



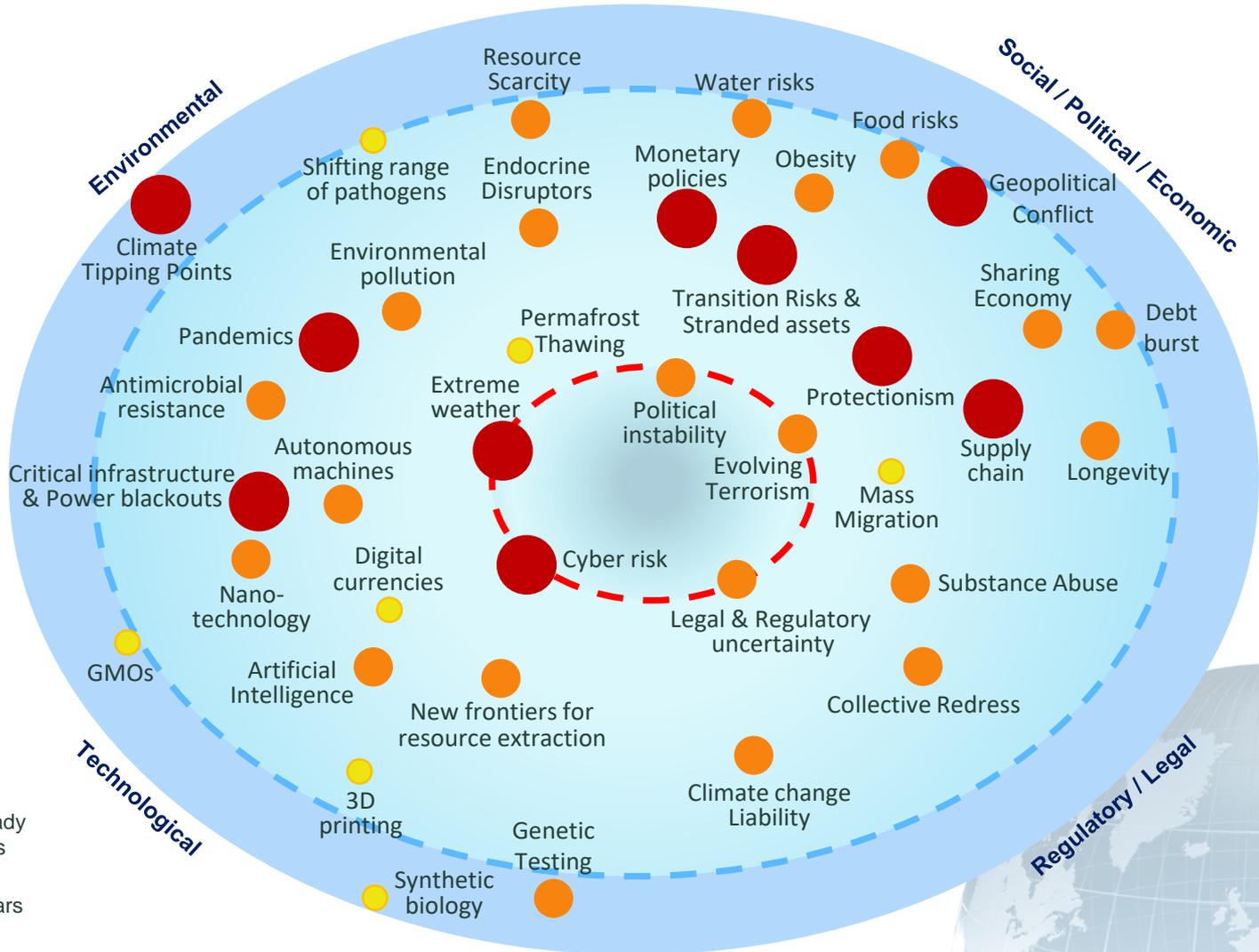
CRO FORUM

Emerging Risks Initiative

Major Trends and Emerging Risk Radar April 2018 Update

TRENDS:

- Ageing and Health
- Changing Consumer Behaviour
- Economic Instability
- Environment and Climate
- Shifting Geopolitical Landscape
- Technological Developments
- Urbanisation and Demographic Change



Key

Impact Assessment:

- Bullet size corresponds to expected impact of risk
- Red circle: Risk category: High
- Orange circle: Risk category: Medium
- Yellow circle: Risk category: Small

Time Horizon:

- Red dashed circle: Significant impacts already seen in insurance claims
- Blue dashed circle: First significant impacts expected within 1-5 years
- Light blue dashed circle: First significant impacts expected within 5-10 years

Ageing and Health (AH)

Most societies are ageing and lifestyles are changing (including 'epidemic of sitting' and rise of obesity), contributing to the rise in chronic diseases. Medical advances in treatment and cure continue apace, especially in genomics and genetics, artificial intelligence supported by advancing data analytics and medical devices, potentially influencing morbidity and mortality.

*Medical Advances
Ageing and Chronic Diseases
Ageing Western Societies*

Consumer Behaviour and Digitisation (CB)

With the growth of digital activity, feelings of being time-poor and wider range of choices, consumers are gravitating towards dominant platforms and trusted brands with a shift from physical to digital trading. Expectations of simplicity and access are rising driven by the increasing use of smartphones, social media and data analytics; to protect consumers from being exploited, regulation of fairness and data privacy are on the rise.

*Time-poor, choice-rich consumers
Disruptive Digital Technologies
Regulation of Fairness
Biases in algorithms / AI
Increasing individualisation*

Economic Instability (EI)

Post financial crisis there have been doubts about underlying growth and stagnant standards of living for many. This is compounded by rising inequality. Politically these factors fuel the rise in populism and a reaction against multinational institutions, leading to nationalism and fragmented regulation. Also long-term low yields and the novel stimulus tool of massive quantitative easing may stoke inflation risks.

*Low yield environment and rising inflation
Instability in economic systems
Protectionism and fragmented regulation
Asset Bubbles*

Environment and Climate (EC)

There is growing concern about climate change and more extreme weather, both acute and chronic (e.g. drought). At the same time other environmental concerns are rising such as overfishing, plastics pollution or urban air quality and diesel emissions. Water scarcity has recently been highlighted by issues in Cape Town, but there is also evidence of increasing number of wildfires with wildfire seasons becoming longer.

*Climate Change
Growth in Environmental Concern
Resource Scarcity*

Title: Shifting Geopolitical Landscape (GL)

Outline: The recent period of Western-based liberalisation and globalisation is shifting towards a more multi-polar world and more assertive behaviours. This is visible through renewed protectionism, Brexit, a resurgent Russia, and China increasingly flexing its economic and political clout.

Lower Level Trends: *Heightened conflict risk (Korean peninsula, South China Sea, Middle East tensions, Europe's borders)
Increased rise of protectionism and anti-global sentiment*

Technology Developments (TD)

Modern technology, digitisation and automation are boosting efficiency and displacing repetitive and tedious human tasks, faster and more broadly than in previous industrial revolutions. Many processes are swifter, cheaper and more reliable. At the same time talent needs and job mix are changing rapidly, contributing to inequality and adding to low-paid gig work, feelings of insecurity, and youth unemployment.

*Technology as an efficiency play
Automation and Robotics
The future of work and talent
Transition to Autonomous Machines*

Urbanisation and Social Change (UC)

There are several societal trends that are changing the way society functions and adding to migration:

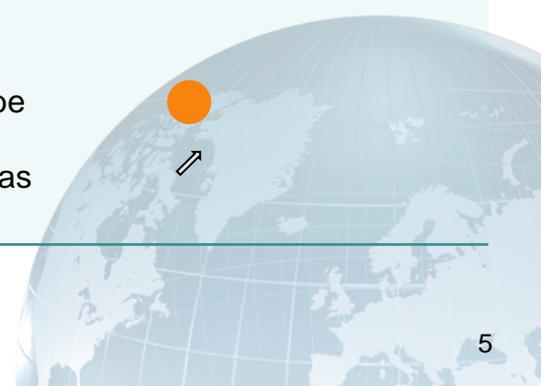
- Population growth and rising urbanisation and mobility affect how people work and socialise
- Social collectivity has been reducing and society is giving greater power to the individual.
- Meanwhile, there is mass migration in some regions, and surging urban middle-class in higher-growth countries.

