lie in the (unknown) future, however, knowledge alone cannot protect against the uncertainty of decisions. In this

context, all that can be done is to speak of relative certainty as compared to relative uncertainty.

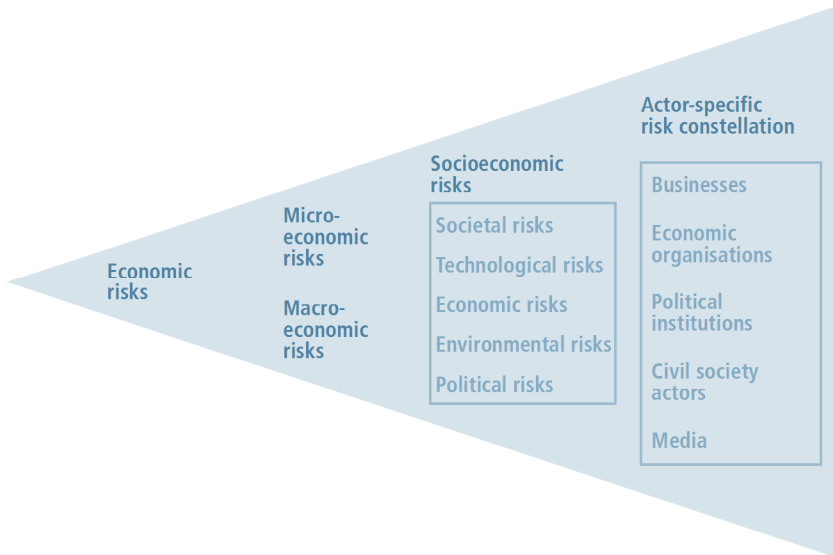
Relative certainty comes about when one seeks to anticipate risks, integrating them into the premises for a decision. Whether something like demographic change represents risk to a business or the macroeconomy thus depends on decision makers' perceptions and expectation. For this reason, it is possible for developments within an organization or economy's surrounding environment that initially are not perceived as risks to later take on a significant role as powerful factors in economic decisions. Time frames also present a difficulty in dealing with risk. Because decisions are often based on expectations of continuity, future risks, even those with precursors evident in the present, often remain unrecognized.

### **Definition and research assumptions**

In summary, then, the expanded understanding of economic risk described here aims to take account not just of micro- and macroeconomic factors, but also of the (global) constellations of socioeconomic risk that affect businesses and economies. For this reason, it is not enough to focus on individual risk; rather, it is necessary to take account of complex and emerging interactions between various risks, as well as the of impact of the various perceptions of risk held by actors and groups of actors.

*In accordance with this understanding, economic risks can be defined as risks whose sources lie in societal, technological, economic and/or political developments, the impact of which unfold within the global economy. They must therefore be observable as economically relevant risks, and be able to be treated as problems of economic decision-making.*

Fig. 1: Approaches to an expanded understanding of economic risks



From this understanding of risk can be derived two premises for the description and assessment of future risk potential, both of which serve to guide this study:

1. A high de facto risk potential primarily arises when the level of potential damage to the global economy associated with a risk is assessed to be high. In addition, the risk increases if it is poorly recognized, if there is little experience in dealing with the risk, and the underlying mechanisms are insufficiently understood.

2. From a social perspective, the potential for conflict associated with risks is of central importance. The lower the consensus as to the risk and possible courses of action, the more difficult it will be to deal with the risk. To that extent, the degree of consensus between relevant act actors with regard to the risk itself, as well as to possible solutions, represents an important criterion in assessing the risk potential.

## Methodology in selecting risk areas

### Starting point

Translating our expanded understanding of risk into methodological terms is a precondition for its use in any survey. Because no individual economic risks will be described and analyzed, but rather environmental developments that hold potential risks for the global economy, so-called risk areas were chosen as the survey's starting point. Risk areas are multifaceted environmental developments and interrelated series of consequences that have high relevance for future economic development.

A first challenge was to develop a suitable process for selecting the risk areas to be analyzed by the participating experts. The final selection had to reflect the theoretical constraints of the underlying concept of risk, and be broad enough to encompass both known risks and those that have received comparatively less attention. At the same time, the candidates had to be able to be dealt with in a survey framework. Therefore, a second necessary step was to create a suitable description of risk fields, in which the essential facts were described, but without anticipating the implications and evaluations of potential risks. The risk area descriptions subsequently formed the foundation of the actual expert survey.

### Identifying risk areas

The first step in identifying risk areas was based on a multi-part analysis of megatrends, which included both continuities (i.e., an extrapolation of existing global trends) and discontinuities (i.e., breaks with previous trends). Megatrends are processes of transformation that can be empirically and clearly demonstrated to be long term, and which have a global reach. The megatrend concept originally comes from U.S. futurologist John Naisbitt, whose work provided the field of scientific futures research with a foundational methodological procedure in the analysis of global trends. Since megatrends

are stable over a time horizon of multiple decades, and have comprehensive impacts in all world regions, they provide reliable information on future challenges for societal, economic and political actors.

At the same time, megatrends have a high level of inherent complexity, which is particularly significant with respect to regional variations. The global trend of demographic change, for example, is precipitating a massive aging of the population both in post-industrial societies such as Europe or Japan and in the economically developing China; however, in many emerging and developing countries, the same trend is leading primarily to massive population growth. In addition to regional aspects, functional and structural factors contribute to the complexity of megatrends. It can thus be assumed that in some circumstances, corporate decision makers might develop different perspectives on the risks and solutions associated with long-term megatrends than would actors from politics, academia or the media.

