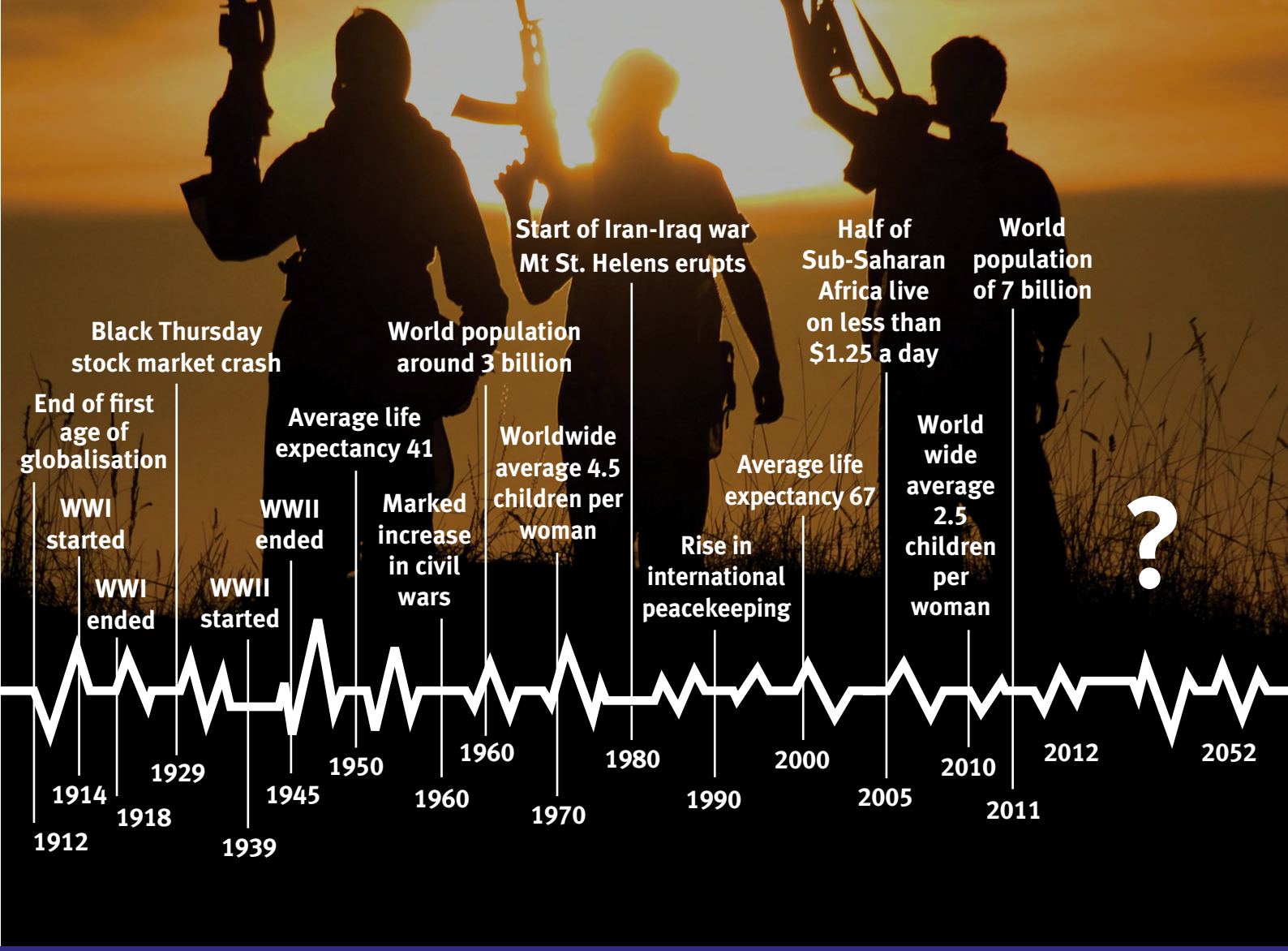


Future risk

Learning from history

Centenary Future Risk Series: Report 1

1912–2012
A CENTURY OF PROFESSIONALISM

CII

contents

Contents

Foreword

This year the Chartered Insurance Institute celebrates its centenary year as a Chartered professional body. What better way to mark this achievement than by looking to the future through a series of seven reports, each of which explores some of the risks and opportunities that might face us in the decades to come, drawing on the assessment of commentators across various fields of expertise.

Whilst 'future gazing' doesn't always lead to accurate predictions, it is an important exercise for the insurance industry to undertake as understanding and assessing potential risks is at the heart of what we do. Indeed, central to the role of insurance is the ability to make informed, professional judgments about the relative risks of various hazards occurring over a particular period of time. By planning for the long-term and challenging assumptions about what the future might look like, the insurance profession will be well placed to provide expertise and insight on the risks that lie ahead.

This publication is the first in a year-long series of reports about future risks. It sets the scene for the series by reflecting on some dynamic trends of the past and their potential implications, as well as discussing some initial findings from a global survey into the risk perceptions of members of the public and how they differ from country to country.

Julian James
President of the Chartered Insurance Institute

1. Introduction

> *The future is not an inheritance, it is an opportunity and an obligation.*
>
> President Bill Clinton

> *It is possible to believe that all the human mind has ever accomplished is but the dream before the awakening.*
>
> H. G. Wells

There have been many profound events over the last hundred years. In 1912, the Titanic left Southampton for her one and only voyage, Harriet Quimby became the first woman to fly across the Channel, the Bolsheviks grew to prominence in Russia and the first Balkan War began. Since then there have been two world wars, revolutions in Russia and Eastern Europe, a cold war, the birth of the European Union, the end of the British Empire, further conflicts in the Balkans, an Asian financial crisis, the collapse of the World Trade Centre and the 'Great Recession'...the list of defining moments is truly endless.

Against this background, the granting of our Royal Charter on the 5th of February 1912 seems relatively insignificant. Yet the study and application of insurance and financial services can help make sense of the world in which we live – indeed the history of the CII is entwined with many of the defining events themselves. In 1940 for example, after the fall of France, thousands of correspondence course books were sent to prisoners of war so that they could continue their studies. Remarkably, on three separate occasions CII examinations were actually held in prisoner of war camps.

A century on, and the world faces a fresh set of global challenges. The financial crisis and subsequent Eurozone sovereign debt problems, as well as the recent political paralysis in the US, suggest we are on the verge of a seismic change in the nature of the global economy and international relations. Similarly, continuing increases in population size and life expectancy, and changes in patterns of migration throw up their own vast array of political headaches and economic trade-offs which need careful management and strong collaborative leadership. And then there is climate change, and the increasing threat of catastrophic weather events that come with global warming. Each presents their own array of opportunities and threats – some of which are familiar and some of which are not.

Crucially, the insurance and financial services industry must be one step ahead in order to provide comprehensive insight into the changing nature of these challenges, and to recommend credible courses of action in the face of them. With this in mind and to coincide with our centenary year, over the course of 2012 we are publishing a series of reports which reflect on the great challenges of the past and explore what the future might hold. Most importantly of all, the CII's publications will, through a multidisciplinary approach, seek to highlight some of the actions and choices we must all confront if we are to increase our chances of securing a world of greater security, health and prosperity in the decades to come.

About this report

This report is the first in a series of seven which marks the CII's centenary year as a Chartered professional body. It sets the scene by focusing on the past and present – the building blocks for any predictions about the future. It begins by discussing some of the key trends over the last century and the important lessons that can be learned from a careful historical analysis. It then reveals some preliminary findings from a global opinion poll into current perceptions of future risks before posing the question: are public perceptions appropriate, or are many worried about the wrong things? The historical analysis and survey results prompt us to start thinking about some possible futures for further investigation – the subject of our forthcoming reports.

2. Approaches and Methods

> *People can foresee the future only when it coincides with their own wishes, and the most grossly obvious facts can be ignored when they are unwelcome.*
>
> George Orwell

> *The future is called "perhaps," which is the only possible thing to call the future. And the only important thing is not to allow that to scare you.*
>
> Tennessee Williams

Seeking to understand what the world might look like at some future point in time is a difficult task. The numerous 'revisions' to various economic growth forecasts over the last twelve months illustrate this point only too well.[1] Trying to envisage the world in 2040 or 2050 is even harder – with the margin of error far greater. Over such a long time horizon, many unforeseen events can occur to fundamentally change the course of our lives. Twenty years ago, for example, few could have reasonably predicted that the financial and economic turmoil now facing us would have been triggered by defaults on 'subprime' mortgages in the US back in 2007.

How can we reasonably hope to prepare for the future?

Scenario planning

Scenario planning is a technique used for long-term strategic analysis and planning. Scenarios are set out in narrative form to describe how the future might look given certain assumptions around future trends and events. Scenario planning does not therefore try to accurately predict the future, but identify a limited set of examples of possible futures to provide a valuable point of reference when formulating long-term policies and strategies. Scenario planning is also a useful means of identifying 'early warning' indicators that signal a shift towards a certain kind of future – whether good or bad.[2]

Given the difficulty in trying to predict what the world will look like at some distant point in time, scenario planning appears a useful tool of analysis – challenging our basic assumptions of what the future might look like and correspondingly prompting us to develop a number of possible policy responses. Therefore scenario planning, broadly defined in terms of building compelling narratives, discussions and dialogues on the future, is the method most closely followed throughout our series of centenary publications.

1 See for example, BBC News (2011) ***Robert Chote defends OBR economic growth forecasts*** http://www.bbc.co.uk/news/mobile/uk-politics-16048137 (accessed January 2012)

2 Paraphrased from Government Office for Science (2009), ***Scenario planning: guidance note*** http://www.bis.gov.uk/assets/bispartners/foresight/docs/horizon-scanning-centre/foresight_scenario_planning.pdf (accessed January 2012)

How can we start to build some scenarios of what the future might look like?

Importance of past trends

Before constructing possible future scenarios, it is necessary to identify some of the key trends of the past – the focus of this special report. This will help us pick out some important potential drivers of change around which we can start to build some future narratives. Similar to the OECD's report[3] on the future of risk published in 2003, our discussion begins by focusing on past trends associated with four interrelated areas: **demographics, socioeconomics, technology and the environment**.

Inevitably, given the limited scope of this report, the analysis excludes many significant trends and events from the past century. We have also been limited in our analysis by the lack of extensive reliable data on some of the topics concerned. Hopefully however, our analysis provides at least a small flavour of some of the most dynamic and relevant trends of the last hundred years.

Current perceptions of emerging risks

Recent historical experience can shape how people view the risks around them. Those risk perceptions are important because they can influence how governments, societies and industries respond to the challenges they face. In this context, the second part of this report discusses some preliminary findings from an international survey undertaken for the CII by Ipsos Mori which sought to identify the future risks that people around the world are currently most worried about, as well as assessing respondents' general level of optimism regarding the future.

Next steps

The analysis of past trends and the preliminary opinion poll findings that follow, enable us to start thinking about some possible futures for further investigation – the subject of our forthcoming reports.

3 OECD (2003), ***Emerging systemic risks in the 21st century***

3. Stylised historical trends

> *Whoever wishes to foresee the future must consult the past; for human events ever resemble those of preceding times.*
>
> Niccolò Machiavelli

> *In history, a great volume is unrolled for our instruction, drawing the materials of future wisdom from the past errors and infirmities of mankind.*
>
> Edmund Burke

History is the social scientist's petri dish – the only place where hypotheses about human behaviour can be tested against actual trends and events. The problem is that history is a very inadequate petri dish; whereas the physical sciences can recreate the same conditions for an experiment a hundred times, there is no way to rerun the Great Depression or the Cold War to see what happens if we were to change various underlying assumptions. Robust conclusions about the past are therefore hard to come by, though a careful historical analysis can still provide clues as to why certain social phenomena have occurred at particular moments in time.

In the context of this argument, the following section discusses some of the most dynamic trends of the last hundred years. As well as describing the trends and setting out the relevant data sources, the discussion will also tentatively explore some of the potential implications for future risks and opportunities. This does not include actual scenario building, but it does outline some potential areas for further investigation.

The following section is arranged thematically – though there are inevitably some overlaps in issues discussed:

1. Socioeconomics
    a. Global economy
    b. Conflict and politics
2. Demographics
    a. Population
    b. Urbanisation
3. Environment and energy
    a. Global warming
    b. International energy
4. Technology
    a. Brief overview
    b. International travel
    c. Information and communications technology

Socioeconomics

The global economy

- *Increasing rates of growth and economic integration may be familiar but they are by no means the only important economic narratives from recent history*
- *Prosperity has often ebbed and flowed, permeated by some of the great political and social events of our time*
- *There have also been substantial regional variations whereby some people have experienced dramatic rises in living standards whilst others have struggled to live day to day*
- *These competing narratives are important as they help us reflect on the potential fragility of economic globalisation as well as the substantial development challenges that lie ahead.*

A century ago the world was in the last throes of the so called 'first age of globalisation'.[4] This was characterised by unprecedented increases in trade, capital flows and migration rates. The OECD notes, for example, that from the 1870s onwards British foreign assets were equivalent to one and a half times its GDP. French, German and Dutch investment abroad was also substantial.[5]

Associated with increased economic integration, world GDP per capita grew at an average annual rate of 1.3% from 1870–1913 by comparison to 0.5% in the previous fifty years (See figure 3).

> *"Stocks have reached what looks like a permanently high plateau."*
>
> Irving Fisher, Professor of Economics, Yale University, 1929.

Then however, following World War I (WWI), major economic powers began enforcing protectionist economic policies, driven and compounded by the rise of certain anti-integrationist political ideas such as nationalism and communism.[6] During the interwar period, levels of trade fell substantially, as did the movement of people and capital (see figure 2). From 1913–1950 world GDP per capita is estimated to have slowed to 0.9% per annum as growth rates fell substantially across Europe, Japan and the rest of Asia (see figure 3).

Following WWII, the global economy rebounded, with worldwide growth of around 3% per annum from 1950–1973 – though there were some significant regional differences. Japan for example, grew by a massive 8% a year while Western Europe grew by 4%. Africa suffered from the lowest regional growth rates – estimated at around 2% per annum (see figure 3).

4 Niall Ferguson (2005), ***Sinking Globalization*** Foreign Affairs http://www.people.fas.harvard.edu/~nfergus/publications/Sinking%20Globalization%20Foreign%20Affairs.pdf (accessed January 2012)

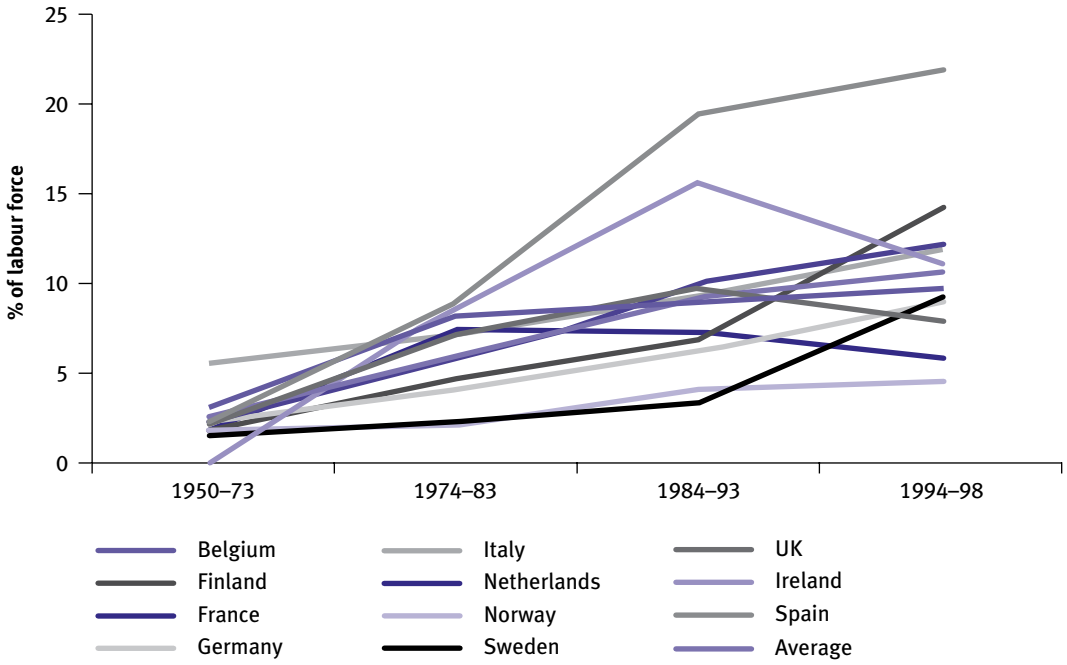
5 OECD (2006), ***The World Economy: A Millennial Perspective***, p.102

6 Martin Wolf (2005), ***Will Globalization Survive?*** Third Whitman Lecture, Institute for International Economics http://www.iie.com/publications/papers/wolf0405.pdf (accessed January 2012)

This immediate post war period was, like that of 1870–1913, characterised by increased trade and capital flows though migration was far less extensive than it had been in the earlier period (see figure 2). In trying to explain increased integration, experts often highlight US investment in postwar Europe, the establishment of a fixed exchange rate system and the role played by international institutions in reinforcing liberal economic principles.[7]

The strong regional growth rates did not last however. From 1973–2001 Japan's growth rate slowed to 2% per annum whilst Western European growth dropped to 1.8%. The former USSR actually experienced negative growth whilst Africa flatlined (see figure 3). During this period, levels of unemployment across developed economies dramatically increased as did rates of inflation (see figure 1 below).