*Rising Urbanisation
Growing Populations
Changing social make-up (e.g. urban middle-class, migration)*

Topic	Associated Trends	Description	Assessment	ERI Publication
3D Printing	TD	3D printing mainly raises questions in relation to product liability and recall, but also worker's compensation and intellectual property rights. Given these questions and the potential lack of control / product quality assurance arising from online printing plans a new legal framework may be required. The development of 4D printing may further add to the risk. 4D printing utilizes materials that can change over time when exposed to specific elements (water, heat, air, etc).	● ⇒	2015
Antimicrobial Resistance	AH	Drug resistance occurs when microorganisms such as bacteria, viruses, fungi and parasites change in ways that render certain medications ineffective. When microorganisms become resistant to most antimicrobials they are often referred to as “superbugs”. This is a major concern because a resistant infection may cause significant human and financial costs.	● ↗	
Artificial Intelligence	CB TD	With progress in Artificial Intelligence (AI) and cognitive computing, machines may begin to make menial decision on behalf of humans. Decision transfer and lack of transparency or human oversight may result in unforeseen risks or unpredictable outcomes creating complex liability issues.	● ↗	2015
Autonomous Machines	TD CB UC	Thanks to new developments in mechatronics, speed learning and artificial intelligence there has been rapid progress in the field of autonomous machines, affecting most industries, military and everyday life. Autonomous vehicles are particularly well publicised. This is likely to change the risk landscape for various lines of insurance business.	● ↗	2017



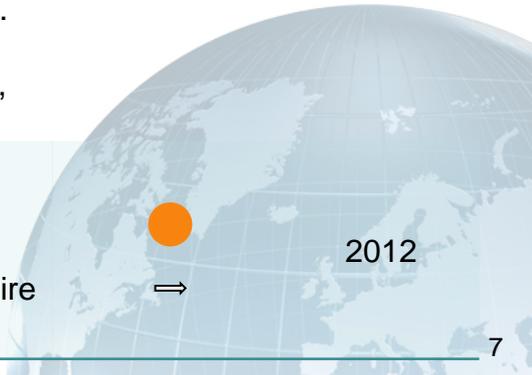
Topic	Associated Trends	Description	Assessment	ERI Publication
Climate Change Liability	<ul style="list-style-type: none"> GL EI EC 	On the legal side: New regulatory developments, increased litigation activity and subsequent liability issues associated with climate change/greenhouse gas emission may lead to large losses under environmental liability, product liability and D&O/professional liability, particularly where the emitter is deemed to have misled.		2009
Climate Tipping Points <i>(new risk)</i>	<ul style="list-style-type: none"> EC EI GL 	Climate change is acknowledged by most nations and pledges to reduce CO ₂ emissions have been made by many governments as part of the COP process. However, the pledges do not go far enough, and even for these pledges, policymakers may fail to translate into effective actions. Exacerbated by the growing world populations and global economies. Emissions and warming continue near the worst IPCC projections, and Arctic ice melting accelerates beyond them. Therefore emissions and feedback effects may accelerate climate change and related disasters, and may enforce secondary effects. Moreover, climate-related hazards can have huge socio-economic and environmental impact if they interact with vulnerable ecosystems and societies.		
Collective Redress	<ul style="list-style-type: none"> CB 	Collective redress is defined as a “procedural mechanism which allows, for reasons of procedural economy and/or efficiency of enforcement, many single claims (relating to the same case) to be bundled into a single court action” The development of collective redress mechanisms in Europe can create an inflation of claims as seen with Class Actions in North America.		