The present analysis draws on a selection of 20 megatrends that have been successfully used by Z\_punkt The Foresight Company in performing futures analyses and developing strategies for public institutions and businesses. As a rule, the analysis of megatrends is based on the extrapolation of key empirical indicators, identification of the most important drivers, and an impact analysis within the context of the specific issue under examination. The advantage of the megatrend approach in an analysis of risk potential lies in its comprehensive perspective: Alongside purely economic factors of influence, it allows future developments holding the potential for significant economic relevance to be included, even if their sources or impacts lie outside the economic sphere.

**Fig. 2: Megatrends – A starting point for risk identification**

Society	Technology	Business	Environment	Politics
Demographic change	Digital lifestyle	Globalization 2.0	Energy and resource reversal	Urbanization
Individualization and emerging lifestyles	Learning from nature	Knowledge-based economy	Climate change / other environmental impacts	New political world order
Improving health	Ubiquitous intelligence	Business ecosystems		Increasing security threats
Women on the rise	Convergence of technologies	Change of the world of work		
Cultural diversity		New consumption patterns		
New patterns of mobility				

Because economic risks often arise from the interaction of various environmental trends, the analysis of megatrends was supplemented by the additional methodological step of cross-impact analysis. Using this method, the interactions of two megatrends can be examined. The primary focus in this task is on discovering which specific risks for the global economy result from the interaction of two long-term global trends. In fact, a variety of megatrends are in themselves consistent, meaning that they show no internal contradictions and are not mutually exclusive. This additional analytical step thus represents an expansion and deepening of the megatrend analysis, capturing issues that are underrepresented in the public discourse.

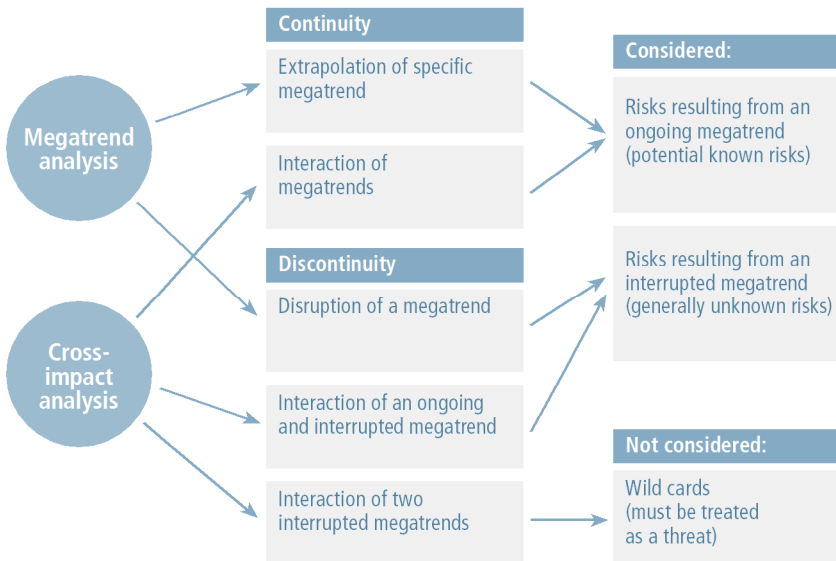
### Continuity and discontinuity

Both analytical processes were initially carried out under an assumption of continuity – that is, the assumption that the future course of development would remain stable. The risks in this case can be derived from the



megatrends themselves, as they involve specific constellations of risk that emerge as developments evolve over the long term. The megatrends and their interrelationships are thus systematically analyzed for potential risks to the overall interactions of the global economy. In essence, the results of the continuity analysis reflect the current scientific and media discourse on global economic risks.

Fig. 3: Process design – Analysis of continuity and discontinuity



The fact that many of the long-term trends are well-recognized and in many respects also well understood can be seen as an indicator of their high relevance within the economic risk discourse. However, under our concept of risk, the pure focus on an assumption of continuity is problematic, because risk potentials tend to remain unrecognized. In this respect, the analysis of discontinuities enables a view of risks that are comparatively unknown, but are no less relevant. Megatrends are stable over long periods of time, but are by no means immutable. Breaks in trends (disruptions) have enormous

consequences for economic relationships, because they typically have not been previously accounted for.

The first phase of discontinuity analysis examines the potential risks arising from an interrupted megatrend. What would happen, for example, if demographic change were to quickly shift direction, and birth rates in previously aging societies were to suddenly rise? Or what would happen if criticism of globalization increased to such an extent that states saw themselves as forced to close off their national economies from the world market? The analysis particularly reflects the fact that disruptions represent a break in the structure of expectations, and therefore can hardly be addressed using standard methods of economic risk analysis.

The cross-impact analysis, looking both at potential trend disruptions and trend continuities, represents an expansion and deepening of the previous analysis. Which impacts might prompt the progressive individualization of society to produce a sudden increase in births, and which economic consequences might precipitate this constellation of forces? What would the challenges to the economy be if globalization continues, but leads to increasing resentment of cultural diversity and a return to traditional ways of life? The analysis focuses particularly on interactions between megatrends, as these often influence multiple reference frames simultaneously, thus creating very complex patterns of risk.

Within this second phase of discontinuity analysis, the plausibility of disruptions is an important criterion. Disruptive events with comparatively low plausibility – we speak in this case of risks with a wildcard character – must be clearly distinguished from the impact that the disruption of one trend might have on a second trend. Against the background of our current understanding of risk, wildcards can best be characterized as threats, which due to their low plausibility are not treated as an economic decision problem, or are done so in only a very limited way. The disruption of two megatrends simultaneously is also deemed to be a wildcard; this type of scenario is correspondingly excluded from the analysis.