Figure 1. Level of unemployment as % of labour force (1950–1998)



Source: OECD (2006), p.124

Despite mixed economic performance between 1973–2000, the global economy actually became more integrated. Trade flows, for example, as a proportion of GDP continued rising, as did links between financial systems. Indeed, the perceived credibility of the capitalist economic model and, to a certain extent, the associated principle of free trade remained relatively intact for many in the West and East Asia up until the end of the 1980s. Its credibility was then substantially boosted by the fall of the Soviet Union in 1991 and with it, the notion that a command economy was a viable method for ensuring long-term growth and prosperity.

It was at this point that political economist Francis Fukuyama (famously but perhaps prematurely) declared the 'end of history' – capitalism and democracy, he argued, had been proven to be the only successful ways to run an economy and government[8].

Two decades on and the world remains more open to trade and foreign capital than ever before. China and India have dramatically benefitted, growing at equivalent rates to Japan in the 1960s. Through such economic development, great gains in living standards have also been achieved. It is estimated, for example, that the proportion of the East Asian population living on less than a dollar a day fell from 56% in 1981 to 16% in 2001.[9]

7 See Martin Wolf (2005), pp.2-3 and OECD (2006), p.24

8 Francis Fukuyama, (1992) ***The end of history and the last ma***n

9 Martin Wolf (2005) p.4

Despite such gains, significant questions remain regarding the current global economic system's stability and fairness:

- The recent financial crisis as well as the Asian crisis of the mid to late 1990s, demonstrated that greater interconnections and similarities between economies can increase the possibility of dangerous contagion: what may start as a problem in a single domestic market can quickly spread to neighbouring economies and beyond.
- The recent crisis also highlighted the possibility that the risks associated with a deeply integrated and complicated global economic system may be impossible to adequately understand or manage.
- In the wake of the financial crisis the sustainability of Western economies has come into question as debt (both private and public) as a proportion of GDP has risen substantially across many European and North American countries.
- In sharp contrast to the West's indebtedness and persistent current account deficits, a number of middle income developing countries like China continue to run large current account surpluses (see figure 4). As a result of these contrasting trends, many experts agree that the global economy has been and remains dangerously unbalanced, with a consumer driven indebted West on the one hand, and an overly export driven high savings East on the other.
- **Whilst for some developing nations, increased integration has brought about huge improvements in living standards, others remain in abject poverty. According to World Bank data, in 2005, half of Sub-Saharan Africa and 40% of South Asia lived on less than $1.25 per day.**[10]

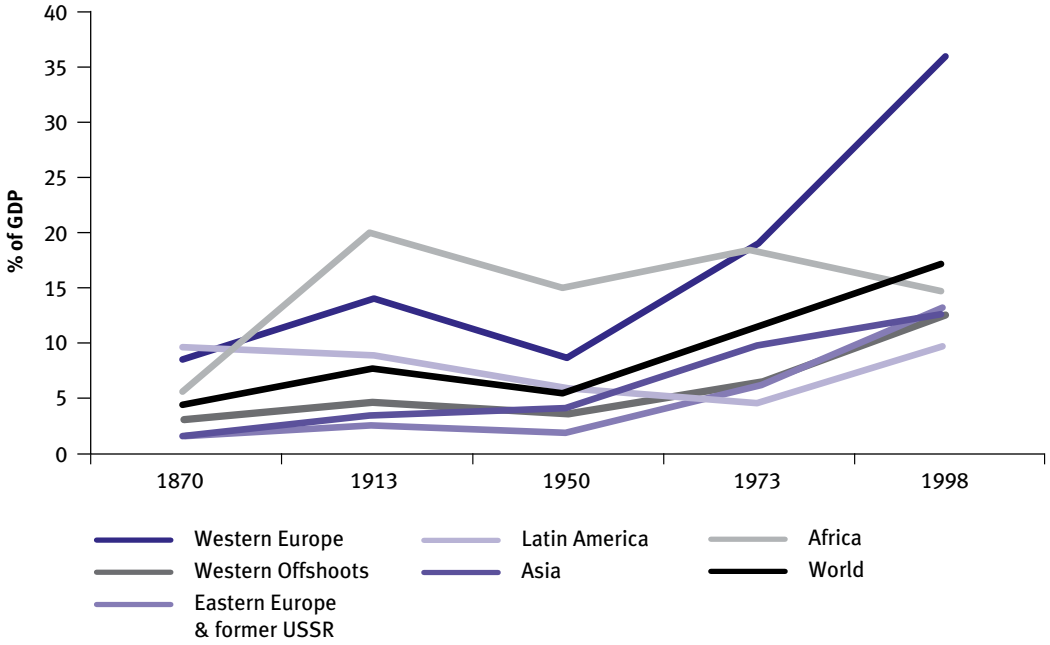
Implications

So what can be learned from these past economic trends and what are some of their potential implications for future risk?

- **Economic integration can be reversed as well as increased.** 'Beggar thy neighbour' economic policies are generally thought to be a relic of the pre-WWII era but the risk is that they could return at times of significant economic and political stress.
- **Greater integration does not necessarily mean increased growth and prosperity.** Indeed, one of the key risks associated with high levels of integration is that it actually increases the chances and severity of financial crises which could in turn reduce long-term growth prospects.
- **The rise of the East appears to be coinciding with the decline of the West.** In this new period, many believe the West risks suffering from a Japan-style stagflation characterised by low growth and high unemployment. Alternatively, there is a risk that China's rapidly growing economy might overheat and experience its own financial or economic crisis.
- **Parts of Africa and South Asia have remained in extreme poverty for decades.** A key risk is that levels of poverty and living standards in these regions will remain high or will actually deteriorate – especially at a time when the 'developed' world is more concerned with solving its own economic problems.
- **Political ideas can stifle as well as stimulate economic growth.** The rise of new political ideas and the decline of more traditional ones could potentially transform the nature of economic activity in the decades to come.

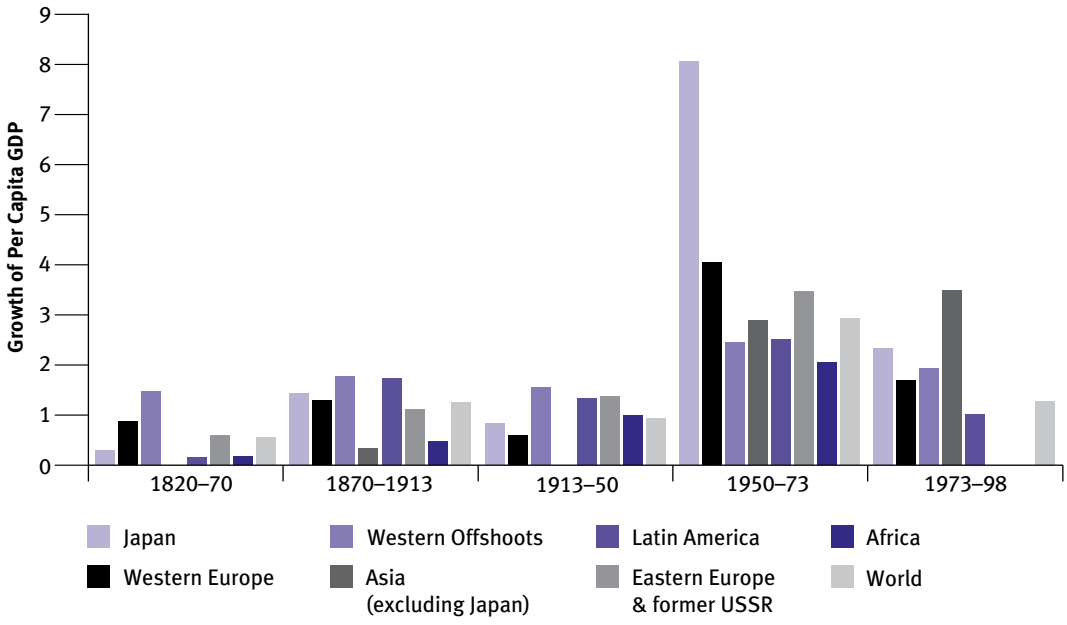
10 The World Bank ***Poverty*** data source: http://data.worldbank.org/topic/poverty?display=default (accessed January 2012)

Figure 2. Merchandise exports as % of GDP (worldwide and by region)



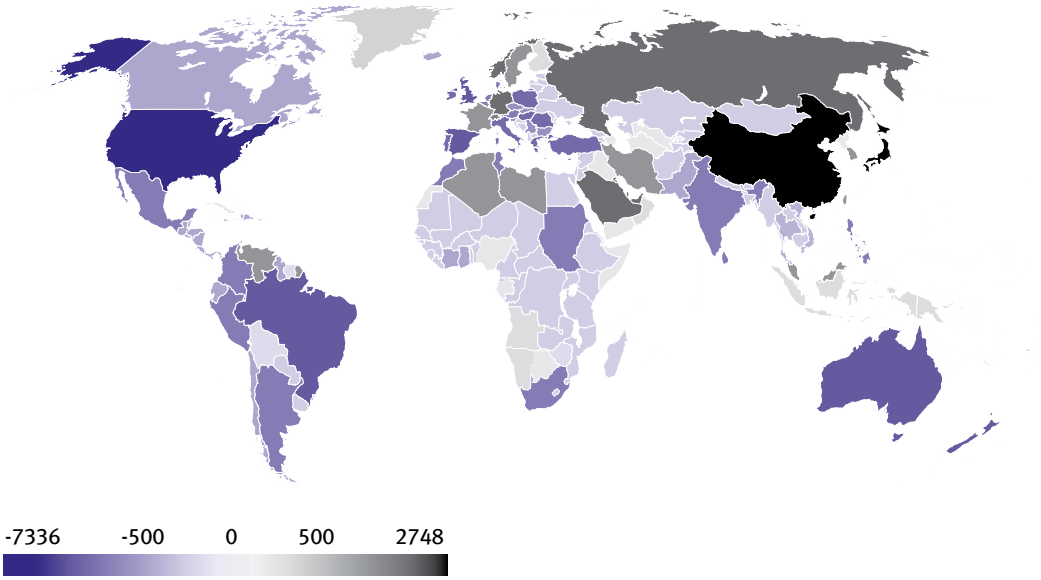
Source: OECD (2006)

Figure 3. Growth of Per Capita GDP – major world regions 1820–1998



Source: OECD (2006) p.127

Figure 4. Map of global current account balances (2009)



Source: IMF ***World Economic Outlook Database*** 2009.

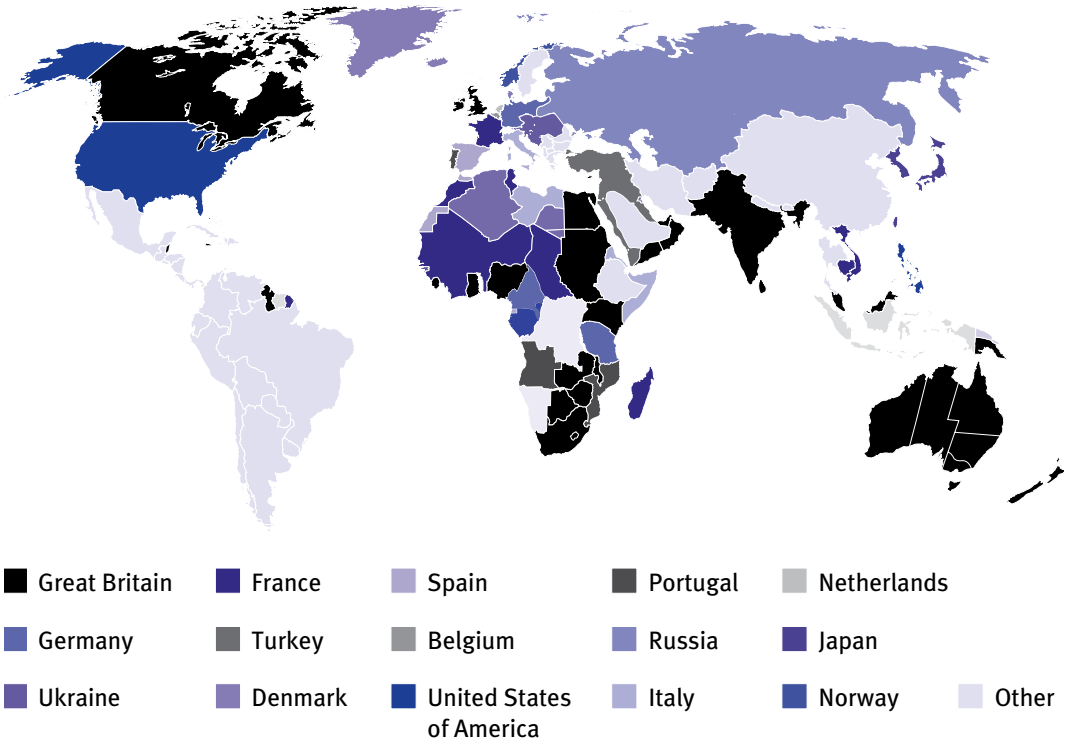
Graphical representation available from: http://en.wikipedia.org/wiki/File:Cumulative_Current_Account_Balance.png

Conflict and politics

- *The last hundred years has seen significant shifts in the nature of conflict, peace and systems of government.*
- *The 20th century began with the onset of war and authoritarian rule. Today, war between Western powers is almost unthinkable whilst the number of democratically elected governments has substantially increased.*
- *Civil war and acts of terrorism are now perceived as key political risks worldwide – with their incidence vastly outweighing acts of war between states.*

In the early years of the twentieth century, the world was dominated by non-elected governments with many people still ruled by their colonial masters. The map below shows the extent to which European empires were prevalent across the globe in 1914, with most of Africa, a significant proportion of Asia and some of Australasia under colonial rule. Democratic government in the sense of free, fair and open elections had arguably only been established in a small minority of countries – and even in these, a substantial proportion of the population were unable to vote.

Figure 5. Colonial map of the world: 1914 (approximation)

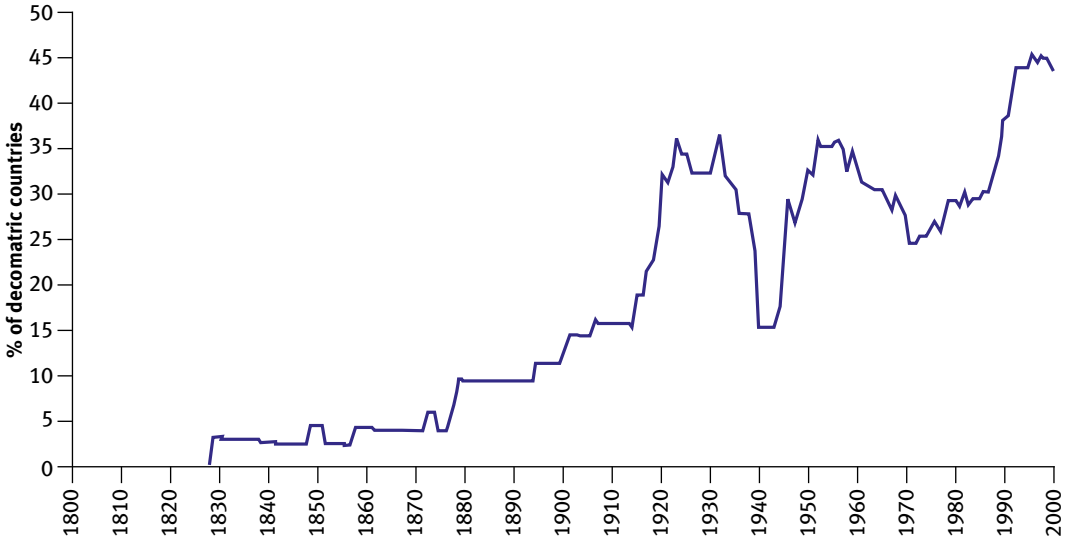


Source: Wikipedia: http://upload.wikimedia.org/wikipedia/commons/4/45/World_1914_empires_colonies_territory.PNG

In this early period, strong political tensions existed between competing world powers which ultimately spilled over into war in 1914. In turn, the nationalist sentiment stirred up by WWI and the failure to find a solution to Germany's economic problems in the aftermath ultimately sowed the seeds for further international conflict in 1939.

Following WWII and the subsequent collapse of empires, the nature of government for many changed. A period of democratization ensued – whereby the defeated nations of WWII as well as newly emerging states began to hold elections to determine who governed. This trend reversed slightly in the 1960s but the overall number of democratic states was still significantly greater than during the immediate pre-war period.

Figure 6. Percentage of democratic countries: 1820–2000

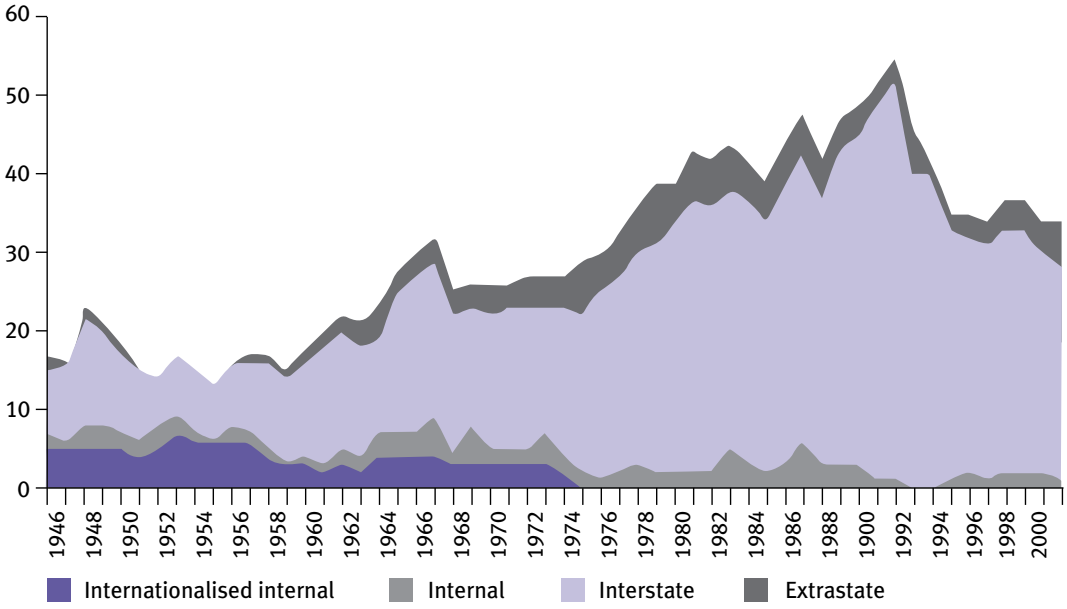


Source: Gates et al (2007) ***Democratic Waves? Global Patterns of Democratization, 1800-2000***, Paper prepared for delivery at the National Political Science Conference, 3–5 January 2007, Trondheim, Norway.