Topic	Associated Trends	Description	Assessment	ERI Publication
Critical Infrastructure Power Blackouts	<ul style="list-style-type: none"> GL EI EC 	In many regions of the world there is a chronic failure to adequately invest in, upgrade and secure infrastructure networks such as electricity provision, water supply, or transport infrastructure. The lack of capacity or outages could result in blackouts. This could lead to a higher than expected frequency and severity of large property losses (incl. BI/CBI). Additionally the risk of solar storms could impact the electrical grid, as well as space-based infrastructure, GPS and communications systems.		2008 & 2011
Cyber Risk	<ul style="list-style-type: none"> GL CB 	The volume and sophistication of malicious cyber activity has increased substantially, and there are growing concerns regarding the security of proprietary corporate data and critical industrial control systems. Cloud computing poses elevated risks due to increased concentration and accumulations. Operational risks exist for corporations and could also lead to large property losses with high and previously unknown accumulation potential if industrial facilities were simultaneously attacked. The growing request for personal identification and authentication, the use of biometric identifiers and the multiple uses of identifiers will likely increase the risk of identity confusion, fraud and even theft.		



Topic	Associated Trends	Description	Assessment	ERI Publication
Debt Burst	EI	<p>The loose monetary conditions that have prevailed in developed markets since the Global Financial Crisis have supported a substantial build-up in leverage, particularly, amongst corporates and households. This raises the risk that borrowers could struggle to service their borrowings once interest rates start to rise (in line with recovering growth), with knock-on impacts to the banking sector (though higher loan losses) and to aggregate demand and economic growth as households and corporates are forced to retrench. The risk could increase in the event that rates were to “snap back” (say on signs of resurgent inflation), rather than gradually tightening.</p>		
Digital Currencies	EI CB TD	<p>Digital currency is a form of currency or medium of exchange that is electronically created and stored. Some digital currencies such as Bitcoin are cryptocurrencies, that is they rely on cryptography for chaining together digital signature of token transfers. There are concerns that cryptocurrencies are extremely volatile and prone to 'pump and dump' fraud.</p> <p>Digital currencies, like Bitcoin tend to rely on “Blockchain” as a distributed ledger that exists on peer-to-peer computer networks. The technology is expected to be substantially disruptive to incumbent operators in a variety of markets, including insurance, beyond their use in cryptocurrencies.</p>		
Endocrine Disruptors	AH EC	<p>Endocrine disruptors are substances which can interfere with hormonal systems. If a direct link between such substances and human health problems could be established, this would have profound consequences for liability insurance throughout the entire value chain.</p>		2012