### Formation of risk areas

The continuity analysis was able to identify a total of 53 individual risks, while the discontinuity analysis identified an additional 87. Throughout, it was clear that there were significant overlaps and redundancies within each analytical section as well as between the continuity and discontinuity analyses. At this point, a cluster analysis was used in order to separate the factors (individual risks) into internally similar groups.

The resulting clusters form risk areas, each composed of a variety of individual risks that themselves reference multiple facets and domains. Thus, for example, the cluster or risk area “protectionism/trade wars” contains individual risks that themselves fall variously into the Society, Economy and Politics categories. Specifically environmental risks, which fall into the cluster or risk area “Food and water scarcity,” are also part of the Society, Economy, Environment and Politics categories. Overall, 30 risk areas were able to be formed in this way, 13 of which involve risks derived exclusively from the continuity analysis, seven with risks exclusively from the discontinuity analysis, and an additional 10 with risks drawn from both blocks.

With an eye to the scope of the expert survey, as well as to keeping relevant systemic economic risks distinct, these risk areas were subjected to an additional cross-impact analysis, aimed specifically at examining interdependencies between the impacts of individual factors. The strongly interconnected risk areas were selected; these were distinguished by a particularly large number of interdependencies, thus demonstrating active impact on other risk areas as well as being passively influenced by others. From this analytical process came the 11 risk areas that were ultimately evaluated by participants in the study:

1. Food and water scarcity
2. Energy and resource scarcity
3. Socioeconomic gaps
4. Uncontrolled mass migration

5. International terrorism
6. Aging societies
7. Sovereign debt/default
8. Financial market collapse
9. Protectionism/trade wars
10. Pandemic outbreaks
11. Technology infrastructure failure

## Expert survey methodology

### Questionnaire design

The questionnaire for the online survey was designed so that each risk area could be processed separately, while composed of the same questions. Each part of the questionnaire contained a description of the risk area, in which the core issues were identified; in some optional cases, facts were cited providing empirical support for the constitution of the risk area. This was designed to encourage participants to provide assessments in risk areas that lay outside their actual expertise.

Following the risk area description was the actual questionnaire, a survey using a rating-scale system. The questions referred directly to the assumptions derived initially from the underlying risk concept, thus bringing both the de facto and social risk dimensions into focus. Many of the questions – particularly those addressing the degree of impact associated with risks or possible solutions – also left open a blank in the temporal/spatial dimension, an essential criterion in the analysis of risk area relevance.

The factual quality of the risk area was the initial subject of query, with a discussion of the core issues critical to the determination of risk. This served to address the issues of attention, understanding and knowledge with respect to the risk itself, as well as risk management. This first block of questions was

aimed explicitly at capturing the professional expertise of experts and decision makers.

The second block of questions discussed the concrete economic impact that, in the view of the expert, would be exerted by a risk area on the global economy as a whole. The experts were first asked to classify the impact at the global level, then with respect to their own region. This enabled an analysis to be made as to how strong the impact was judged to be relative to the global average. The subsequent open question asked participants to outline any concrete economic consequences.

The third block of questions was directed at the solubility of risks in general, and particularly at solutions drawn from the individual expert's organizational point of view. Here, the temporal aspects of the question were critical. Thus, experts were initially asked to evaluate the degree of urgency behind solutions in the particular risk area. The next section dealt with the implementation of possible solutions; participants were asked whether decision makers were addressing the problem, and had already taken steps toward managing the risk.

The final block of questions dealt with the social dimension of risk, raising the issue of the risk area's potential for conflict. Participants were first asked about the degree of consensus between various decision makers in dealing with the risk area. In the second open question, participants had the opportunity to identify and discuss what they held to be the largest barriers to managing the risk.

The questionnaire's design was intended to enable the most extensive possible evaluation and analysis of results, with particular value being placed both on relationships between individual questions and between blocks of questions. Moreover, the analysis integrates metadata on the regional origin and professional expertise of the individual experts, all of which was captured at the time of registration.

### **Scope and spectrum of participants**

The study's specific underlying concept of risk had clear implications for the spectrum of desired participants. For a start, we had defined risk as a problem

of decision-making. This implied that the survey had to be addressed to decision makers who were confronted with risk in the context of their professional activities. Additionally, there was a need to survey experts drawn from non-economic contexts, given the requirement that economic risks not be limited to a purely economic set of interdependencies, but viewed rather as cross-sectoral and cross-system challenges. Figures from politics and civil society were represented strongly within this latter non-economic group. An additional premise was related to the study's global perspective, and the observation that risk environments in various regions of the world develop differently, and above all can be perceived differently. The survey is thus addressed to an international panel.

The panel consisted of 70 experts, broken down by world region as follows:

Europe and Russia	37 participants
Asia	9 participants
Latin America	9 participants
Africa	7 participants
USA and Canada	5 participants
Middle East	3 participants

Broken down by field of professional activity, the panel was composed as follows:

Academia	26 participants
Politics	17 participants
Economics	16 participants
Civil society, media	11 participants

The heterogeneity of the participants enables an evaluation of global economic risk that takes account of specific regional and sectoral viewpoints. This is shown particularly in the responses to the open questions, in which the experts in general drew significantly on their individual professional experiences. In this way, the survey succeeded in presenting a quite comprehensive picture of the context-dependent nature of the evaluation of global economic risks.