The 1960s also saw a marked increase in the number of civil wars (see figure 7 opposite). Some of this increase was, at least in part, driven by the USA and USSR engaging in so called 'proxy wars' where they would arm particular intrastate groups that supposedly opposed the other superpower's ideology. Many of these states were also in transition from one regime type to another during this period, which, it has been argued, also made them particularly susceptible to internal conflict.[11]

11 For a discussion of how regime type can influence the propensity for civil war see, Hegree et al (2001) ***Towards a democratic civil peace? Democracy, political change and civil war, 1816-1992***, Vol. 95, No.1, pp.33-48

Figure 7. Conflict by type: 1945–2000



Source: Gleditsch et al (2002) ***Armed Conflict 1946–2001: A New Dataset,*** Journal of Peace Research, Vol 39, No.5 pp.615-637

The number of civil wars continued to increase and spiked at the end of the cold war, as political and inter-ethnic tensions came to a head following the collapse of the Soviet Union and Yugoslavia. The number of civil wars then substantially fell as the twentieth century drew to a close. The decline corresponded with a substantial increase in international peacekeeping operations in the aftermath of the cold war[12], a decline in third parties arming intrastate groups, and Soviet successor countries beginning to develop state institutions.

Whilst the number of civil wars remained relatively high in the latter half of the twentieth century, instances of conflict **between countries** were rare though the prospect of war between the US and USSR was, for a short while at least, very real (particularly around the time of the Cuban Missile Crisis). In accounting for the prolonged peace between major world powers, some point to nuclear deterrence, arguing that since the costs of war are so high, no rational government would ever strike the first blow against another nuclear power. It should be noted however, that nuclear deterrence did not prevent armed conflict occurring between the nuclear states of India and Pakistan over Kashmir in the 1990s, though some suggest that the presence of nuclear weapons prevented a substantial escalation of violence.

Another possible reason for the absence of conflict between some of the world's major powers is the widespread emergence of democratic forms of government. It has been argued (and backed up by considerable empirical evidence) that democracies, broadly defined, do not fight each other. It follows that an increase in the number of democracies should improve prospects for peace.[13]

This does not, however, mean that democracies do not engage in wars against non-democratic states: so called "liberal internationalism" – that is military intervention in other sovereign states in order to pursue objectives like the prevention of human rights abuses, has been a commonly espoused justification for military action over the last decade or so.

Despite a rise in the number of democratic states in recent times, democracy is still not the predominant form of government in the world today. At the end of the twentieth century less than 50% of all countries were classified as democracies. Similarly the continuing rise of China as an economic force and the corresponding financial turmoil engulfing the West appears, on the face of it at least, to break Fukyama's rule that liberal democracy is the only effective means of governing a country.

12 For example, according to the UN "...with a new consensus and a common sense of purpose, the Security Council authorised a total of 20 new operations between 1989 and 1994, raising the number of peacekeepers from 11,000 to 75,000" http://www.un.org/en/peacekeeping/operations/surge.shtml (accessed January 2012)

13 See for example, B. Mesquita et al (Dec 1999) ***An institutional explanation of the democratic peace***, American Political Science Review vol. 93 no.4

Implications

So what can be learned from these past political trends and what are some of their potential implications for future risk?

- **Acts of civil war (including terrorism) are now the most common threat to national security:** Despite a decline towards the end of the last century, civil war and acts of terrorism remain key security risks facing many nations across the world today.
- **Incidences of conflict between states have rescinded:** Whilst this is undeniably true the reasons for it are unclear. The concept of nuclear deterrence is highly controversial, whilst the so called democratic peace is only relevant for explaining the lack of conflict between sets of democratic nations. The risk of interstate conflict, particularly between democratic and non-democratic countries, is therefore very real.
- **Fledgling democracies and regimes in transition are often fragile:** Past experience suggests that the risk of a breakdown in democratic institutions and of civil war is greatest during the initial stages of transition to a new regime.
- **Whilst more nations are choosing democratic systems of government, others are not:** Far from liberal democracy being the end of history, some governments remain unwilling to institute democratic reform. And in developed nations there is talk of a crisis of democracy, with fewer people voting and participating generally.[14] In both cases forms of domestic unrest could result.
- **International intervention can aid as well as prohibit conflict resolution:** Whilst proxy wars helped prolong many conflicts during the cold war, the rise of international peacekeeping in the 1990s has been cited as an important reason for the decline in violent conflicts towards the end of the century. A key risk then is that tomorrow's interventions take on the form of the first type rather than the second.

14 Robert D. Putnam. (1995). ***Bowling Alone: America's Declining Social Capital***. Journal of Democracy Vol. 6 No.1, pp.65–78.

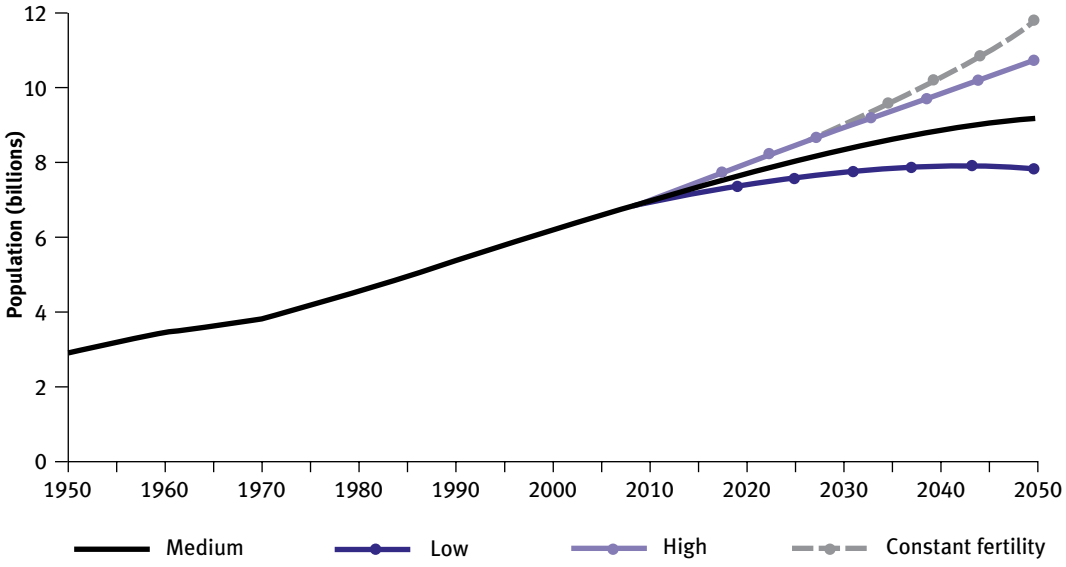
Demographics

- *Since the 1950s world population has risen by an unprecedented degree, driven by substantial improvements in life expectancy*
- *In many societies there appears to be a dramatic shift underway from young to old as rising longevity rates coincide with rapidly decreasing fertility and limited migration*
- *Mass urbanisation is also a late twentieth century phenomenon – with dynamic social change in Asia a key driving force*
- *There have however been significant regional differences with some less developed countries suffering from stagnating life expectancy and relatively high fertility rates.*

Population – 7 billion and counting

Since 1960 the world's population has more than doubled in size, from 3 billion in 1960 to 7 billion at the end of 2011. This rate of growth is exceptional – over the course of human history, the world's population has only grown very slowly if at all. However the 1950s saw accelerating longevity and with it, world population began to grow substantially, peaking at 2 per cent a year in the 1960s. By 2005-2010 population growth had slowed, primarily due to falling fertility, yet it was still growing at around 1.7% per annum.

Figure 8. Population of the world, 1950–2050, according to different projection variants



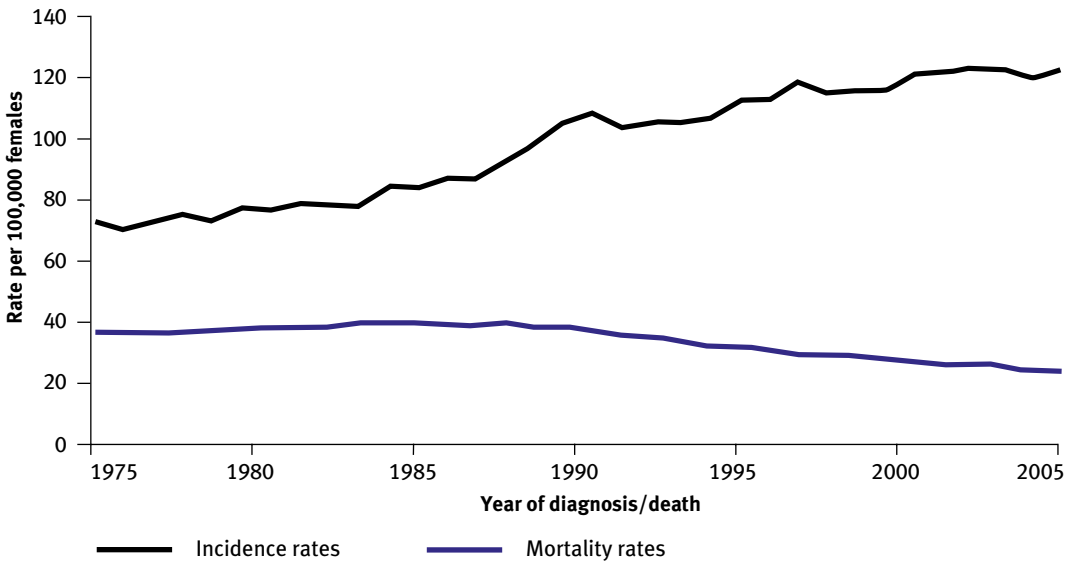
Source: UN (2006) World Population Prospects: The 2006 Revision

Population ageing and mortality

Increased life expectancy has been a substantial driver of population growth. The last hundred years has witnessed rapid increases in life expectancy from an average age of 46 in the 1950s, to 67 in the 2000s. All regions experienced increases in life expectancy during the 1950s and 60s though the increase was most pronounced in Asia and Latin America. In Asia for example, life expectancy increased from just over 40 in the 1950s to around 55 by the 1970s – a rise of nearly 40%.[15]

The continued rise in life expectancy is primarily due to substantial improvements in lifestyles and healthcare. For example, the number of people smoking in the UK has fallen from nearly 70% of the total adult population in 1948 to around 20% in 2009.[16] At the same time, diagnosis and treatment of potentially deadly conditions, such as breast cancer, have significantly improved. Average life expectancy at birth across many developed countries is now touching 80 or more.

Figure 9. Breast cancer mortality and incidence: 1975–2005

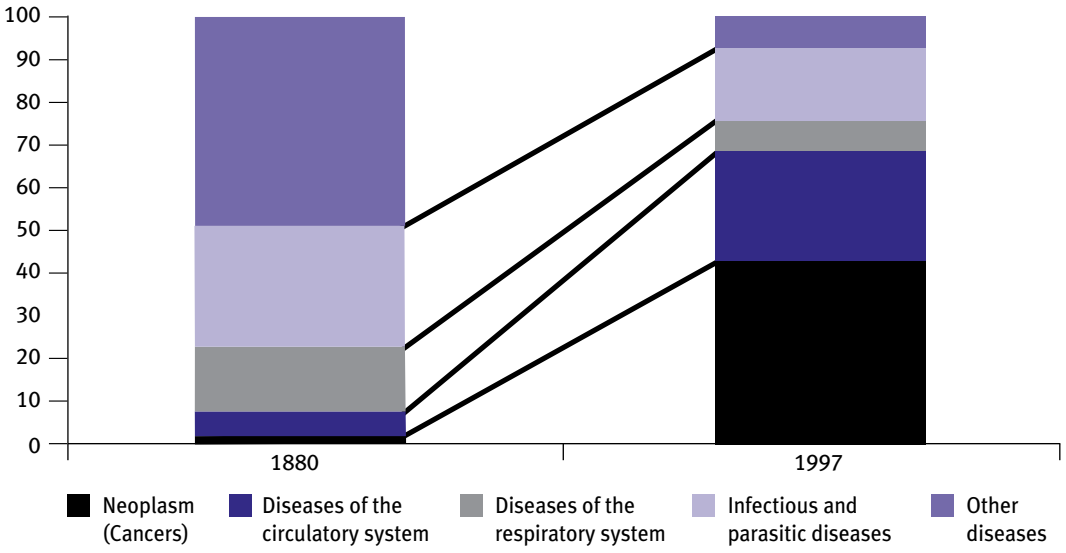


Cancer Research UK, presented as part of Swiss Re (2011) report; ***A Window into the future***.

15 UN (2006) ***World Population Prospects: The 2006 Revision***, p.19

16 Swiss Re (2011) ***A window into the future: Understanding and predicting longevity***, p.6

Figure 10. Cause of death England and Wales: 1880 and 1997



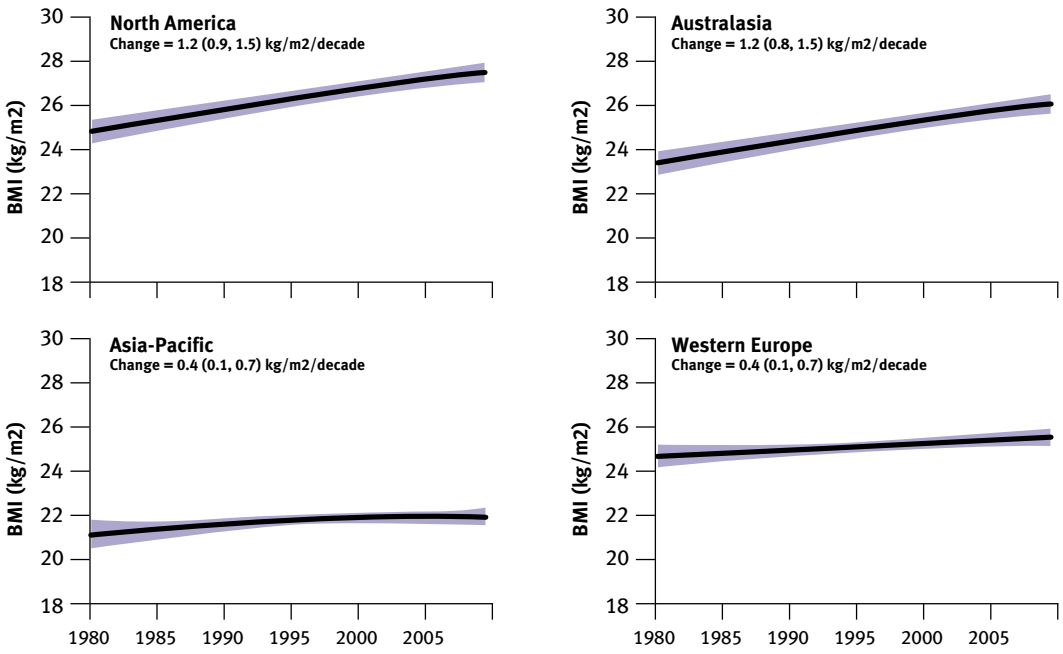
House Commons (1999) A Century of Change: ***Trends in UK statistics since 1900*** Research Paper 99/111:

Figure 10 above, shows compelling evidence of the substantial progress that has been made over the last 100 or so years on diagnosing and treating illness and disease. In 1880 nearly 50% of all deaths in England and Wales were unable to be properly defined, 30% died from infectious or parasitic diseases, and few cancers were detected. In contrast, by 1997, less than 10% of deaths were unable to be defined; only 17% died from infectious or parasitic diseases and cancer was more frequently detected.

Despite such significant improvements, new public health problems are still emerging in the developed world. The occurrence of obesity caused by overeating, poor diet and lack of exercise is one such problem. The World Health Organisation estimates that nearly 3 million people die every year as a result of being overweight or obese. In addition they find that 44% of diabetes, 23% of the ischemic heart disease and between 7% and 41% of certain cancers are attributable to obesity.[17] Worryingly levels of obesity are rising: in North America for example, average Body Mass Index (BMI) for a woman has increased from just over 24 to around 28 in the past thirty years.