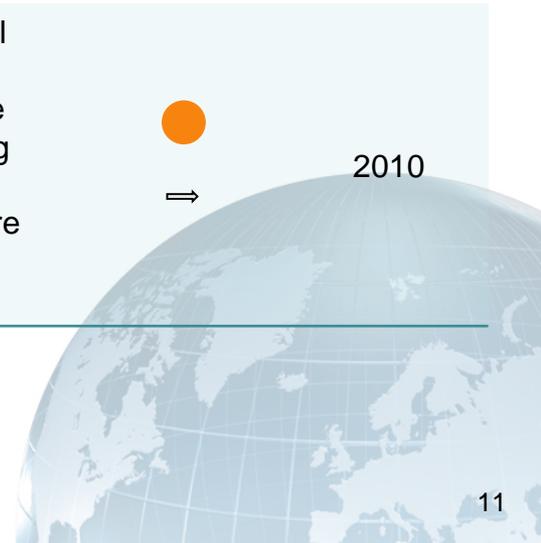
Topic	Associated Trends	Description	Assessment	ERI Publication
Environmental Pollution	 	<p>The International Agency for Research on Cancer (IARC), classified outdoor air pollution as carcinogenic to humans. Water Pollution is an endemic and growing issue. Noise pollution, soil pollution and light pollution are damaging the environment at an alarming rate. Plastic litter and debris of all kinds is conspicuous on shorelines and elsewhere, and micro-plastic ‘smog’ is spreading in the oceans and polar ice. All having implications for human health and liability claims with potential to accelerate global warming and disrupt the food chain.</p>	 	2009
Evolving Terrorism	 	<p>The risk of terrorism has been evolving for the last two decades, making it difficult and subjective to assess. Its inventive and adaptive nature undermines probabilistic modelling inferred from the past. Therefore assessing the plausibility of a specific type of terrorist attack in the future largely relies on expert judgment. Potential threats are NBCR terrorist attacks (Nuclear, Biological, Chemical Radiological) and other non-conventional terrorist attacks on computer systems and industrial installations (Cyber terrorism, Electro-Magnetic Pulse (EMP)).</p>	 	2007
Extreme Weather		<p>Extreme weather refers to phenomena that are at the extremes of the historical distribution and rare for a particular place and/or time, making their behaviour difficult to assess. The effects and mechanisms are hard to isolate and fully describe. This presents challenges for measurement and modelling. However, the incidence and intensity of extreme weather is growing. Climate change is predicted to trigger more frequent severe events, especially floods and heatwaves. The increasing cost of claims is compounded by higher value insured properties concentrated in vulnerable locations (e.g. on the coasts).</p>		

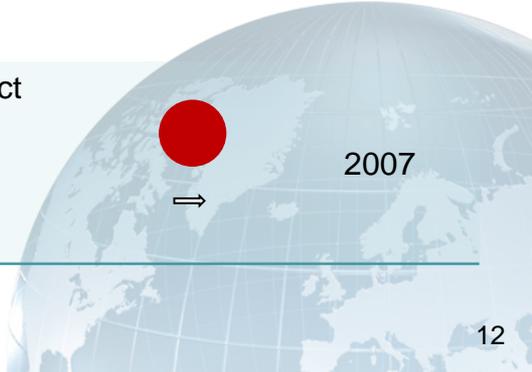
Topic	Associated Trends	Description	Assessment	ERI Publication
Food Risks	<div data-bbox="353 382 426 439">AH</div> <div data-bbox="353 454 426 511">GL</div> <div data-bbox="353 525 426 582">EI</div>	<p>There is a general increase in food safety notices and product recalls worldwide due to tightened regulation and greater supply chain globalisation. Cases such as the melanin scandal in China have shown how local criminal acts can have repercussions around the world. There also exists risks associated with food insecurity (i.e. risk of conflict, health effects of malnutrition).</p>		2013
Genetically Modified Organisms (GMOs)	<div data-bbox="353 668 426 725">AH</div> <div data-bbox="353 739 426 796">EC</div>	<p>Genetically modified organisms are organisms whose genetic material has been altered using genetic engineering techniques. Concerns have been raised over possible ecological or health impacts, ethical issues and control of technologies. On the other hand they may also be a vital tool for resilience in a warming world.</p>		
Genetic Testing	<div data-bbox="353 991 426 1048">AH</div> <div data-bbox="353 1062 426 1119">TD</div>	<p>Genetic testing is the analysis of chromosomes (DNA), proteins, and certain metabolites. Direct-to-consumer or Personal Genomic Testing is not diagnostic, but provides predictive risk information on disorders with a genetic basis, such as certain types of cancer. This can bring information asymmetry between insurer and applicant, with impacts on pricing and claims. Current genetic tests do not satisfy accuracy and reliability criteria, but improvements in data processing algorithms and AI are expected to change this in the near future. The legal landscape around the use of genetic data is fragmented and in constant evolution.</p>		