# Globalization and its Complexity: Challenges to Economic Policy

Jan Arpe

## Old risks in new bottles

The risks explored in the previous chapters are not in their essence new: the scarcity of resources critical to survival, speculative bubbles, extreme social inequality, migrating populations, epidemics, terrorism and even state bankruptcies have long been a part of the fabric of human life.:

- In his book “Collapse,” Jared Diamond argues compellingly that the inhabitants of Easter Island handled their scarce timber resources so wastefully that the civil war triggered by the issue ultimately destroyed their entire culture (Diamond 2005).
- The Netherlands’ notorious tulip mania ended in 1637 with the collapse of a speculative bubble. Previously, tulip bulb prices had soared as tulips became collectors’ items for which exorbitant amounts of money exchanged hands.
- Triggered by the invasion of the Huns in the fourth century, mass migrations took place across Europe for the next 200 years.
- The Black Death, the great plague pandemic that lasted from 1347 to 1353, spread across the whole of Europe and led to an estimated 25 million deaths, about one-third of the population at the time.
- The “German Autumn” of 1977 marked the climax of a wave of terrorism in Germany. Among other events, this involved the murder of Hanns Martin Schleyer, president of the Confederation of German Employers’

Associations, and the hijacking of the Lufthansa airplane “Landshut.” Beyond Germany’s RAF, the 1970s saw the formation of terrorist groups in other European countries, such as the IRA in Ireland, the ETA in Spain and the BR in Italy.

- At the end of 2001, Argentinian President de la Rúa declared his country unable to repay its debts. Three years previously, the country had been plunged into a recession that led to capital flight, a banking crisis, excessive government indebtedness and inflation.

Some crises have led to radical societal changes, while others have plunged whole cultures into collapse. It seems as though one would only have to look back precisely enough, carefully analyzing the past and drawing appropriate conclusions, in order to find the correct responses to the risks of modernity. However, there is a significant difference between the crises of the past and today’s threats. Indeed, the context has radically changed. At issue are no longer simply regional cultures, or catastrophes with primarily local effects. At stake today is *all* of humanity, as a look back at a century featuring two world wars, a cold war and a nuclear arms race illustrates. Today, global resource shortages loom, the entire world economy is shaken by finance crises, worldwide mass migrations due to climate change and severe developmental differences can be foreseen, and terrorist attacks like that on 11 September 2001 in New York shift perceptions of security worldwide. And it is virtually unimaginable what a global pandemic might mean, or what global implications the bankruptcy of a major economy such as that of the United States, Japan or significant European countries might hold.

Rapid technological developments have enabled human activities to have impacts as strong as those of natural influences; human-induced climate change is only the most prominent example. Atmospheric chemist and Nobel Prize winner Paul Crutzen goes so far as to speak of a new geological era, the “Anthropocene” (Crutzen 2002). Yann Arthus-Bertrand’s film “Home”



illustrates in breathtaking images just how we humans have changed the planet in the last 60 years.<sup>1</sup>

In the 20 years since the end of the Cold War, the globalization process has once again accelerated immensely. The global interdependence of political, economic and social systems has produced unprecedented complexity. The risks of a globalized world are substantially different from the risks of the past – in terms of potential damage, temporal dimension, geographical scope, irreversibility, potential for social conflict and mutual interdependencies.

The interplay of global megatrends such as economic globalization, demographic development, climate change and technological progress amplifies the influence of local events through reciprocities and feedback effects. As a result, conventional problem-solving strategies are failing. In part due to the border-constrained nature of national policymaking, these strategies are generally effective at the regional level only. They are too often oriented toward specific trends, and are informed by models whose idealized assumptions are helpful under readily comprehensible conditions, but which lose legitimacy when confronted with the complexity of globally interconnected systems.

## The global economy as a dynamic network

The structural changes in the global economy stand out when one sees economic activity as part of a dynamic network. The objects within this network are the market actors, the economic goods, the factors of production, the available information, etc.<sup>2</sup> The quantity of these objects is a measure of the *size* of the network. The objects stand in varying relationships to one another: Market actors interact with one another, certain factors of production

<sup>1</sup> [www.youtube.com/user/homeproject](http://www.youtube.com/user/homeproject)

<sup>2</sup> We do not aim here to provide an exact definition of the network model, but rather the idea of a meta-model illustrating structural changes.

are needed to produce a good, market actors have access to certain bits of information, and so on.

These dependencies can be abstractly represented by links between the objects. The average number of links per object is a measure of the *interconnectedness* of the system as a whole<sup>3</sup>. Both the objects and the links between them have very widely varying properties. For example, market players have varying preferences, natural resources are distributed very unevenly from a geographical perspective, access to information is sometimes better and sometimes worse, etc. Indicators of this variance measure the *heterogeneity* of the network<sup>4</sup>. Of course, because we are dealing with a dynamic network, the objects and the links within the network change over time. Indicators of the rate of change measure the dynamics of the network.

Table 1 outlines how the global economy changes in terms of size, complexity, heterogeneity and dynamism in the course of global transformation.

The Atlas of Economic Complexity (Hausmann et al. 2011) deals with these changes in great detail. In summation, the particular challenge lies in the fact that all of humanity today lives and interacts within a single large, highly networked, very heterogeneous and highly dynamic system.

<sup>3</sup> This is a very simple measure of the degree of interconnectedness. Other graph-theoretical indicators such as connectivity numbers or expansion properties describe other aspects of global networking.

<sup>4</sup> For example, consider here indicators such as the Atkinson measure, or the Gini or Theil indices, which although used primarily for the measurement of income and wealth inequalities, are in principle applicable to any statistical distribution.