17 World Health Organistion (2011), ***Obesity and overweight***, Fact sheet No. 311 http://www.who.int/mediacentre/factsheets/fs311/en/index.html (accessed January 2012)

Figure 11. Body Mass Index (BMI) trends in high income countries: 1980–2005

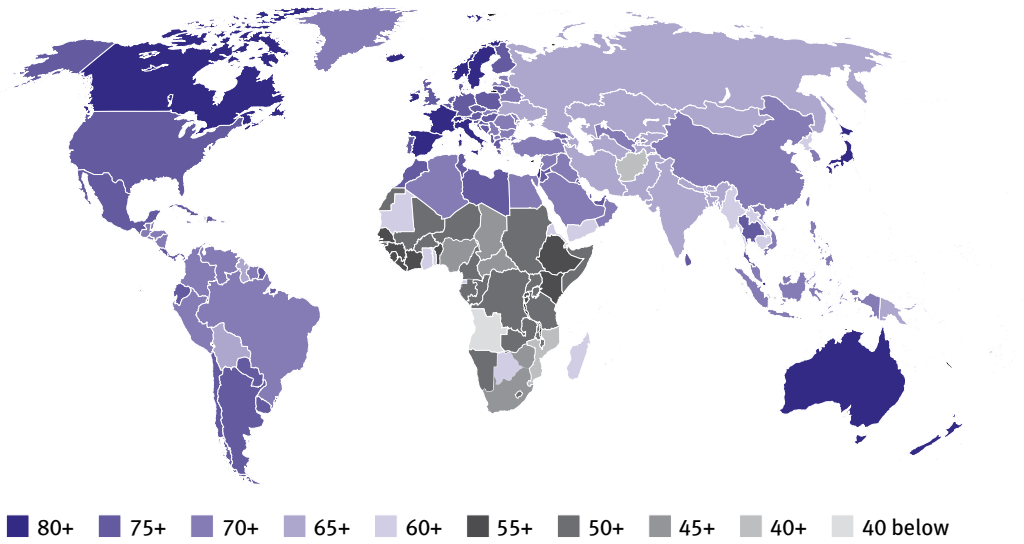


Source: Imperial College lecture slides, ***National, regional, and global trends in metabolic risk factors***

The one region where life expectancy has worryingly flatlined since the 1980s is Africa. Life expectancy in Africa is currently just over 50, whilst infant mortality rates in Sub-Saharan Africa are tragically high at around 150 deaths per 1000 births (over 1 in 10). The UN has suggested that low life expectancy here is a function of the HIV/AIDs epidemic, the continuing prevalence of armed conflict, economic stagnation and the resurgence of infectious diseases such as tuberculosis and malaria.[18]

According to the CIA World Factbook, average life expectancy at birth in Angola in 2011 was just 38 years of age.[19]

Figure 12. Worldwide life expectancy map shows significant regional variation



Source: Graphical image taken from: http://www.worldlifeexpectancy.com/

18 UN (2006), p.15

19 CIA World Factbook (Nov 2011) ***Angola*** https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html (accessed January 2012)

Fertility

Whilst life expectancy has risen across many regions, fertility rates have fallen. On average, worldwide fertility has fallen from 4.5 children per woman in 1970 to 2.5 children per woman in 2010. Over this time period, the most pronounced falls in fertility have taken place in Asia, from an average of 5 children to 2.3 children, in Latin America from 5 children to 2.4 children and in Europe from 2.2 children to 1.5 children.

In fact, fertility levels in many developed countries have now declined to below-replacement rate levels (this assumes that life expectancy and migration remain constant over time). Africa has also seen fertility rates decrease - though not quite as substantially - from almost 7 children per woman in 1970 to a still relatively high 5 children per woman in 2010. Indeed there are 14 countries that still have fertility levels of equal to or greater than 7 children per woman.[20]

Figure 13. Total fertility 1970–1975 and 2005–2010

Total fertility		
Major area	1970–1975	2005–2010
World	4.47	2.55
More developed regions	2.13	1.60
Less developed regions	5.41	2.75
Least developed countries	6.61	4.63
Other less developed countries	5.25	2.45
Africa	6.72	4.67
Asia	5.04	2.34
Europe	2.16	1.45
Latin America and the Caribbean	5.04	2.37
Northern America	2.01	2.00
Oceania	3.23	2.30

Source: UN (2006) World Population Prospects: The 2006 Revision, p.9

Migration

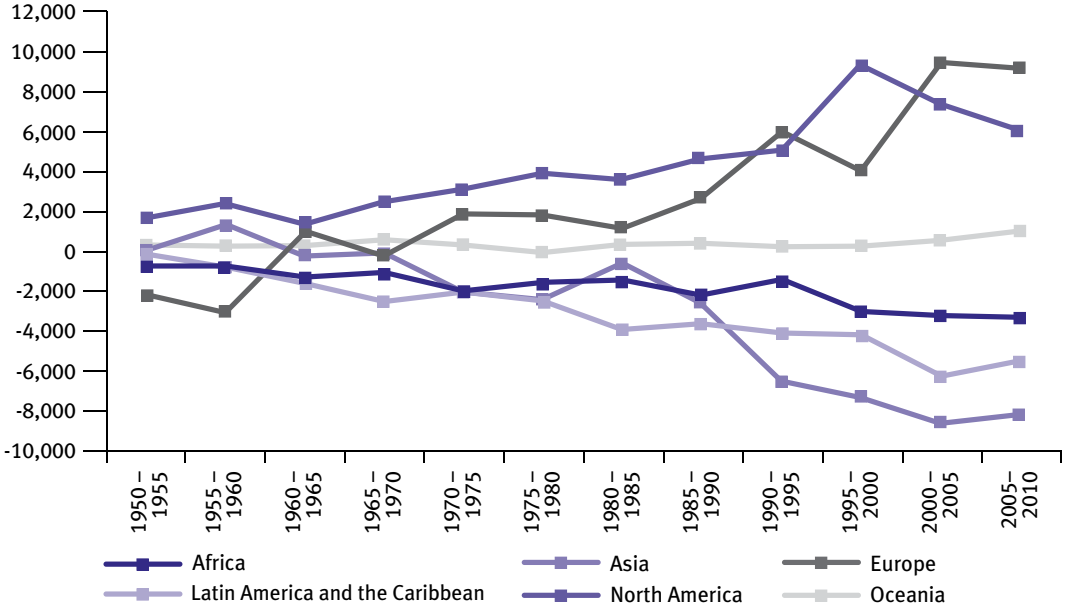
Migration is the third driver of population change. Since the 1960s the more developed regions have been substantial net gainers. In the 1960s net migration in the developed world, that is the number of immigrants (inflow) minus the number of emigrants (outflow), was around 0.5 million per annum (net increase). By the end of the twentieth century this had increased to around 2.5 million per annum. Today it is nearly 3 million.

Asia was the greatest source of migrants during the last decade with a net outflow of 1.3 million a year over this period. Latin America and the Caribbean also saw large numbers of people leave during this time, experiencing a net decrease of 0.75 million a year.

The rate of migration from developing to developed regions has increased over time though the rate of this increase has slowed somewhat over the last few years as the West experiences increasing economic strain.

20 UN Ibid, p.10

Figure 14. Net migration by region 1950–2010 (thousands per five year period)



Source: UN (2006) World Population Prospects: The 2010 Revision

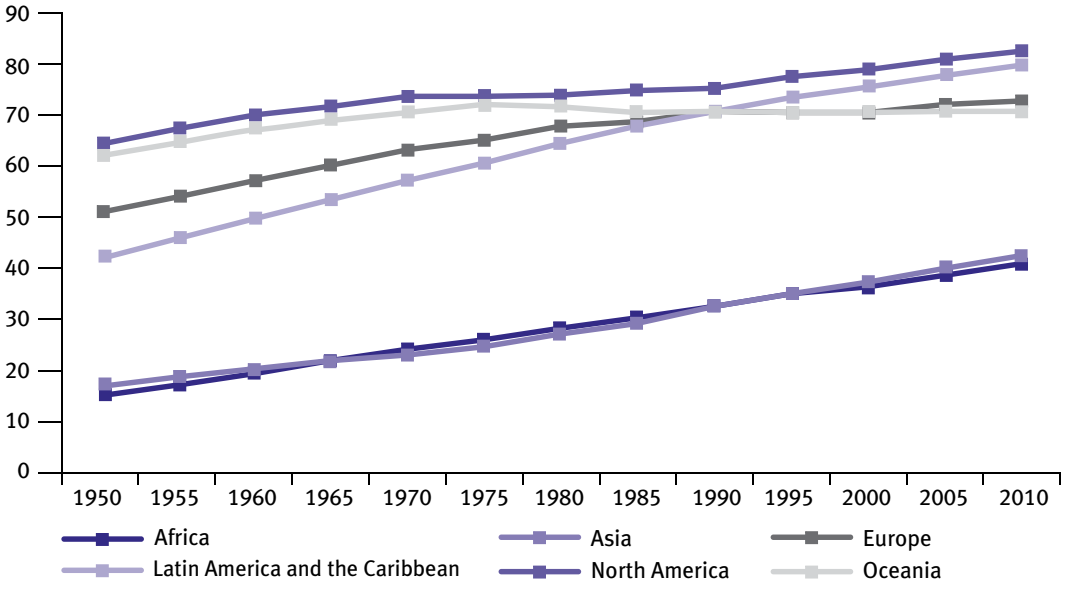
Urbanisation

All regions of the world have experienced substantial urbanisation since 1950. The total number of people living in cities worldwide is now around 3.5 billion (50% of total population) by comparison to 0.7 billion sixty years ago (just under 30% of the total population at the time).[21]

Developing countries in Africa, Asia and Latin America have seen the greatest increases in urbanisation. For example, Asia in 1950 had an urban population of around 230 million which equated to around 15% of its total population. Today it has an urban population of close to 1.8 billion equating to over 40% of its total population. Similarly, Latin America and the Caribbean had an urban population of 69 million in 1950. Today it has an urban population of close to 500 million. The developed world has also experienced increasing rates of urbanisation but the transformation has not been quite as spectacular.

21 BBC (2005) ***Interactive Map: Urban Growth***
http://news.bbc.co.uk/1/shared/spl/hi/world/06/urbanisation/html/urbanisation.stm (accessed January 2012)

Figure 15. Percentage of population living in cities by region: 1950–2010



Source: UN World Urbanisation Prospects: The 2009 Revision

Implications

So what can be learned from these past population trends and what are some of their potential implications for future risk?

- **Substantially increasing life expectancy combined with decreasing fertility is unprecedented:** Societies have never before seen such a large increase in life expectancy corresponding with such a sharp decrease in fertility. The resulting demographic shift from young to old is bound to risk changing the nature of politics, economic activity and social cohesion.
- **Rising obesity is a systemic threat to the health of populations worldwide:** Given its link to many dangerous chronic diseases, increasing obesity is a significant threat to life expectancy across the world. Increasing obesity also presents an economic risk through the rising costs of healthcare.
- **HIV and forms of infectious disease remain prevalent in parts of Africa:** The risk of dying young is highest in Sub-Saharan Africa. Whether this situation improves depends on a number of factors including amongst others; an end to conflict, investment in public infrastructure (including basic healthcare) and economic growth.
- **Developed countries have seen significant growth in immigration:** Increased immigration poses a number of political, economic and social risks as well as opportunities. In the UK for example, a net increase in migration is often badly received by the general public and media. Evidence suggests however, that immigration only has a small negative impact on the lowest paid UK workers and there remains the possibility that immigration might actually raise overall economic productivity.[22]
- **More people are living in cities than ever before:** Increased urbanisation poses a number of risks including health risks around sanitation and the spread of disease and climate risks around increasing green house gas emissions.

22 See report by the Select Committee on Economic Affairs (2008) ***The Economic Impact of Immigration***, Volume 1: Report http://www.publications.parliament.uk/pa/ld200708/ldselect/ldeconaf/82/82.pdf

Environment

Global warming

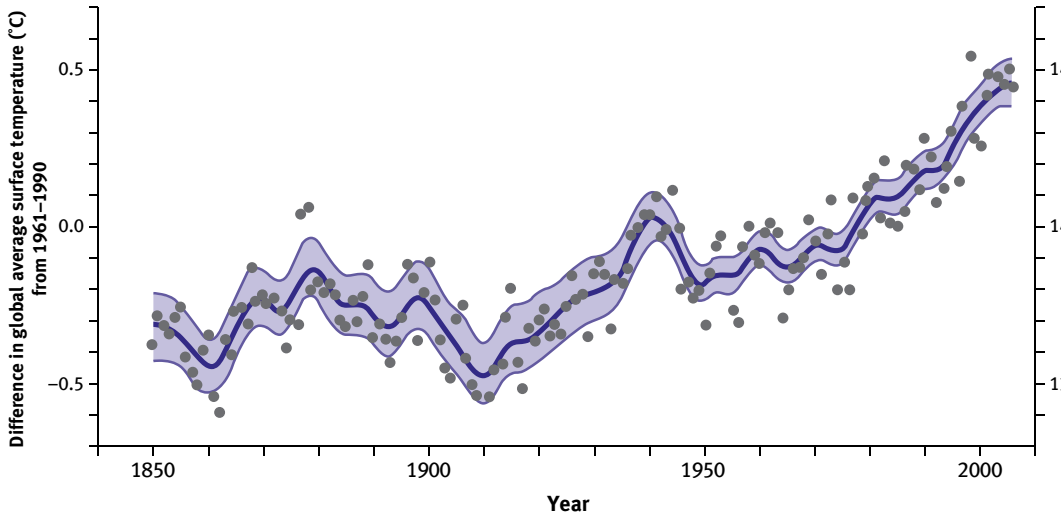
- *Global surface temperatures have significantly increased over the past hundred years coinciding with increasing CO_2 emissions*
- *Natural disasters appear to have become more common though to what extent this is due to global warming remains difficult to estimate*
- *Natural disasters have affected different regions in different ways – with some appearing better than others at adapting to disaster threats.*

According to the Intergovernmental Panel on Climate Change (IPCC), the average global surface temperature has risen by 0.6°C during the last century. In addition, the rate at which the global surface temperature is increasing appears to be rising. During the period 1995-2006, eleven of the twelve years ranked amongst the warmest since records began.

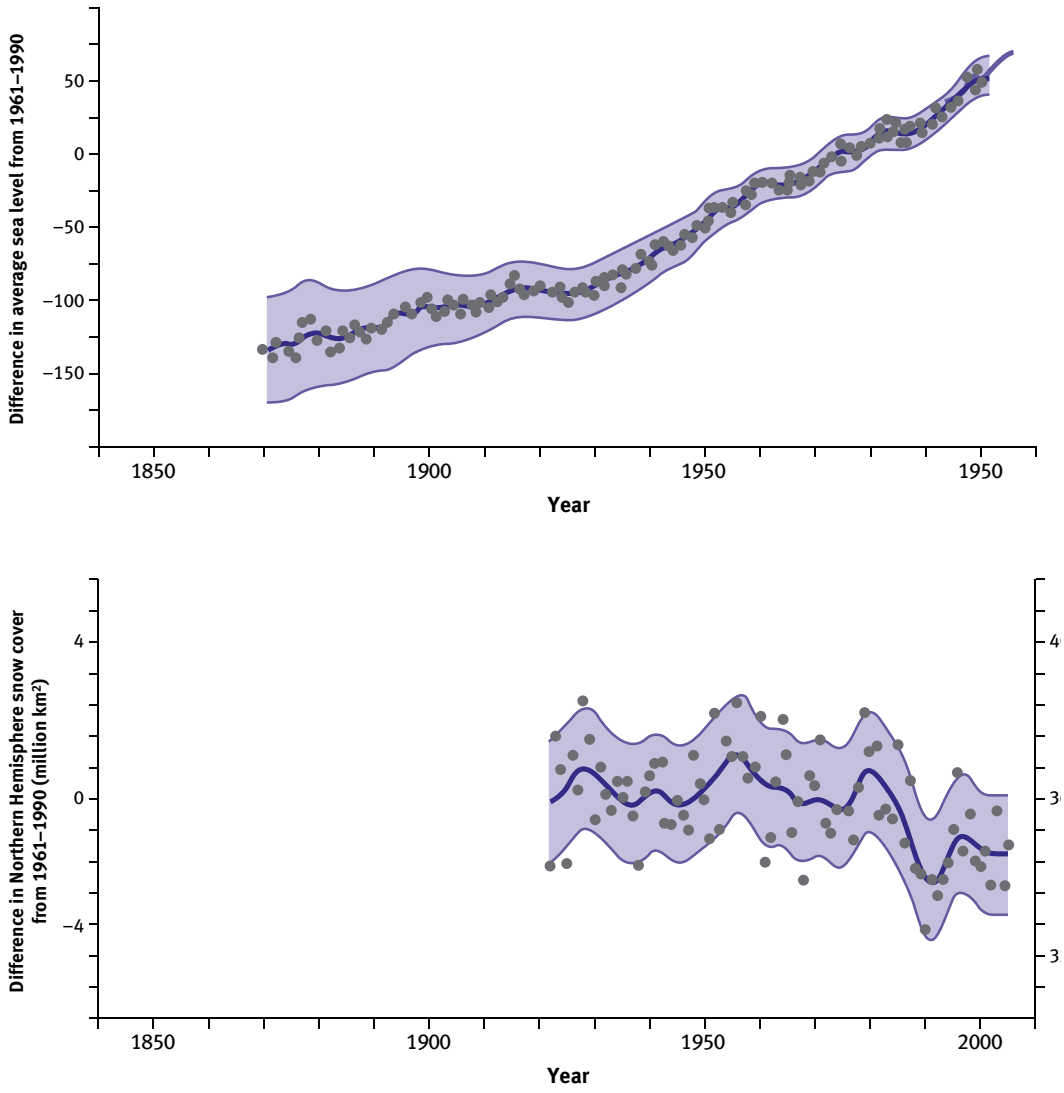
Coinciding with global warming, sea levels have risen by an average rate of 1.8mm per year since 1961 and 3.1mm per year since 1993. The rise in sea levels is consistent with the melting of glaciers and polar ice sheets. Indeed, since 1978 average annual Arctic sea ice has shrunk by around 2.7% per decade.

Along with a rise in sea levels, precipitation has also significantly increased in parts of North and South America, Northern Europe and Northern and Central Asia. Precipitation has, however, declined in some of the hottest regions including Sahel, the Mediterranean, Southern Africa and parts of Southern Asia. The IPCC believes that the size of the area affected by drought has subsequently grown.[23]

Figure 16. Changes in temperature, sea level and Northern Hemisphere snow cover



23 Intergovernmental panel on climate change ***Fourth Assessment Report: Climate Change 2007***
http://www.ipcc.ch/publications_and_data/ar4/syr/en/spms1.html



Source: IPCC – Observed changes in (a) global average surface temperature; (b) global average sea level from tide gauge (blue) and satellite (red) data; and (c) Northern Hemisphere snow cover for March-April. All differences are relative to corresponding averages for the period 1961–1990. Smoothed curves represent decadal averaged values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties (a and b) and from the time series (c).