Topic	Associated Trends	Description	Assessment	ERI Publication
Geopolitical Conflict <i>(new risk)</i>	<div data-bbox="340 362 413 415">GL</div> <div data-bbox="340 434 413 486">EI</div>	<p>Heightened tensions between countries, resulting from shifts in the international order and the rise of a multi-polar world, have substantially increased the risk of inter-state conflict. Potential hotspots include the Korean Peninsula, the South China Sea, and the Middle-East, where the regional rivalry between Saudi Arabia and Iran is playing a key role in current conflicts include Iraq, Syria and Yemen.</p>		
Legal & Regulatory Uncertainty	<div data-bbox="340 648 413 701">GL</div>	<p>Current regulatory trends have prompted leading companies to re-examine the effectiveness of their governance and oversight. The continued adoption of new or proposed regulations or accounting changes (e.g. IFRS17) can lead to compliance challenges and to increasing regulatory complexity. Furthermore, 'non-regulation' has also been identified as a risk in some areas.</p>		
Longevity	<div data-bbox="340 876 413 929">UC</div> <div data-bbox="340 948 413 986">AH</div>	<p>Medical advances and reduced smoking have increased life expectancy, but were underestimated for decades, posing substantial problems in retirement financing, long-term care and healthcare in old age throughout much of the world. Other more recent lifestyle changes, especially obesity, appear to be introducing additional and opposing effects adding to challenges in predicting the long-term outlook for longevity.</p>		

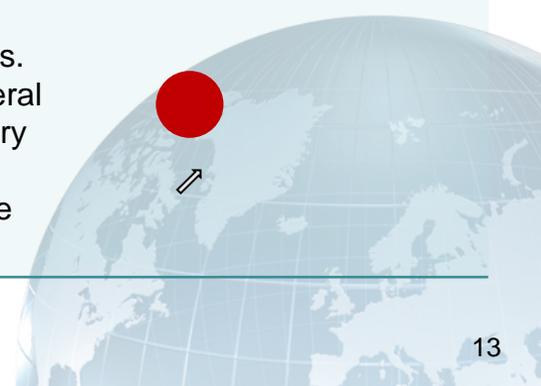


Topic	Associated Trends	Description	Assessment	ERI Publication
Mass Migration	<ul style="list-style-type: none"> GL EI UC 	<p>Numerous conflicts as well as economic pressure have resulted in large-scale disruptive cross-border migrations. The arrival of large numbers of migrants translates into increased pressure on welfare systems and infrastructure. This may result in socio-economic and political consequences which are not yet fully recognised or understood.</p>	 	
Monetary Policies	<ul style="list-style-type: none"> GL EI 	<p>Expansive monetary policy may generate inflation, which will increase insurance claims beyond the expectations of the original policy. On the other hand, decisions that favour the shrinkage of sovereign balance sheets might cause deflation, or accelerated increase in interest rates, which would result in market liquidity drought, potential insolvency of banks, and ultimately have negative impact on financial markets and contraction of insurance business. Concern over growing asset bubbles continue to be voiced.</p>	 	
Nanotechnology	<ul style="list-style-type: none"> TD 	<p>The manipulation of matter on an atomic and molecular level raises concerns about nanomaterial toxicity as inherent risk exposures are relatively unknown throughout the product life cycle. Similar to the asbestos case, there is potential for long latent large losses across various industries. However, nanotechnology-related advances in medicine and healthcare could have an overall positive impact on mortality and morbidity.</p>	 	2010