Table 1: Global economic changes in four dimensions

<ul style="list-style-type: none"> <li>• More market actors</li> <li>• Larger market volumes</li> <li>• More information available</li> <li>• Stronger quantitative effects associated with human activity</li> </ul>	▷	<b>Size of network increases</b>
<ul style="list-style-type: none"> <li>• Stronger interaction between market actors</li> <li>• More complex value-added chains</li> <li>• Higher availability of information</li> <li>• Larger scope for effects of human activity</li> </ul>	▷	<b>Complexity increases</b>
<ul style="list-style-type: none"> <li>• Heterogeneous capabilities and needs of market actors; unequal distribution of resources</li> <li>• Higher product diversity</li> <li>• Varying availability of information</li> <li>• Strong global variability of market effects</li> </ul>	▷	<b>Heterogeneity increases</b>
<ul style="list-style-type: none"> <li>• Intensifying interaction dynamics</li> <li>• Faster change in production processes</li> <li>• Increase in information density</li> <li>• Faster propagation of effects of human activity; delays in global distribution</li> </ul>	▷	<b>Dynamism increases</b>

## Decision-making in a complex world

The evolution of the global economy is determined by:

- the decisions and actions of its actors (individuals, groups, institutions); and
- the repercussions of these decisions and actions within the system.

Decisions themselves are driven by individual needs and convictions, social norms, economic conditions, political environments and technological

opportunities. These drivers in turn are endogenous components of the system, and are themselves likewise governed by the global dynamic. The focal point for the emergence of global risks is ultimately the interplay of individual and institutional decisions under a given set of conditions. Herein lies a paradox: While the environment increases in complexity, the manner in which *individual* decisions are made in a given situation tends not to do so. This is because these decisions depend ultimately on actors' brain structures, which change only marginally over time, at least if one assumes that the intergenerational evolution of the human brain is an extremely slow process.<sup>5</sup>

On the one hand, this means that the capacity of single individuals to deal with complex situations requiring decisions has its limits. On the other, this insight also offers cause for hope: The better the functioning of the brain can be understood, and thus the behavior of people under specific circumstances, the better that situations that demand decisions can be modeled, analyzed and simulated.

The "big picture" in which individual decisions are made depends substantially on decisions that are made institutionally, in the sense that multiple people are involved in an institutionalized decision-making process. These include fiscal policies, business strategies, or supranational finance market regulations. In contrast to the way individual decisions are made, institutional decisions can be deliberately shaped. To be sure, individual choices form the basis for institutional decisions, as individual persons are ultimately involved in the shaping process. However, the process of institutional decision-making can make available problem-solving capacities that single individuals cannot possess. Institutional decisions are distinguished by the fact that they are rooted in the surrounding environment's social systems, such as organizations or cultures, rather than solely in the brain structures of the individuals involved. Although these environmental features

<sup>5</sup> At the same time, research shows that over the course of a full lifetime, the brain has a large, mostly untapped development potential that could be better exploited by new types of lifelong learning (Staudinger, Marsiske and Baltes 1995).

too possess a certain inertia, their underlying evolutionary processes are much faster than are their biological counterparts.

Decision-making processes must adapt themselves to globalization's growing complexity. The point of leverage here lies in the shaping of institutional decision-making processes, in which the potential for achievement is greater than the sum of the individual participants' potential, and which as sociocultural structures (as opposed to physiological brain structure), are malleable. The bottom line is that the development of the global economy is significantly influenced by decisions made at the level of governments, central banks, international organizations and multinational corporations. These decisions also form the framework that encompasses most global risks<sup>6</sup>. However, many of the fundamental principles on which these institutional decisions depend are increasingly less appropriate within the complexity and dynamic shifts of the global economy. In what follows, we focus on four such challenges.

**The growth paradigm increasingly conflicts with the reality of globally limited resources, and no longer promotes well-being within post-industrial societies.** Worldwide consumer demand, and thus resource requirements too, will climb rapidly in the years ahead. However, economic policy decisions relying wholly on economic growth are not indefinitely sustainable. On the one hand (at least under methods existing today), there is a limit to the amount that can be produced; on the other, the limited number of consumers and scarce time resources means that consumption cannot take place *ad infinitum*<sup>7</sup>. But even as the possibility of unlimited growth is being called into question, so too is the concept's basic sense. At a certain stage of growth, the contribution of

<sup>6</sup> This does not apply to risks of natural origin such as pandemics or natural disasters. Nevertheless, institutional decisions can in these areas too have an influence on the quality of preparedness and safeguards.

<sup>7</sup> However, the time horizons of an initially steady rise in consumer demand and any potential global consumer saturation differ substantially. This means that at least globally, a saturation point is unlikely to occur within the next few decades.

economic growth to the increase in people's levels of satisfaction seems to drop sharply.

**Explanations and predictions offered by economic models are increasingly diverging from reality.** Global amplification and feedback effects are enabling the development of phenomena such as the current financial crisis, which most economists failed to predict, and which even in retrospect has eluded convincing explanation within the framework of established economic theories. This is because central elements of traditional economics, such as the Homo economicus model, the efficient-market hypothesis, closed equilibrium systems or assumptions of homogeneity, do not account for aspects such as cognitive biases, information asymmetries, phase transitions with multiple unstable equilibria or heterogeneity. There is a risk that economic policy strategies will be based on theoretical assumptions that effectively blind policymakers to important aspects of reality. The global economy becomes more susceptible to risks as a result, and consequently more fragile.

**In many critical areas, the pursuit of short-term, local objectives leads neither to long-term nor globally advantageous results.** In large systems, which to a large extent consist of unrelated individual components, global target values can be optimized by optimizing the corresponding values at the individual component level. With increasing complexity, however, this is less and less true: The welfare of people in one location depends ever more on the actions of other people at a distant location. Feedback effects associated with global interdependence lead to a divergence between short- and long-term goals, as well as between local and global targets.