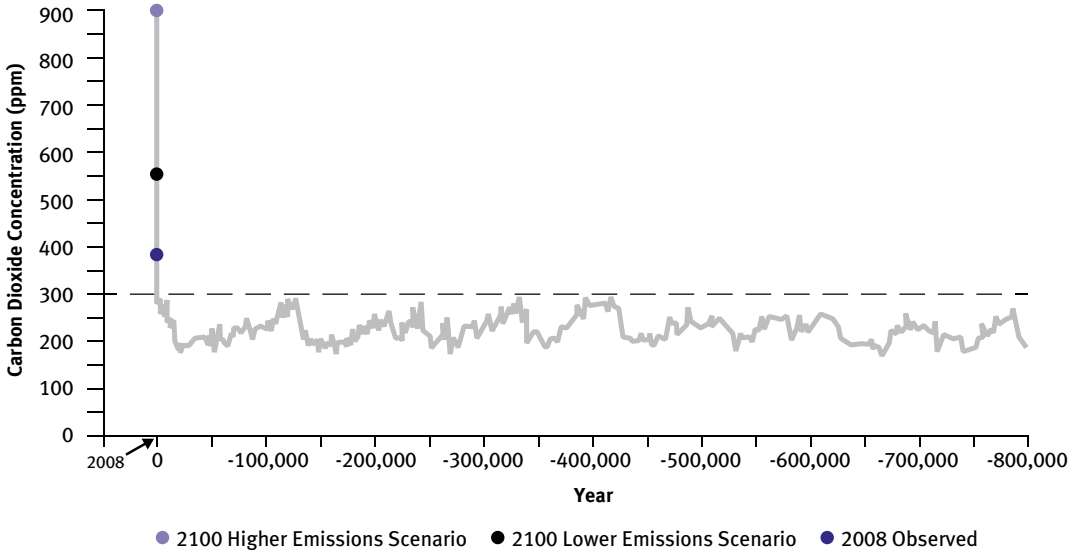
What's been causing climate change?

Many experts now agree that the global warming witnessed over the last 100 years, is, at least in part, due to human activity, especially the emission of green house gasses (GHGs). GHG emissions have grown by over 70% over the last four decades driven by an 80% increase in Carbon dioxide emissions (CO_2).

According to the IPCC, global increases in CO_2 are primarily due to fossil fuel use, with agricultural activities providing another significant but smaller contribution.

Worryingly, the level of CO_2 in the atmosphere has now reached an unprecedented level. It is estimated that over the last 800,000 years, the atmospheric carbon dioxide (CO_2) concentration has varied to within a range of about 170 to 300 parts per million (ppm). Today however, carbon dioxide concentration is around 450 ppm.

Figure 17. Historic and predicted carbon dioxide levels



Source: National Oceanic and Atmospheric Administration

What have been the effects of global warming?

The IPCC argue that it is 'very likely' that over the past 50 years, cold days, cold nights and frosts have become less frequent over land areas, and that correspondingly hot days and hot nights have become more frequent. They further argue that it is 'very likely' that average Northern Hemisphere temperatures during the second half of the twentieth century were higher than during any other 50 year period in the last 500 years.

An increasingly warm climate can have an impact on health in many ways such as increasing the likelihood of heat related mortality and increasing the number of areas affected by infectious disease vectors (i.e. spread of malaria carrying mosquitoes).[24]

Some commentators have also argued that global warming increases the likelihood of natural disasters occurring such as flooding due to rising sea levels, and drought due to decreasing levels of precipitation in already dry regions. Indeed, coinciding with recent global warming has been an increase in natural disasters – though it is difficult to ascertain the extent to which global warming is to blame. Indeed, some of the recorded increase in disasters is likely to be the result of improvements made in reporting methods.

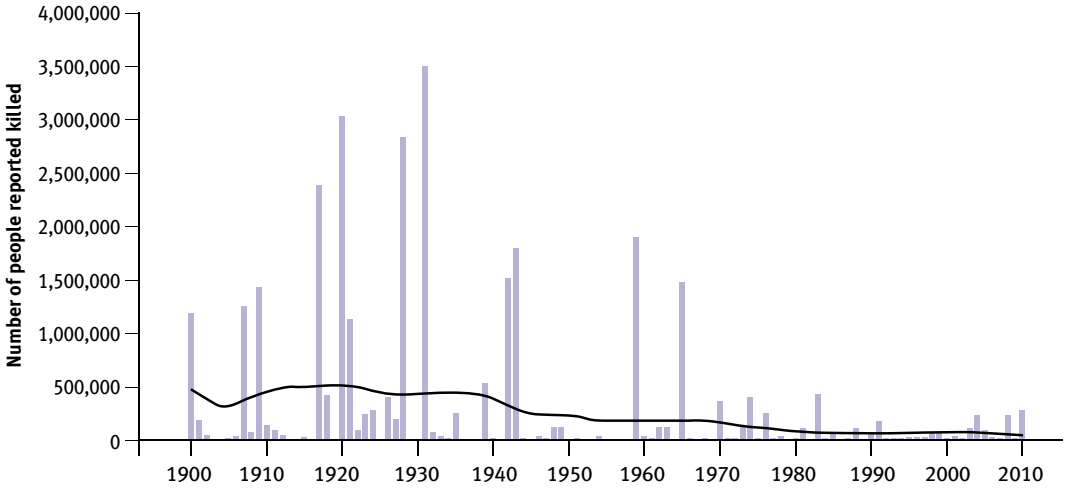
Nevertheless, natural disasters have clearly had a significant impact on people's lives. It is estimated that in 2010 around 200 million people were affected by disasters and that over 400,000 people died as a result. The economic cost was also substantial, at around $120bn.[25]

However, despite a recorded increase in the number of natural disasters and the number of people affected by them, the number of recorded deaths has actually fallen. One of the reasons for this is the falling impact of epidemics: influenza, which was one of the biggest natural killers in the first half of the twentieth century, has caused far fewer fatalities in the last 50 years. As figure fifteen shows, from the 1940s onwards droughts, floods and earthquakes have caused the largest number of disaster related deaths. This does not mean that the threat of pandemics has rescinded – improvements in international travel have increased the ability of infectious disease to spread quickly (see technology section for more details).

24 IPCC (2007)

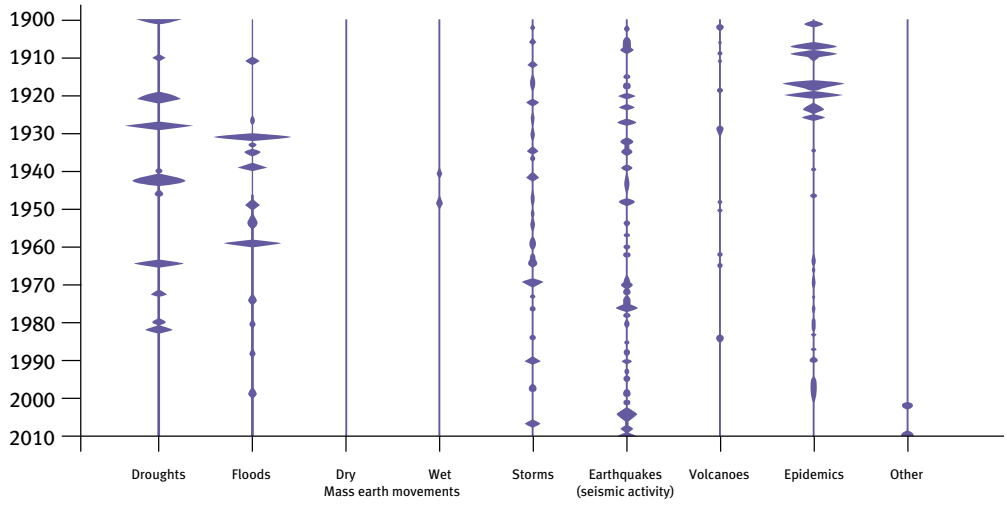
25 EM-DAT: The international disaster database, ***Natural disaster trends*** http://www.emdat.be/natural-disasters-trends

Figure 18. Number of deaths due to natural disasters: 1900–2010



Source: EM-DAT: The International Disaster Database

Figure 19. Number of people reported killed by disaster type 1900–2010



Source: EM-DAT: The International Disaster Database

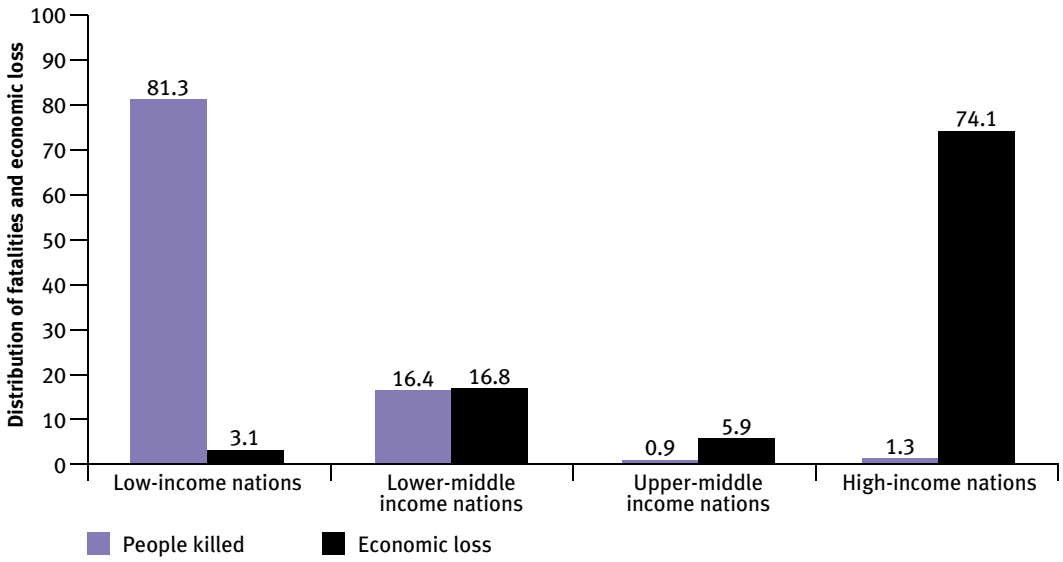
Disasters and cities

Although there has been an overall fall in the number of disaster related deaths, there have been substantial regional variations. Indeed, disasters tend to cause far more fatalities in low income countries than middle or high income countries. Correspondingly, it appears that high income countries suffer from greater immediate economic loss as a result of disasters than low income countries.

In explaining the disparity in fatalities, some experts have pointed to the difference in the quality of housing, infrastructure and health services across many of the world's cities.[26] This difference means that for some, living in a city helps to improve their chances of surviving a disaster, whilst for others it has the opposite effect. Consider, for example the difference in outcomes following the earthquakes that struck Chile and Haiti in 2010. The earthquake in Chile was far stronger than the one that struck Haiti – yet the death toll in Haiti was much larger at over 200,000 compared with Chile's 500. In accounting for the difference one international expert said:

> *"When you look at the architecture in Chile you see buildings that have damage, but not the complete pancaking that you've got in Haiti"* [27]

Figure 20. Distribution of fatalities and economic loss from tropical cyclones per year



Source: The International Federation of Red Cross and Red Crescent Societies

26 The International Federation of Red Cross and Red Crescent Societies (2010), ***World disasters report 2010: Focus on urban risk***

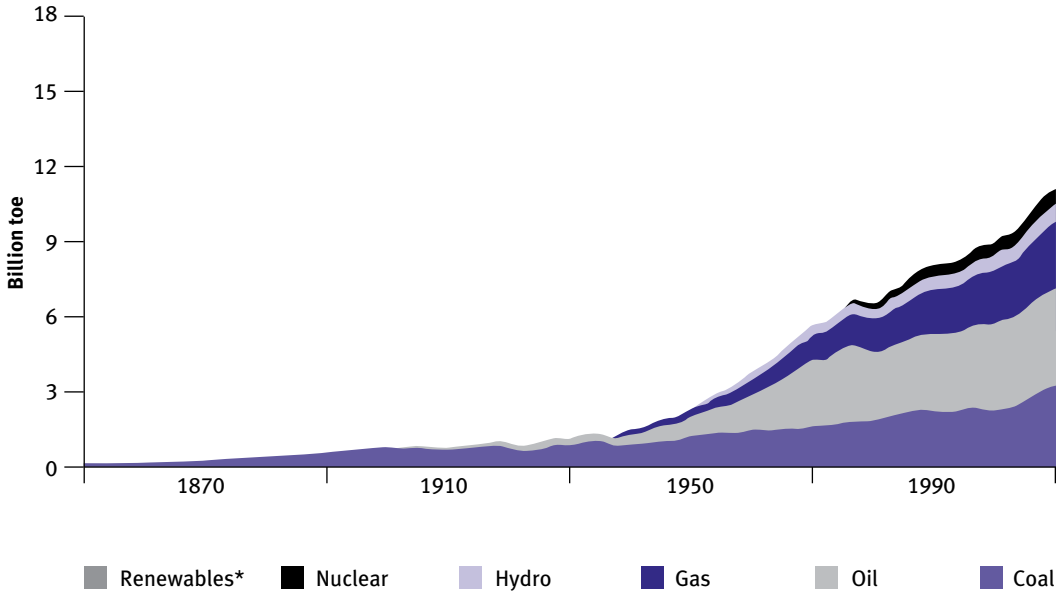
27 Frank Bajak (2010) **CHILE EARTHQUAKE 2010: Why The Haiti Earthquake Wasn't As Strong, But Far More Devastating**, article in the Huffington Post. For disaster stats see Lloyd's of London (2011) **Nat cats inflict over $218bn in damage**

International Energy

- *Energy consumption has dramatically increased in recent times, driven by economic development and population growth as well as the introduction of new technologies*
- *Yet at a time of significantly rising demand, the rate of certain fossil fuel extraction – particularly oil – appears to be reaching a peak.*
- *Arguably then, development of renewable energy is not just about limiting CO_2 emissions to save the environment but about providing further sources of energy to feed the rapid growth of the developing world.*

Since 1900, world energy consumption has dramatically increased – **by a factor of 22.5**.[28] Population and income growth have been the two most important driving forces behind increased energy demand, whilst improvements in technology have helped increase supply by unlocking new methods for extracting resources and generating energy. Increasing rates of energy consumption has therefore been a particularly profound feature of the last sixty years, coinciding with substantial increases in world population, economic development technological advance.

Figure 21. World energy consumption 1870–2000 (tonnes of oil equivalent – toe)



*Includes biofuels
Source: BP Energy Outlook 2030

28 BP (2011), ***BP Energy Outlook 2030, slide 9***

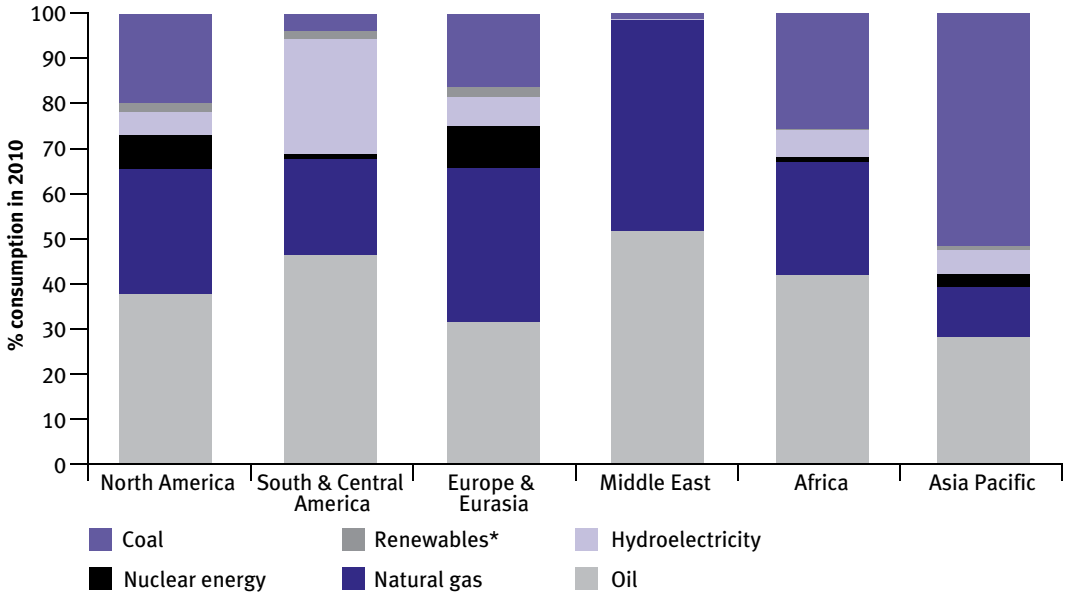
Worldwide energy consumption

The last hundred years have also seen the emergence of a number of 'new' types of energy. The 'first age of globalisation' was characterised by a reliance on the steam engine and coal, with the latter remaining the key source of fuel up until the mid-twentieth century. Then came electricity and the internal combustion engine. Today, whilst coal remains the primary source of fuel worldwide, gas, renewables and nuclear power are also being increasingly produced and consumed.[29]

Consider for example, consumption of hydroelectric power, which equated to approximately 450 million tonnes of oil in 1985. Today it equates to around 800 million tonnes – an increase of nearly 80%.[30]

There are however, significant regional variations in the types of energy consumed. The Middle East for example, is currently almost completely reliant on oil and natural gas, whereas the Asia-Pacific Region relies primarily on coal. Southern and Central America consumes a proportionately high amount of hydroelectric power whilst North America and Europe and Eurasia rely more on nuclear power than anywhere else.