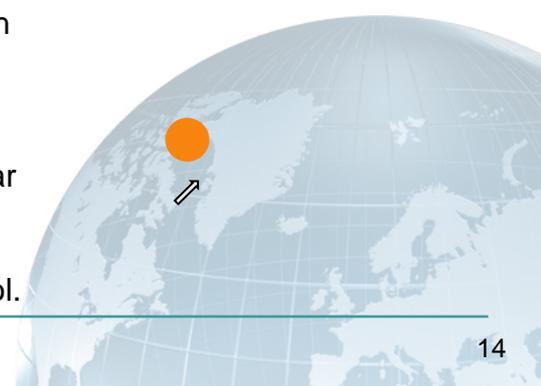


Topic	Associated Trends	Description	Assessment	ERI Publication
New Frontiers for Resource Extraction	<div style="display: flex; flex-direction: column; gap: 5px;"> <div style="background-color: #00728f; color: white; padding: 2px 5px; border-radius: 3px;">TD</div> <div style="background-color: #00728f; color: white; padding: 2px 5px; border-radius: 3px;">EC</div> </div>	<p>Increased demand for natural resources is leading to exploration in previously unexplored areas, resulting in potential ecological disasters and the destruction of natural habitats (e.g. drilling in the Arctic). Complex technologies applied in extreme situations lead to increased risks. For instance, development and production of unconventional oil and natural gas resources, including fracking, oil sands or undersea methane hydrates, require processes and technologies that differ considerably from those used for conventional resources. As these techniques expand, concerns about environmental impacts and sustainability increase too, displayed through e.g. increased activist criticism and media coverage.</p>		
Obesity	<div style="background-color: #00728f; color: white; padding: 2px 5px; border-radius: 3px;">AH</div>	<p>The increasing prevalence of obesity has a direct impact on life-expectancy as well as on healthcare costs, with the latter also subject to potential future changes in legislation regarding reimbursement. Liability might be affected where e.g. sedentary jobs or specific products consumed (e.g. sugars) can be directly linked to weight gain. Medical progress with the aim of reducing future obesity presents an opportunity especially for life insurers.</p>		
Pandemics	<div style="display: flex; flex-direction: column; gap: 5px;"> <div style="background-color: #00728f; color: white; padding: 2px 5px; border-radius: 3px;">UC</div> <div style="background-color: #00728f; color: white; padding: 2px 5px; border-radius: 3px;">AH</div> </div>	<p>Pandemics represent a material risk that has the potential to affect all life insurance markets around the world. Ongoing medical developments along with changes in the way that individuals and authorities respond to a pandemic threat make it difficult for life insurers to predict the scale and nature of the next pandemic.</p>		

Topic	Associated Trends	Description	Assessment	ERI Publication
Permafrost Thawing	EC	<p>Permafrost is subject to thawing and increased human activities, e.g. from mining. Permafrost thawing will release massive quantities of methane, a potent greenhouse gas. Permafrost thawing might also release microbes, some of them potentially harmful for humans. Two kind of microbes have already been released during the summer 2016 (i) Ancient microbes that lived originally as far back as 50.000 years ago, and (ii) recent such as anthrax and smallpox from previously frozen grave-sites. This risk may accelerate with climate change and compound warming effects.</p>		
Political Instability	GL EI	<p>Political instability and violent social unrest can appear suddenly and may spread rapidly if underlying structural causes are present. These include high food and energy prices, water scarcity, high unemployment, income inequality and poor public services. This is likely to impact insurance losses under property schemes (incl. BI/CBI), particularly in areas of high value concentration.</p>		
Protectionism	GL	<p>With a general shift of global economic power from the West to the East in a multi-polar world, the new context and ambitions are increasing the complexity and instability of global power balances. Failure of global governance, and increasing bilateral or multilateral dispute between states increase the risk of trade wars and military conflict, compounded by nuclear proliferation and new military technology (e.g. autonomous weapons). This may destabilise the world economy and particularly financial markets.</p>		