**Decision-making processes are increasingly inadequate to deal with rising levels of complexity and uncertainty.** Increasingly complex systems become increasingly difficult to control, and develop what can sometimes be dangerous internal dynamics. The worldwide interdependence of political, economic and social systems, technological change, and the interaction of diverse global forces in the Anthropocene era create explosively climbing complexity, with which human capabilities are increasingly less able to cope. Furthermore, as the complexity of the systems in which we interact increases, structural uncertainties also deepen, and we are often forced to make decisions despite having only incomplete information available.

In order to avoid sliding with ever greater frequency from one global crisis to the next, it appears essential to reconsider the bases for our decisions in a radical manner and address the corresponding challenges:

- Solving the growth dilemma
- Developing appropriate economic models
- Developing new strategies and mechanisms for long-term and globally oriented action
- Developing new decision-making processes able to deal with complex challenges

In the next section, a number of future-oriented approaches show how these challenges can be met.

## Future-oriented approaches

### Solving the growth dilemma

The first question is whether growth per se serves human purposes at all, and whether the economy could somehow function even without growth. This question goes to the heart of so-called post-growth economics (Jackson 2009, Paech 2005). The starting point is the recognition that peoples' well-being – at least in the industrialized nations – has already become decoupled from economic growth (Frey 2008, Oswald 1997). At the same time, happiness research has reported that economic contractions, particularly heterogeneous cases that affect some people more strongly than others, strongly reduce people's sense of well-being. It remains unclear how a transition towards an economy without growth might manifest itself.

But even if continuous growth should prove essential for the economy, two fundamental constraints remain. On the production side, natural resources are globally limited, as the Club of Rome noted in its 1972 report "The Limits to Growth" and its subsequent updates (see Meadows et al. 1972, Meadows et al. 2004). And on the expenditure side, consumption capacity is similarly

constrained by the number of consumers and the time available for consumption; these limits ultimately could lead to saturation and stagnation.

Of course, these limitations are only for specific types of growth based on the consumption of resources, and in which additional time is spent in the process of consumption. Thus, several ways out lie close to hand: On the one hand, fewer resources could be depleted (through more efficient production or targeted reuse of materials), alternative resources used (such as renewable energy or nuclear fusion) and growth oriented increasingly toward goods and services that require no non-renewable resources. On the other hand, efforts could be made to create growth not through more goods and services, but through better ones. Specifically targeted support of research and innovation seems to provide a persistent foundation for promising alternatives.

German process engineer Michael Braungart is of the opinion that the often-requested waiver is the wrong way to deal with production-side limits.<sup>8</sup> Instead, he has proposed the “cradle-to-cradle” principle, which keeps the cycle of resources in balance through the reuse of materials (McDonough and Braungart 2002). The essential idea is to reuse raw materials after their processing and disposal, something that would require rethinking the design of processing and utilization processes.

With the rise of the emerging markets in the coming years, global consumer demand will rise rapidly, ensuring that a point of global saturation will certainly not be reached for some time. Economic stagnation thus remains initially a problem primarily for the developed countries. Prominent approaches aimed at replacing gross national product as an indicator used to guide activity include the OECD’s Better Life Index and the work of the Stiglitz-Sen-Fitoussi Commission (Stiglitz, Sen and Fitoussi, 2009), which has been used by the French government.<sup>9</sup>

<sup>8</sup> [www.braungart.com/](http://www.braungart.com/)

<sup>9</sup> [www.oecdbetterlifeindex.org](http://www.oecdbetterlifeindex.org)



## New economic models

In 1936, John Maynard Keynes wrote: “The extraordinary achievement of the classical theory was to overcome the beliefs of the ‘natural man’ and, at the same time, to be wrong” (Keynes 1936). Now, it is the nature of models to employ abstractions, in order to reduce complexity while simultaneously deriving useful explanations and predictions. However, global change increases the relevance of influential variables that are not included or are given too little weight within traditional economic models. The search for better models has shown that the inclusion of ideas from other disciplines such as psychology, physics or biology can be profitable, often at a metaphorical level. For example, econophysics aims at applying the concept of phase transitions to dynamic economic systems; from biology, the idea of evolution has entered economic discourse.

In their book “Animal Spirits: How Human Psychology Drives the Economy, and Why it Matters for Global Capitalism” (Akerlof and Shiller 2009), George Akerlof and Robert Shiller adopt Keynes’ idea that human activity is driven largely by “animal spirits” rather than by rational considerations, as is assumed within (neo)classical economic theory. Akerlof and Shiller cite five aspects of the “animal spirits” intrinsic to us: confidence and its multipliers, fairness, corruption and antisocial behavior, the money illusion, and stories that shape our understanding of the world. The authors – along with many other prominent economists – see the fact that standard economic theories wholly ignore these aspects of human nature as a core reason for the emergence of speculative bubbles (and hence also for the current financial crisis).

In addition, former IBM Chief Technologist Gunter Dueck explains how basic human tendencies lead to overreaction and thus exacerbate alternating boom and bust phases; he argues that underlying emotional reactions should thus be taken quite seriously (Dueck 2006). And Herbert Gintis, an economist at the University of Massachusetts, the Santa Fe Institute and the Central European University in Budapest notes that the assumptions of the various scholarly disciplines that study human behavior in fact diverge strongly. He has called for a unification of these intellectual fundamentals within the fields of economics, sociology, anthropology and psychology (Gintis 2009).