Figure 22. Regional energy consumption: 2010



*Includes biofuels
Source: BP World Statistical Review 2011

29 Ibid

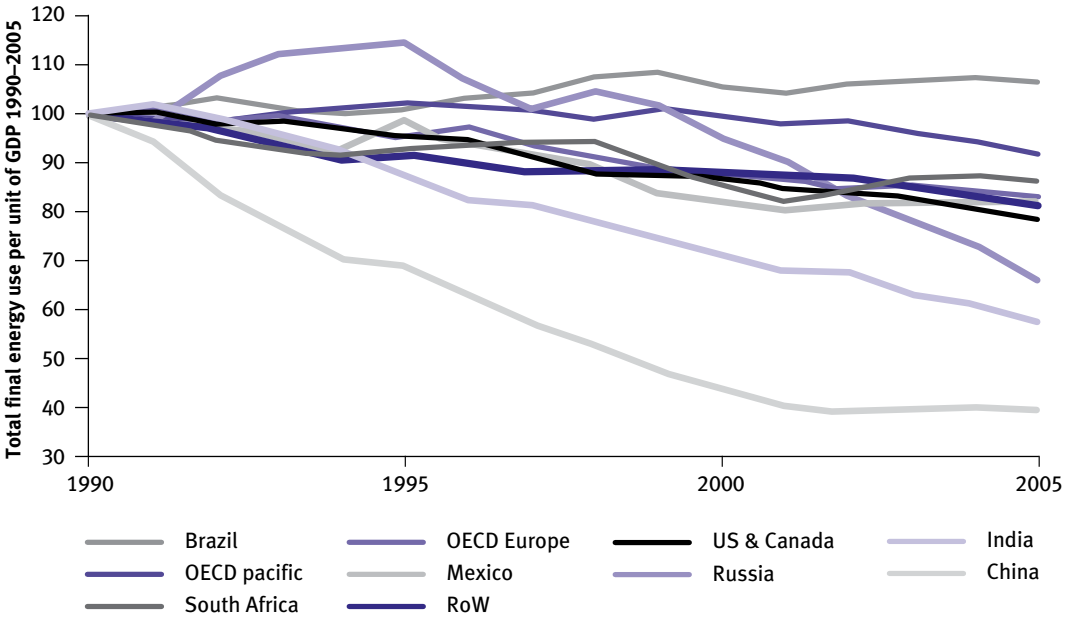
30 BP (2011), ***BP Statistical Review of World Energy***

Increasing energy efficiency

Whilst aggregate consumption has increased, there is evidence that energy usage has become more efficient over the last twenty years. According to estimates from the International Energy Agency, since the 1990s all countries and regions have experienced a decline in energy consumption per unit of GDP with the exception of Brazil. Improvements have, in many cases, been the result of introducing modern, efficient technologies and processes. The IEA cites the example of China whose improved energy efficiency, particularly in industry, was one of the main factors driving down energy use per unit of GDP during the 1990s.

The IEA estimate that on average, Japan and the Republic of Korea have the highest levels of industrial energy efficiency, followed by Europe and North America.[31]

Figure 23. Total Final Energy usage per unit of GDP 1990–2005



Source: IEA (2008) Worldwide trends in energy usage and efficiency: 2008

Oil depletion

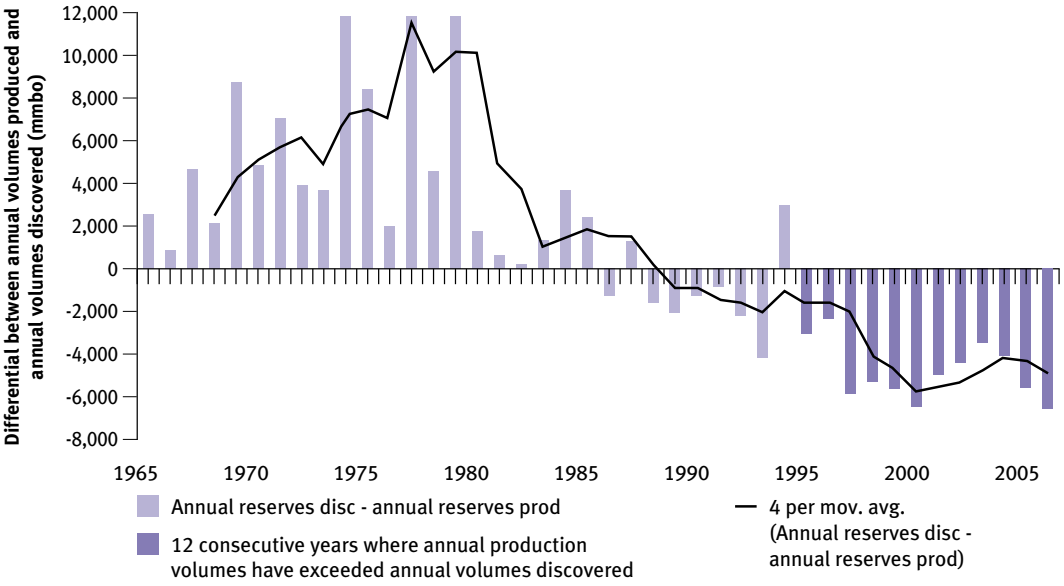
Over the last couple of decades levels of oil extraction have diminished across some of the world's reserves, whilst per annum discoveries of new oil fields have also fallen. As a consequence of both trends, many now believe that we have reached (or will reach in the near future) maximum global oil production and that after this point a decline in production levels will occur. They call this point in time 'peak oil'.[32]

The graph below indicates that since the mid-1990s non-OPEC countries have, in aggregate, been producing 4 to 5 billion barrels each year more than they have been finding through exploration. A similar pattern can also be seen for OPEC countries.

31 International Energy Agency (2008) ***Worldwide Trends in Energy Use and Efficiency***

32 Interview with Matthew Simmons (2005), ***Seven Questions: the future of oil***, An interview for Foreign Policy Magazine

Figure 24. Difference between volume produced and volume discovered



Source: PFC Energy (2008), ***Deepwater Trends and Implications for the Drilling Market***

The negative effects of decreasing oil production on worldwide supply can be counteracted by increased production of other energies and, to a certain extent, by new exploratory methods to find previously untouched oil supplies. One example of the latter is deepwater drilling (drilling for oil in waters deeper than 5,000 feet). Oil production from deepwater drilling increased from near zero in 1990, to 9 million barrels per day by 2010. And production rates from this type of drilling have not significantly slowed in recent years, increasing by 46% since 2006.[33]

Deepwater drilling has not been without its risks however, as the Deepwater Horizon oil spill in the Gulf of Mexico demonstrated. The disaster led to the loss of 11 lives and will continue to have an impact on the surrounding ecosystems for decades to come. It also had dramatic implications on BP's second quarter income statement for 2010 which revealed a related pre-tax charge of $32 billion[34] pushing the company into a record overall loss of $17bn for the quarter.

The main oil producers

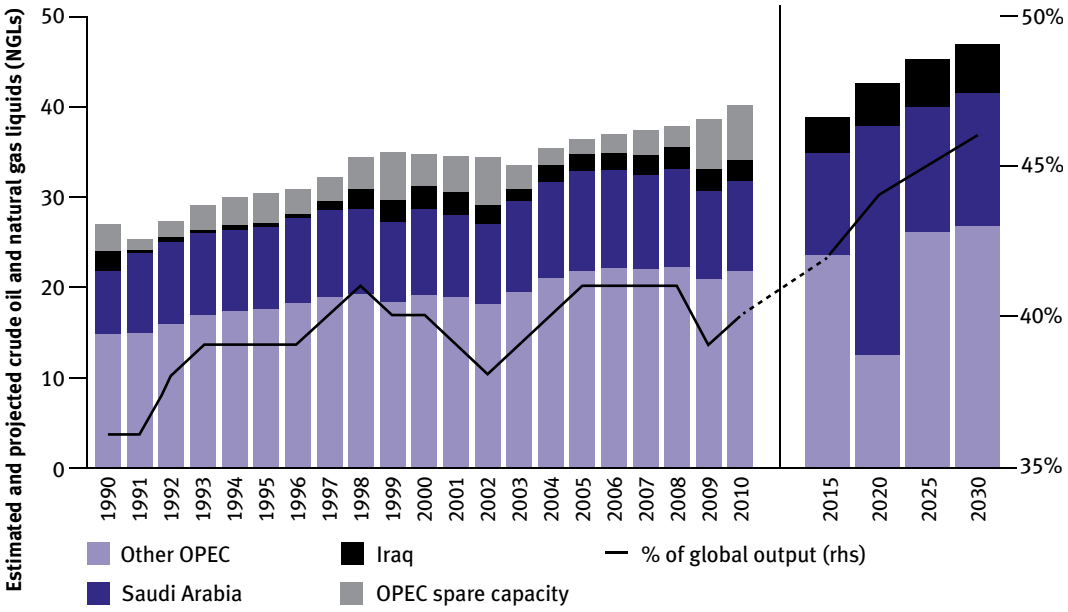
In the 1960s the Organization of Petroleum Exporting Countries (OPEC) was founded to unify and coordinate members' petroleum policies. By the 1970s it included many of the world's biggest oil producers and today it is estimated that OPEC countries[35] produce over 40% of total global output. Indeed, since 1990, OPEC countries have increased their oil production from approximately 25 million barrels of world crude per day to 40 million barrels per day – a 60% rise.

33 PFC Energy (2008), ***Deepwater Trends and Implications for the Drilling Market***

34 Graeme Weardon (2010) ***BP oil spill costs to hit $40bn***, Story in the Guardian http://www.guardian.co.uk/business/2010/nov/02/bp-oil-spill-costs-40-billion-dollars

35 OPEC countries include: Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela

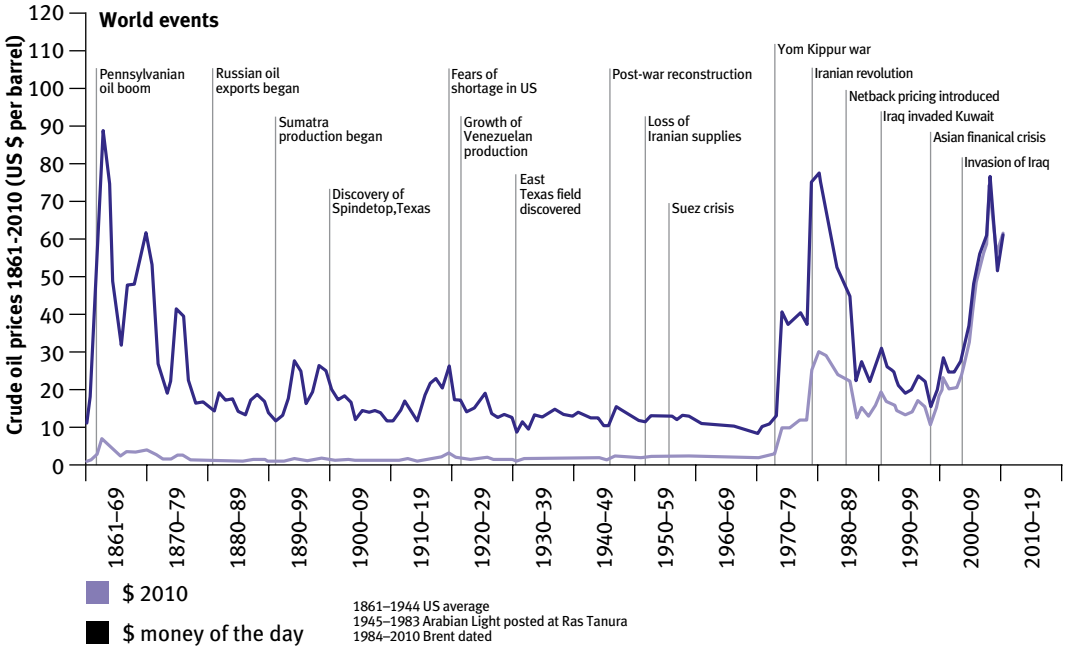
Figure 25. Estimated and projected crude oil and natural gas liquids (NGLs)



Source: BP (2011), ***BP Energy Outlook 2030***

Given the dependence of many countries on oil produced by OPEC members, actions taken by OPEC and events affecting member countries can have dramatic implications for the supply and price of oil. The most obvious example of this was the decision made by OPEC in the 1970s to limit the exportation of oil to certain Western countries until a number of political and economic demands were met. In turn, due to concerns over the OPEC supply line, global oil prices rose from an average of 10 dollars per barrel at the beginning of the 1970s to nearly 100 dollars a barrel by the end of the decade.

Figure 26. Crude oil prices and significant events 1861–2010



Source: BP World Statistical Review 2011

Implications

So what can be learned from these past environmental and energy trends and what are some of their implications for future risk?

- **Global warming has been linked to heat related mortality and extreme weather events:** If global warming continues, the risk of heat related deaths (such as heatstroke as seen in France in 2003) and incidences of natural disasters (such as episodes of flooding and drought) could also rise.
- **Some of the global warming experienced over the last hundred years may have been man-made:** There is a risk that continuing rises in GHG emissions will warm the planet further with implications for health and the environment.
- **Natural disasters pose a risk to human life and economic activity:** Natural disasters still pose a significant risk to human life particularly in low income urban areas. It follows that should the number and severity of disasters increase (especially in low income areas), the risk to human life is likely to increase. Disasters can also incur significant economic cost – with recent examples showing that high income countries can lose substantial sums of money in the aftermath of an event.
- **In the last fifty years, increasing demand for, and limited supply of energy has stimulated innovation:** The prospect of limited availability of oil has driven the search for new sources of energy, such as nuclear power, and new methods of extracting previously untapped resources, such as deepwater drilling. The Deepwater Horizon oil spill and the Fukushima meltdown highlight some of the risks associated with these types of energy generation.
- **Energy demand has been increasing whilst oil production has slowed:** As economies and populations continue to swell and drive up demand, there is a risk of energy shortages if extraction of traditional sources of energy cannot keep pace. The risk of an energy crisis can be offset somewhat through increased use of renewable energies, though to what extent countries will be willing and able to shift from traditional sources of energy such as coal, oil and gas remains to be seen.
- **The supply of oil and gas is sensitive to political tension:** As shown by OPEC in the 1970s and by Russia in the 2000s, political and economic tensions between countries can have far reaching implications for the supply and price of energy. Should significant political fault lines emerge once again between the key producers of oil and gas and its consumers, there is a risk of sudden and severe shocks in price and supply.

Technology

- *There have been a multitude of innovations and technological advancements over the past century*
- *After a brief overview of some of the key innovations, the following discussion focuses on just two aspects; travel and Information and Communications Technology (ICT), where recent trends are particularly well documented*
- *This will provide an indication of the sheer scale with which recent technological change has driven increased interconnections between people*
- *It will also allow us to consider some of the regional disparities that exist in the use of certain technologies as well as some of the key risks involved.*

Brief overview

> *"...a week' s worth of today' s New York Times, is more information than a person was likely to come across over the course of a lifetime in the 18th century."*
>
> Karl Fisch 'Did You Know'

The early part of the twentieth century saw revolutions in the nature of travel with the development of the automobile, helicopter and aeroplane. This early period also saw the introduction of many household mainstays such as the radio, vacuum cleaner and the tape recorder. It also heralded a new age for progress in medical science, epitomised by the discovery of penicillin in 1928 as a means of defeating bacterial infections on an industrial scale.

The second half of the twentieth century saw continuing technological advances. There were new innovations in telecommunications, like the television, VCR, DVD player and computer, as well as new forms of transportation like the hovercraft and space shuttle. Medical advances also kept pace: in 1953, Watson and Crick described the first correct double-helix model of DNA structure. And by the 1960s, the first human heart transplant had been performed.

Since the beginning of this century, there have been more profound developments, particularly in the area of electronics with the widespread dissemination of computers, the internet, mobile phones, social networking and more. Continuing gains have also been made in the fields of transportation and medical science. Recent examples include the development of hybrid cars and artificial livers.

Research and development is also ongoing into nanotechnology, bioengineering and nuclear fusion. And new endevours like the Oscillation Project are threatening to change the face of particle physics – early results appear to break Einstein's proposition that nothing can travel faster than the speed of light.[36]

For an illustration of key innovations since 1900, please see figure 27 overleaf.