Topic	Associated Trends	Description	Assessment	ERI Publication
Resource Scarcity	<div data-bbox="330 382 407 432">GL</div> <div data-bbox="330 451 407 501">EC</div>	<p>As the world economy continues to grow – to a large extent driven by the rapid industrialization and growth of developing nations – and world population increases, so does the demand for natural resources putting increasing pressure on limited resources.</p> <p>Growing scarcity may lead to conflicts in the future. Furthermore, activities aimed at the extraction of resources result in greater environmental impact.</p>	 	
Sharing Economy	<div data-bbox="330 694 407 743">CB</div>	<p>The sharing economy is an economic system in which assets or services are shared between private individuals, either for free or for a fee, typically on the Internet. From UberPOP to AirBnb, customers are taking charge, and business models are shifting from B2B/B2C to C2B. New challenges arise from this shift away from classic to new business models in insurance services (e.g. peer-to-peer insurance).</p>	 	
Shifting Range of Pathogens	<div data-bbox="330 915 407 965">AH</div>	<p>Due to the impacts of climate change, trade and an ever greater density of global travel networks, many pathogens are expanding and/or shifting their range, with potential implications on human health and agricultural production.</p>	 	
Substance Abuse <i>(new risk)</i>	<div data-bbox="330 1165 407 1215">AH</div>	<p>Currently the United States face a substantial “Opioid Crisis” with more than 2 million Americans suffering from an addiction to prescription opioids or heroin. Drug overdoses are the leading cause of death of Americans under 50. The numbers of death cases from drug overdoses are increasing year after year. Similar substance abuse crises may develop in other countries as well. Other substances at risk for abuse followed by severe health damage and even death are e. g. psychotropic drugs and alcohol.</p>		



Topic	Associated Trends	Description	Assessment	ERI Publication
Supply Chain	<ul style="list-style-type: none"> EI CB 	Hyper-optimisation of supply chains due to improvements in technology and global logistics may increase vulnerabilities to disruption and concentrations of risk. Further risks arise from increased complexity resulting from the rise in interconnectivity. This may result in higher than expected accumulation and correlation of insured losses.	 	
Synthetic Biology	<ul style="list-style-type: none"> TD AH 	Synthetic biology refers to the design and construction of biological devices and systems. It relies on key enabling technologies such as DNA sequencing and measuring gene expression. It could have far-reaching consequences for medicine and human health.	 	
Transition Risk and Stranded Assets <i>(new risk)</i>	<ul style="list-style-type: none"> EI EC UC 	A consequence of major risks, such as climate change, there is the risk of transition and stranded assets. Transition risks arise as the world aims to adapt to the warming climate and reduce the emission of green house gases (especially CO ₂). This has implications for insurers in the product design and associated liabilities, plus the way they invest. One particular transition risk is the occurrence of stranded assets. These are assets that become obsolete due to policy changes (e.g. coal sector, diesel vehicles) or due to carbon pricing (e.g. surplus aircraft). They may not be climate-resilient and become uneconomic, risky or impaired by physical changes, or due to emerging liabilities e.g. for oil companies.	 	
Water Risks	<ul style="list-style-type: none"> GL UC AH EC 	Increasing global population and poor planning and management of infrastructure and resources undermine water. Associated risks include water scarcity, pollution, health, water treatment issues, decreased economic growth, a rise in social and political instability and conflicts, and reputation risks.	 	2016

Previously deleted entries since 2011 *(no new deletions in this edition)*

- EMF : Electromagnetic Fields
- Asbestos / Silica
- MTBE - Methyl Tert-Butyl Ether
- Welding rods
- Toxic Moulds / Implants
- Alcohol
- Occupational Diseases
- Blockchain – merged with Digital Currencies
- Personal Damage Compensation



Emerging Risks Initiative Position papers published by the CRO Forum

Topic	Year	Chairing Company
Autonomous Machines	2017	SCOR
Water Risks	2016	SCOR
The Smart factory	2015	Prudential
Pushing the Limits, Human Rights & Corporate Insurance	2014	Swiss Re
Food, Risk Appetite, Diversification, ESG	2013	Lloyd's
Endocrine Disruptors	2012	Hannover Re
Power Blackouts	2011	Allianz
Nanotechnology, Longevity, Carbon Nano Tubes	2010	Zurich
Environmental Liabilities, Work Related Stress	2009	RSA
Critical Information Infrastructure	2008	AXA
Terrorism, Influenza Pandemics	2007	Munich Re
Climate Change and Tropical Cyclones	2006	Swiss Re

CROF ERI Position Papers 2005-2017