In his book “Rethinking Macroeconomics: What Failed and How to Repair It,” Nobel prize-winning economist Joseph Stiglitz deals repeatedly with the effects of failing to assume heterogeneity within the standard economic model, and notes in particular that the heterogeneity of expectations among market participants is a key contributor to systemic imbalance (Stiglitz 2011).

The abundance of data available today (something that will increase even further in the future), along with the growing power of computers, for the first time offers the possibility to verify the validity of models on an empirical basis, and to use complex simulations to derive macroeconomic models from microeconomic principles – an idea that derives from the newly created area of agent-based computational economics (Tesfatsion and Judd 2006).

The following table from “The Origin of Wealth,” (Beinhocker 2006) summarizes the main differences between “traditional economics” and a new theory of “complexity economics.”

Having at hand all these new models and approaches, it is, however, critical to remember that rising levels of complexity will always ensure that some uncertainties remain. It appears important, therefore, to explore meta-level issues more deeply, such as where the ability to model reaches its limits, and what useful conclusions can be drawn for dealing with the consequent uncertainty.

**Table 2: Traditional economics and complexity economics compared (Beinhocker 2006, Table 4-1)**

	Traditional economics	Complexity economics
<b>Dynamic</b>	▷ • Closed, static, linear, systems in equilibrium	• Open, dynamic, non-linear, systems not in equilibrium
<b>Actors</b>	▷ • Collectively modeled • Make decisions using complex deductive calculations • Comprehensively informed • Failure- and bias-free • No learning or adaptation requirements	• Individually modeled • Make decisions using inductive rules of thumb • Incompletely informed • Prone to bias • Capable of learning and adaptation
<b>Structure of ties</b>	▷ • Modeled on the basis of actors' indirect interactions through market mechanisms	• Modeled on the basis of direct interactions between individual actors
<b>Emergence</b>	▷ • Micro- and macroeconomics remain separate	• Micro- and macroeconomics are linked • Macro-level models are emergent results of interactions at micro level
<b>Evolution</b>	▷ • No mechanism for renewal of the system or increase in order and complexity	• Evolution process based on selection, mutation and amplification provides for renewal of the system and the increase in order and complexity

### **New strategies for long-term and globally oriented action**

The world economy is becoming increasingly irreducible, insofar as global problems are less amenable to solution though being broken into their local components and solved on an individual basis. Examples include collective CO<sub>2</sub> emissions that exacerbate global climate change, or trade wars that arise because individual states put their selfish short-term interests ahead of long-

term global solutions. In such a rapidly changing world, however, the danger arises that the fastest possible answers to daily events will be given ever-greater priority, while long-term consequences will drop from view.

Individual preferences provide a starting point in addressing this dilemma. In classical economic theory, the market's "invisible hand" enables actors' self-interested pursuit of profit to lead to the optimum macroeconomic state. However, individual decisions do have an effect on uninvolved market participants, through what are called externalities. These are external costs or external benefits which the market price does not – or at least does not sufficiently – take into account. Internalization is possible through the use of regulatory instruments such as the trading of certificates (for example, emissions or debt allowances) or the taxation of activities that cause externalities. In order for these instruments to be effective with regard to global externalities, they must be enforced at the global level, which is a major challenge due to the lack of global governance structures. In addition, it is often difficult or virtually impossible to quantify externalities in monetary terms. In the case of long-term externalities, this is made particularly difficult by complexities, uncertainties and inconsistent time preferences.

In addition, there are alternatives to market mechanisms that produce fewer externalities and are more efficient, wasting fewer resources. Nobel prizewinner Elinor Ostrom, an expert on environmental economics, has shown that so-called commons problems, in which there is a danger of depletion of freely available resources, are in certain contexts better solved by cooperative self-organization than by the market and state action (Ostrom 1990). Economist Peter Barnes has suggested the establishment of so-called commons trusts in order to facilitate a more equitable and sustainable usage of common goods (Barnes 2006).

### **New decision-making processes for dealing with complex challenges**

One of the central insights of cybernetics is the "law of requisite variety," also known as "Ashby's law" (Ashby 1956). This states that as more possibilities for action are available to a system's control mechanism, the better able it is to compensate for increases in the number of potential failure

points (and thus for greater complexity). In short: Handling complex systems can only be performed successfully through the use of processes that are themselves complex. It is thus advisable to approach complex challenges with strategies that are sufficiently complex.

The most complex problem-solving tool available to us is the human brain. Particularly in the subconscious elements of the brain, many experiences are processed in such a way as to form the basis of evaluations, which in turn enable very complex problems encountered later to be decided quickly. For this reason, in periods of stable conditions, intuition and gut feelings often function surprisingly well. Problems arise, however, if conditions change abruptly. In periods of change, reliance on the intuition of individual decision makers is a risky proposition. As social scientist and Nobel economics prizewinner Herbert Simon writes in “Models of Bounded Rationality”: “The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world – or even for a reasonable approximation to such objective rationality” (Simon 1982). This argument is given weight by the insight drawn from brain research that “objectively rational behavior” is in any case an illusion produced by the cortex – the brain region responsible for rational decisions – “after limbic structures and functions have already determined what is to be done,” as biologist and neuroscientist Gerhard Roth says (Roth 2003).

Conventional theories and processes too founder when confronted with the increasing complexity associated with globalization, and with the increases in the speed of development and information exchange associated with technological progress. As a result, even experts are often left perplexed, while decision makers find themselves overwhelmed and bereft of clear direction.