36 Richard Gray (2011) ***Speed of light broken again as scientists test neutrino result***, Article for the Telegraph

Figure 27. Innovation timeline

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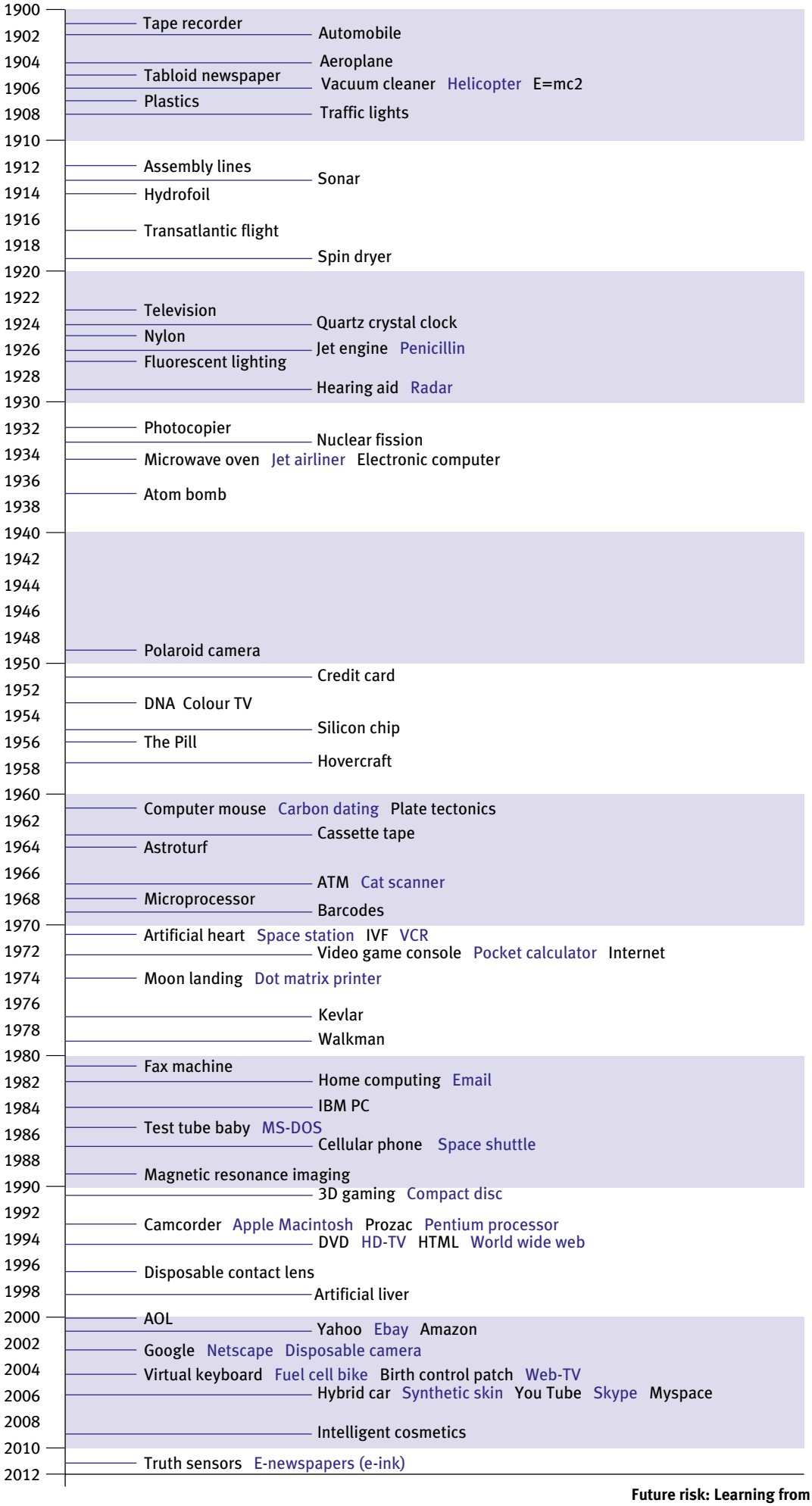


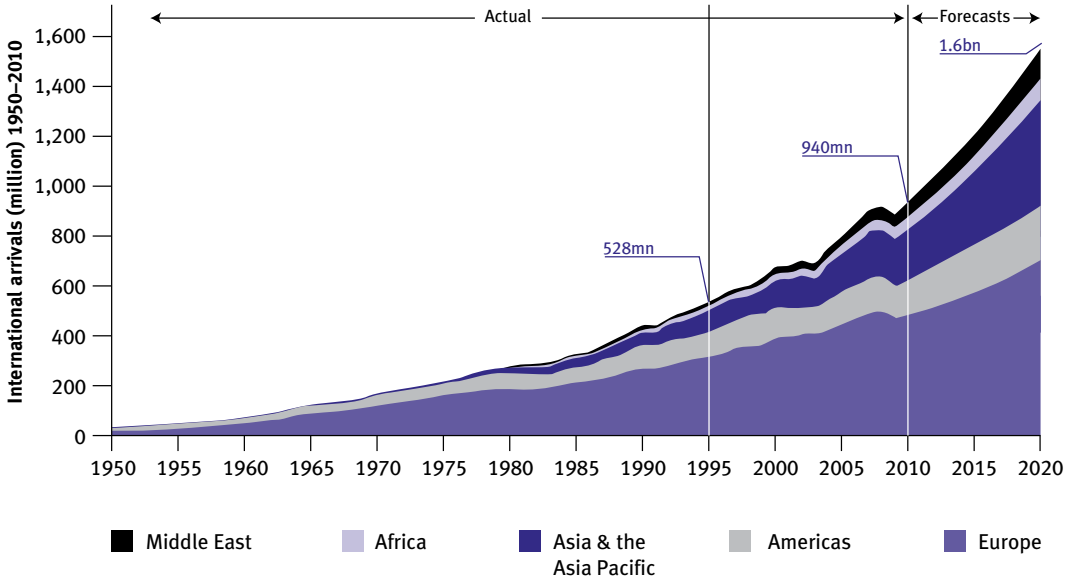
Trends in transportation and communications

Advances in transportation and telecommunications have vastly improved the possibility of exchange between people – no matter how distant they may be from one another.[37]

International Travel

Advances in aviation have facilitated enormous growth in international commerce and tourism. In 1950, there were just 25 million international arrivals (by all forms of transport). By 2010 the number of international arrivals was touching 950 million – a 38-fold increase. In 2010, receipts from world travel accounted for a quarter of worldwide exports of commercial services.[38]

Figure 28. International arrivals (1950–2010)



Source: UN World Tourism Organisation

As the graph above illustrates, since 1950, all regions have experienced increases in international arrivals. This increase was particularly significant in Asia and the Pacific (13% on average a year) and in the Middle East (10%) while the Americas (5%) and Europe (6%), grew at a slower pace and slightly below the global average.

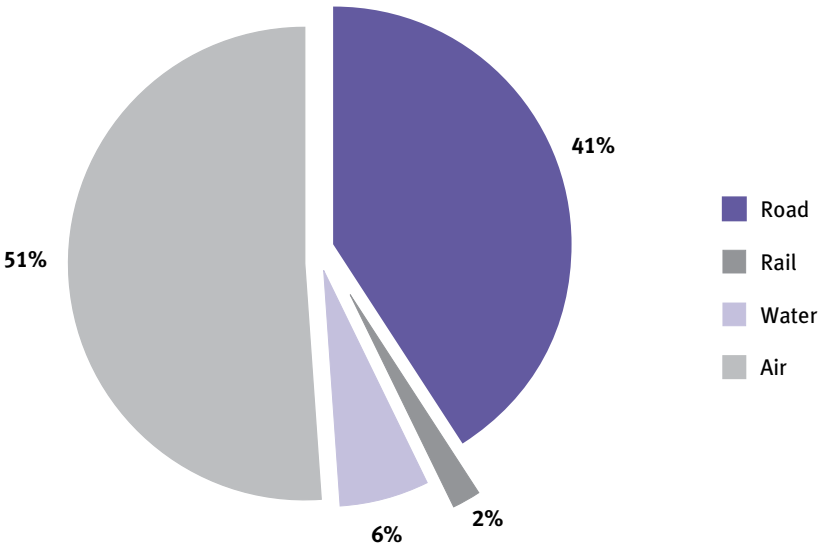
New destinations have therefore steadily increased their market share relative to more established tourist hot spots. In 1950, Europe and the Americas were the main tourist-receiving regions representing a joint market share of 95% of international arrivals. By 2010 their market share had diminished to 69%. In fact, now Asia and the Pacific region have overtaken the Americas as the second biggest tourist destination.

In 2010, just over half of travellers arrived at their destinations by air (51%), while the remainder travelled over the surface (49%) – whether by road (41%), rail (2%), or over water (6%). Over time, the trend has been for air transport to grow at a faster pace than surface transport, so the share of air transport has gradually increased.

37 OECD (2003), ***Emerging systemic risks in the 21st century***, p.44

38 World Trade Organisation (2011): ***International trade statistics 2011*** http://www.wto.org/english/res_e/statis_e/its2011_e/its11_trade_category_e.pdf

Figure 29. Inbound tourism by mode of transport (2010)

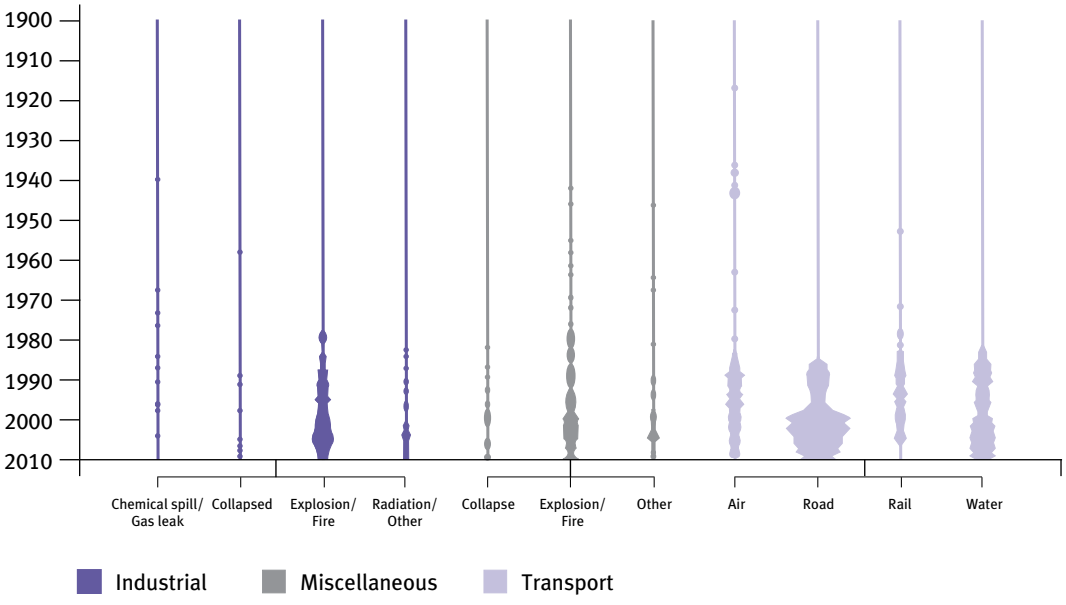


Source: UN World Tourism Organisation

Technological accidents

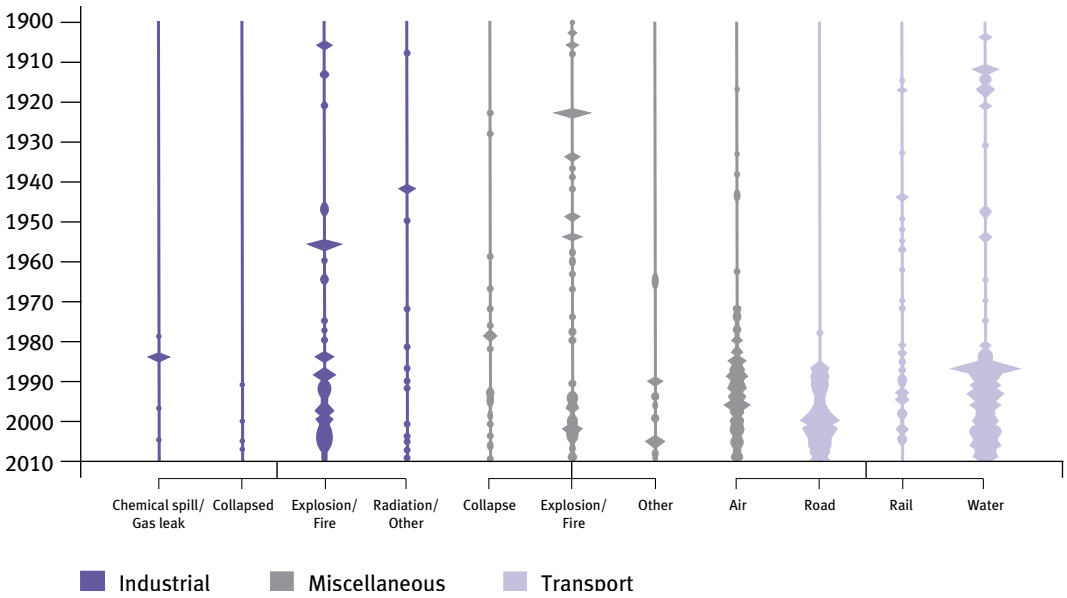
Since the 1970s there has been a swell in the number of reported technological disasters – suggesting that disasters have become more commonplace as technological developments have increased in pace and scale (though interestingly the number of disasters have declined somewhat over the last decade). Disasters related to transportation (particularly road, air and water) have been the most common with road related events the most frequent of all.

Figure 30. Number of technological disasters by type 1900–2010



EM-DAT: The International Disaster Database

Figure 31. Number of people reported killed by technological disasters



EM-DAT: The International Disaster Database

It can be inferred by comparing figures 30 and 31 that the greater the number of disasters, the greater the likelihood of technology related deaths over the past hundred years. This is one reason why deaths related to transportation are most common – though explosions (both industrial and miscellaneous) are not far behind.

The number of disasters is not however, the only determining factor in explaining variations in fatalities across technologies. For instance, fatalities have been more common with regards to water related transport than on the road, despite the relatively fewer incidences of water related disasters. On the face of it, this suggests that disasters involving certain types of transportation (i.e. transportation over water) may be more likely to lead to a larger loss of life than other forms (i.e. transportation via road).

Whilst these conclusions may be accurate, the recorded results should be treated with caution. Some of the swell in reported disaster frequency, and some of the reported variation in deaths by technology type, may actually be explained by changes in methods of recording events and not by a 'real' increase in disaster incidence or a 'real' difference in number of fatalities. Similarly there are likely to be a number of other reasons why there are differences in the relative number of disasters and fatalities across technologies which are not possible to discuss here due to the limited scope of the data.

Telecommunications

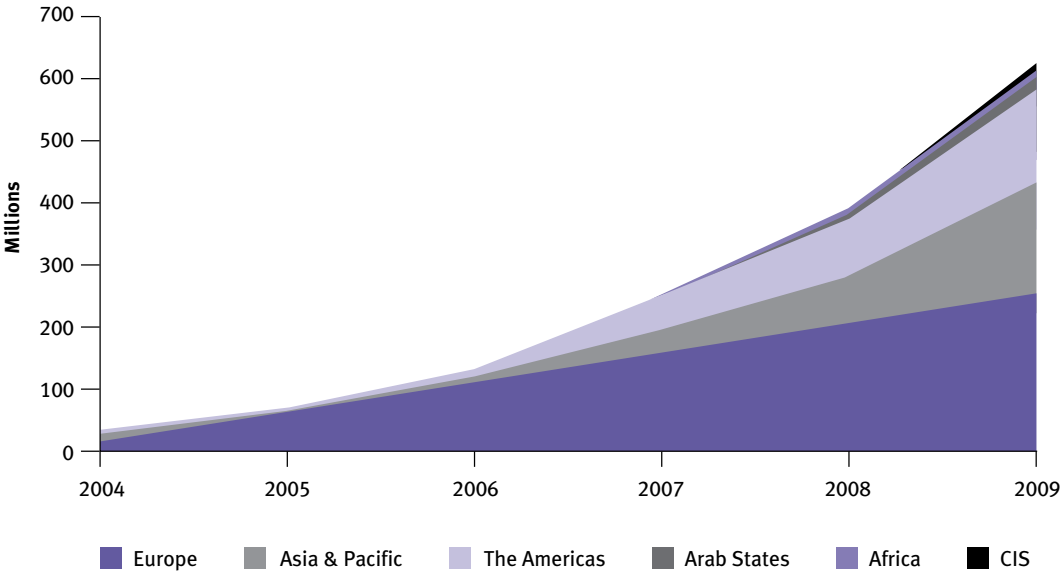
"I think there is a world market for maybe five computers."

Thomas Watson, chairman of IBM, 1943

Whilst advances in transportation have increased the connections between people through travel, telecommunications have boosted the exchange of global information flows through the radio, television, personal computer, mobile phone and more.

Use of telecommunications technologies has grown dramatically over the last ten years – particularly internet penetration which has been a real 'game changer'. In 2004 there were less than 50 million mobile broadband users. By 2009 there were over 600 million – an eleven fold increase in the space of just four years.

Figure 32. Mobile broadband users (2004–2009)

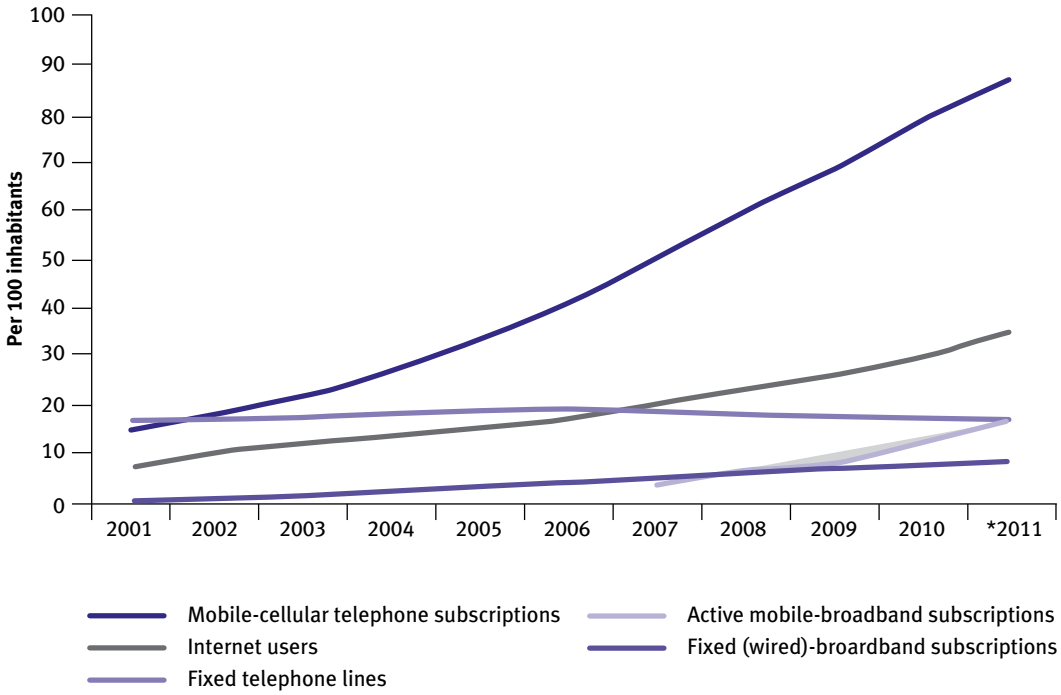


Source: UN International Telecommunication Union

Overall internet access (mobile plus fixed) has also substantially increased over the last decade – though there remain significant regional disparities. Currently, whilst 7 in 10 people have access to the internet in the developed world, only 3 in 10 people have access in the developing world. These countries are however catching up, with developing world internet access as a proportion of the developing world population more than doubling since 2007.