If the growing complexity has overwhelmed existing decision-making mechanisms, two possibilities exist: either to reduce the complexity with the help of other instruments, or devise new mechanisms that are better adapted to the complexity. Vast computing power can today be applied to the task of reducing complexity. Moreover, a huge amount of data is available for analysis and knowledge extraction, while highly complex simulations enable the discovery of fundamental patterns and the creation of comprehensive

forecasts. Current examples include the IBM Smarter Planet Initiative <sup>10</sup> or the FuturICT project which, though still in the planning phase, aims at large-scale simulations of social systems <sup>11</sup>.

Another form of complexity reduction is the visual representation of data, which has become the task of the relatively new field of data-driven journalism. Through the open and vivid presentation of data and facts, one of the basic conditions for dealing with complexity – transparency of dependencies – is fulfilled. Such efforts are currently being promoted by the open data movement.

However, the automated reduction of complexities also has limits, as ascertaining the character of complex interdependencies is often impossible, a hurdle that in turn hinders the production of valid predictions. In such cases, a fundamentally different approach to dealing with future challenges must be found. This includes both the assessment of future risks, a task that no longer appears possible using statistical methods and rational expectations theory, and the preparation for several possible futures whose probabilities are not quantifiable. Scenario planning techniques and other methods of futures research could gain in importance as providing the foundations for decisions. Dealing with fundamental uncertainty as opposed to calculable risks is an increasingly urgent challenge, and one which has not yet been explored deeply enough from a structural perspective.

With respect to new mechanisms, intelligent decision-making architectures are required. Networking is a key factor within this area. The Internet offers a valuable opportunity to share knowledge around the world, engage many people in conversation and draw on collective intelligence (Surowiecki 2004). The potential inherent in information and communications technologies extends well beyond majority decisions, average ratings and the endless comment threads in online forums; the intelligent analysis of social networks,

<sup>10</sup> [www.ibm.com/smarterplanet/de/de/](http://www.ibm.com/smarterplanet/de/de/)

<sup>11</sup> [www.futurict.eu/](http://www.futurict.eu/)

elaborated discussion and evaluation platforms, and the automatic semantic processing of large-scale texts are on the way.

In their book “Nudge: Improving Decisions about Health, Wealth and Happiness,” economists Richard Thaler and Cass Sunstein write about decision architectures, and propose their concept of “libertarian paternalism” as a guiding principle in designing processes (Thaler and Sunstein 2009). The idea is to guarantee actors the largest possible freedom of choice, while at the same time “nudging” them toward deciding in a (societally) desirable manner.

### **Global rethinking required**

The above-noted challenges to the foundations of global decision-making give rise to a whole series of fundamental questions:

- To what extent does a market economic system – particularly in a highly complex society with a global division of labor – need economic growth in order to function?
- How might economic incentives for sustainable growth look? How might growth and resource use be decoupled?
- What are the “correct” microeconomic foundations on which to construct macroeconomic models?
- How can systems be made resilient? How can they be both robust and adaptable?
- Are local redistribution mechanisms enough, or do we need globally managed redistribution? What normative principles should be used to decide which distribution of resources is globally just? How might processes that produce these principles look? Are there realistic alternatives to compensatory redistribution, perhaps in the form of business models that automatically respond better to heterogeneous environments and produce “fairer” output distributions?
- What significance might be held by new mechanisms that fall outside the spectrum traditionally bounded by the market and planned economies? How can these be brought to scale?

- Which problems can be solved by “relocalization,” and which cannot? Where is global governance necessary, and how can it be effectively designed?
- How can externalities at the global level be internalized (on a politically practical basis)? What mechanisms already in place enable the pursuit of global and long-term goals? How can limited resources in particular be priced in conformity with market principles, and how can inconsistent time preferences be factored in?
- What would it look like to create networked knowledge and decision-making systems that enable a new level of quality in dealing with complex systems, thanks to the intelligent combination of individual human capacities and available information? What role can the Internet play in this process?
- How can today’s data processing capacities and advanced algorithms help to create complex solutions that match the growing complexities of problems?
- What new approaches to risk assessment and futures planning are emerging? How can fundamental uncertainty be dealt with in a systematic way?

Scientific engagement with the challenges described above is still in its infancy, and remains far from being regarded as “mainstream.” Some latent awareness that the classic foundations for decision-making must be fundamentally overhauled does exist today within scholarly, political and civil-society circles, but remains very shallow and weak. The lack of ideas on how to proceed and the focus on more immediately pressing phenomena make a fundamental examination of these issues difficult.

While the identification of future-oriented approaches itself is no easy task, the next challenge will be to translate such ideas from academia into policy and economic practice. This is particularly true in those areas where global management is required, but no corresponding global structures suitable to the task are in place.



In addition, it is important to find new ways of dealing with risks, since – as described above – these are qualitatively changing. Linear, individual case studies are of increasingly less help. The rational assumption that a risk can be sufficiently precisely characterized through its probability of occurrence and potential for damage no longer holds in a networked, heterogeneous world; this is because the significance of other risk dimensions – the distribution of potential damage, irreversibility, and so on – has risen, and because the high level of complexity and uncertainty often renders probability and potential damage unquantifiable. The future will likely be characterized by increasingly unpredictable discontinuities, and we must find ways to deal with it by making our economic and social order accordingly resistant.

Already today, behavioral and evolutionary economics, statistical physics, the emerging interdisciplinary science of complex systems, and new agent-based models are contributing to a better understanding of the global economic order. The crucial question for the years ahead will be whether and how researchers' ideas will show up in the shaping of finance and economic policy, and whether this will succeed in developing a sustainable global economic and social model able to minimize risks, resist crises and give future generations the opportunity to lead a fulfilled life on our planet. As Yann Arthus-Bertrand says so strikingly in closing his documentary "Home": "It's too late to be a pessimist."

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