Over the last few years, increasing internet usage has been enabled by widespread dissemination of mobile phones with built-in broadband. Developing world access to this type of technology has increased from 2.9% of the developing world population in 2009 to 8.5% of the population by 2011. Indeed growth in general mobile phone usage has been massive – from approximately 30 subscriptions per 100 people globally in 2005, to nearly 90 subscriptions per 100 hundred people in 2011. Interestingly though, the proportion of people with fixed telephone lines has remained relatively constant throughout.

Figure 33. Global ICT developments 2001–2011



Source: UN International Telecommunication Union

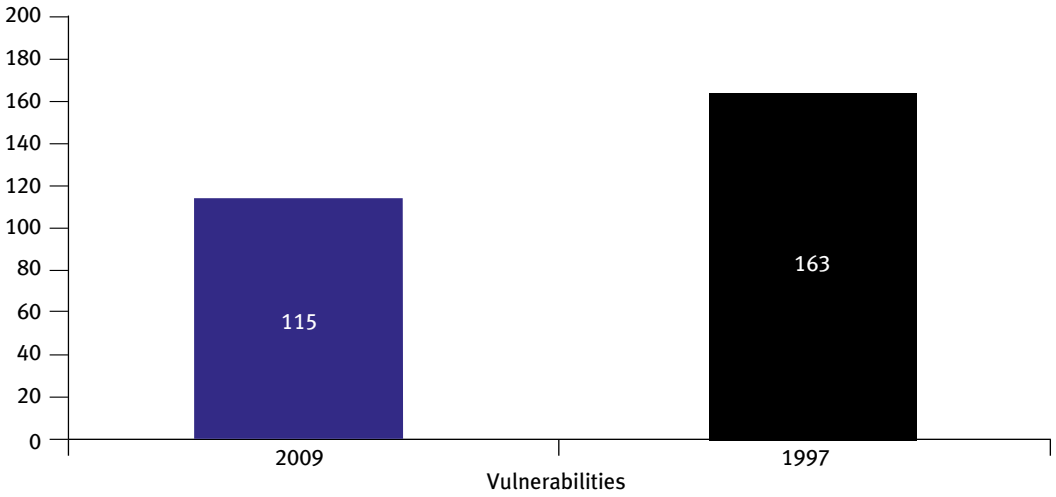
Cyberthreats

As an increasing proportion of people access the internet, there has been a rise in the number of so called 'cyber attacks' where individuals' or organisations' computers are hacked into by third parties who try to steal personal information such as credit card details. Internet protection software giant Symantec estimated that there were over 3 billion malware attacks in 2010 – peaking in September with an average of 40 million web attacks per day. The volume of web based attacks increased by 93% from 2009 to 2010.[39]

It is not just personal computers that are at risk from cyber attacks. With the growing uptake of Smartphones and tablets, as well as their increasing connectivity, many different types of mobile devices have become vulnerable to malicious applications. Symantec estimated that whereas in 2009 Smartphones had 115 vulnerabilities, this had increased to 163 vulnerabilities by 2010. Currently most malicious code for mobile devices consists of Trojans that pose as legitimate applications. These are then uploaded onto "app" marketplaces in the hope that users will download and install them.

39 Symantec (2011) ***Internet Security Threat Report: Trends for 2010***

Figure 34. Mobile phone threats 2009/2010



Source: Symantec Internet Security Threat Report: Trends for 2010

Implications

So what can be learned from these past technological trends and what are some of their possible implications for future risk?

- **There have been substantial technological developments over the last century:** If technological change increases at a similar rate over the next fifty years, then this could have profound and unpredictable social, economic and political implications. It could also offer significant opportunities such as extensions to life expectancy or increasing renewable energy usage.
- **Developments in transportation have helped to revolutionise travel:** Short and long distance travel is now easier and more frequent than it has ever been throughout human history. As well as providing new opportunities in areas like tourism, there are also risks related to the spread of disease, border control and national security. Increased travel also has implications for climate risk as a result of CO_2 emissions.
- **Technological disasters have increased in frequency:** Coinciding with increasing advances and dissemination of technologies – particularly those related to transport and industry – there has been a reported increase in the prevalence of technological disasters. Using certain technologies can therefore risk causing personal injury though this can be mitigated with innovations in safety systems like the introduction of the seat belt in cars.
- **There have been dramatic advances in telecommunications, particularly ICT:** The spread of internet access across the world presents a vast array of opportunities for knowledge sharing. There are also, however, growing risks associated with this type of technology such as cyber crime that threatens peoples' privacy and financial security.

Towards some broad possibilities for the future

There have been momentous changes over the last hundred years – with developments over the past fifty being particularly pronounced. Since the 1960s economic development has gathered spectacular momentum in Asia, the world's population has risen at an unprecedented rate almost everywhere, energy consumption has grown almost exponentially, the temperature on the earth's surface has swollen considerably and technology has changed the face of interaction with the world around us.

If we transported ourselves back to the year 1900, and without knowing what we know now, could we have foreseen any of these developments? In the broadest sense we actually did – or at least a few individuals foresaw some of them. Consider for example the Russian Nobel Prize winning scientist Élie Metchnikoff who predicted in 1900 the substantial rise in life expectancy that was to come:

> *"In a hundred years, the average of life will be raised to sixty years, and…centenarians will be plentiful and hearty along the shady broad streets of the next century."*

Or the American civil engineer John Elfreth Watkins Jr. who at the turn of the century foresaw technological developments that sounded remarkably like the advent of television.

> *"Man will see around the world. Persons and the things of all kinds will be brought within focus of cameras connected electrically with screens at opposite ends of circuits, thousands of miles at a span."* [40]

These predictions provide hope that long-term visions of the future, however farfetched they may sound to their contemporaries can, occasionally at least, bear some general resemblance to future trends and events. History is of course also littered with predictions that turned out completely wrong like weather forecaster Michael Fish's famous assertion that a hurricane would not hit the UK in 1987 just hours before the worst storm for generations struck up and down the country. Yet without considering what the future might look like we will enter it blind and have no hope of being prepared. The best approach, as the failed weather forecast ably illustrates, is to consider and then prepare to face many different futures rather than rely on any single interpretation.

For the most part, however, people often base their future expectations quite rigidly on recent historical experience, which, in a rapidly changing world, may not always be the most sensible approach. In the following sections we seek to understand the extent to which public perceptions about future risks differ across regions of the world and pose the question: are people concerned about the right issues?

40 The Ladies Home Journal from December 1900, which contained a fascinating article by John Elfrith Watkins Jr. "What May Happen in the Next Hundred Years"

4. Current perceptions of future risks

> *What you see and hear depends a good deal on where you are standing; it also depends on what sort of person you are.*
>
> C.S. Lewis

> *The eye sees only what the mind is prepared to comprehend.*
>
> Robertson Davies

Our understandings of future risks are conditioned by "socially and culturally structured conceptions and evaluations of the world" around us.[41] This will, in part, be founded on recent personal experience as well as collective memories of key trends and events from the past. The claim that historical experience drives risk perception is crucially important, as the relative level of public concern about particular risks will shape the ability of individuals, communities and nations to respond to them. As Yale research scientist Anthony Leiserowitz notes, "public risk perceptions can fundamentally compel or constrain political, economic and social action to address particular risks"[42]. In other words, if the general public believes that certain potential hazards, like climate change for example, are a greater risk than others such as terrorism, then, other things remaining equal, governments and societies are likely to take stronger action to mitigate the former hazard rather than the latter.

In this section we look to shed some light on the current views of people globally towards emerging risks. To meet this aim we commissioned Ipsos MORI to poll members of the public across five countries, each in different continents. The results reported below reflect on the risks that the public are most worried about at this **present moment in time** as well as their general level of optimism regarding the future. The findings are a precursor to some more detailed research that we are undertaking on **future attitudes to risks** which will be published later on in the centenary series.

Headline findings

- The results suggest an interesting divergence in opinion between the developed and developing countries surveyed.
- Respondents from two of the developed countries (Great Britain and the United States) were most concerned about economic decline and rising income inequality and they were relatively pessimistic regarding their futures – with respondents from GB the most negative of all.
- By contrast, respondents from India and Brazil did not appear particularly worried about economic decline and nor did Brazilian respondents appear particularly concerned about income inequality.
- Rather than highlighting economic risks, respondents in India were most worried about overpopulation whilst Brazilian respondents were most concerned about fresh water shortages.
- Whilst respondents from the two developed countries were relatively pessimistic regarding their futures, respondents from India and Brazil were very optimistic, suggesting, perhaps, a real confidence in the ability of their countries to overcome some of the challenges that lie ahead.

41 Asa Boholm (1998), Comparative studies of risk perception: a review of twenty years of research, Journal of risk research, No. 1, Vol. 2, pp.135-16

42 A. Leiserowitz (2006), ***Climate change risk perception and policy preferences: the role of affect, imagery, and values*** http://environment.yale.edu/climate/files/LeiserowitzClimaticChange.pdf

About the survey

Results are based on a total of 2,678 interviews conducted in five countries: Australia, Brazil, Great Britain (GB), India and the United States (US) (c. 500 interviews in each). Countries were chosen to ensure a diverse mix of developed and developing nations from all corners of the globe. Fieldwork took place between 6 December and 19 December 2011. The survey was conducted using the Ipsos Global @dvisor omnibus service – a monthly online survey in 24 countries. Data have been weighted.

Please note that while data have been weighted, taking an online approach in countries where there is a lower level of internet penetration, such as India and Brazil, means that we cannot necessarily view the results as representative of the whole population. Rather, we should view the data as reflective of the views of a more educated, affluent or 'connected' group.

In reporting the results, we begin by highlighting key differences in opinions between countries, before articulating some of the possible explanations for these disparities. It should be noted however, that whilst we can be relatively confident that some of the reported differences in opinions between countries are "real", we cannot hope to "know" the reasons for this – the data is simply not deep enough to yield such insights. Therefore any proposed explanations for differences of opinions between countries represent (at best) untested hypotheses based on recently documented information. Such explanations are therefore only intended to provide an interesting context in which to view the survey findings.

The questionnaire

Respondents were asked to pick one risk from a list of twelve that they were currently most worried about. The list was chosen to reflect our analysis of past trends from Chapter 1, and then refined to ensure a limited set of options to keep the survey simple and easy for respondents to understand. The final list included the following options:

- Major terrorist attack
- Violent conflict
- Growing income gap between rich and poor
- Sustained economic growth
- Sustained economic decline
- Major worldwide outbreak of a disease, such as pandemic flu
- Big increase in the number of people who are over weight
- Major worldwide energy crisis
- Substantial global warming
- Increase in catastrophic weather events, such as a tsunami or hurricane
- Severe fresh water shortage
- Major cyber attacks on government and businesses' computer systems

Current concerns

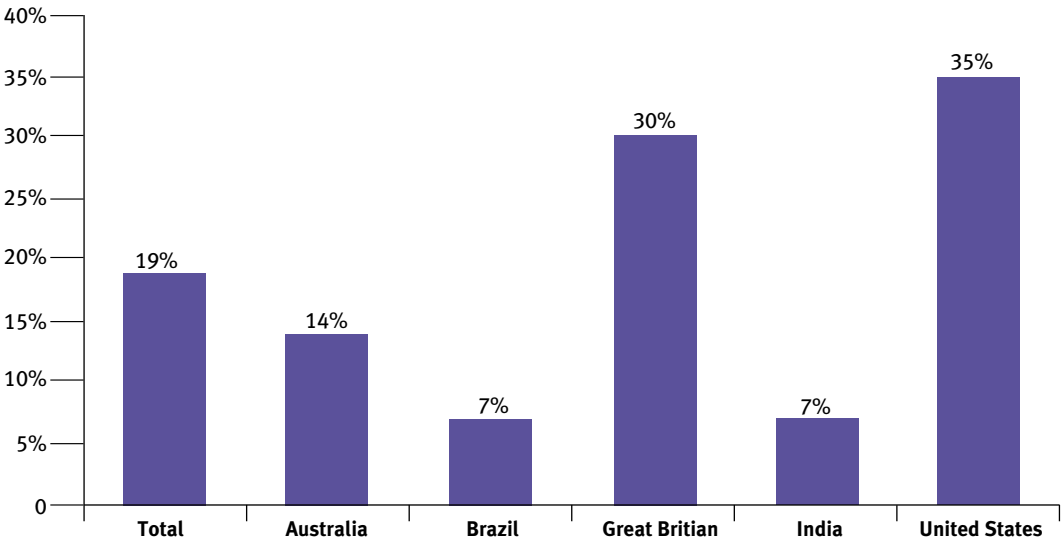
"It's the economy, stupid"

Sustained economic decline came out as the risk that respondents were most worried about. Nearly 1 in 5 of all respondents chose this risk, reflecting perhaps, the continuing uncertainty surrounding the global economic environment. However, there were significant differences in views across countries.

Approximately 1 in 3 people in both GB and the US were most worried about economic decline by comparison to less than 1 in 10 in Brazil and India. This result might reflect the different economic outlooks for both sets of countries. Whilst GB and the US continue to face substantial headwinds in the aftermath of the financial crisis, India and Brazil continue to grow at breakneck speed.

Interestingly, people in Australia – the other developed country surveyed as part of this study – appeared far less concerned about economic decline than their British and American counterparts with only 1 in 7 choosing this risk. Perhaps this is due to the relatively positive outlook for the Australian economy – growth of over 3% is predicted for 2012, putting it ahead of many other developed nations.[43] US GDP growth for 2012, for example, is only expected to touch 2%[44] – which, whilst obviously less than Australia and more than GB, seems particularly low when you consider that growth rates have been as high 8% over the last ten years.

Figure 35. Percentage of respondents most worried about sustained economic decline



Inequality

Approximately 1 in 7 people chose rising income inequality as the risk they were most worried about. Again there were important regional differences – though these differences were not as pronounced as they were on the subject of economic decline. Between 13% and 18% of respondents from Australia, GB, India and the US selected this risk with respondents from India selecting it most frequently (approximately 1 in 5). According to a recent OECD report, inequality in earnings has doubled in India over the past two decades and that around 40% of Indians live below the poverty line.[45]

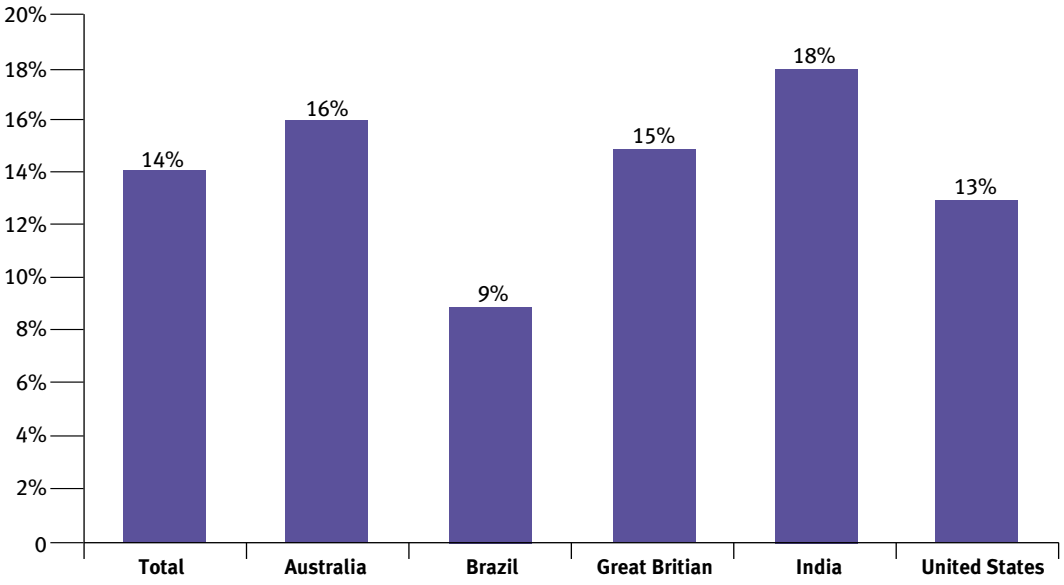
43 Sarah Mishkin, (Sept 2011) ***Australian GDP grows 1% in third quarter***, article for Financial Times http://www.ft.com/cms/s/0/cb0fb172-2085-11e1-9878-00144feabdc0.html#axzz1jEqosxnt

44 Story from Reuters (Dec 2011) ***Wall Street banks curb economic growth forecasts*** http://www.reuters.com/article/2012/01/10/us-usa-economy-sifma-idUSTRE8091RZ20120110 (accessed January 2012)

45 Story for the BBC News (Dec 2011) ***India income inequality doubles in 20 years, says OECD***, http://www.bbc.co.uk/news/world-asia-india-16064321 (accessed January 2012)

Respondents from Brazil were least concerned about rising inequality, with only 9% identifying this as the key risk. This result is interesting given that, until recently at least, Brazil had one of the largest income distributions in the world. Perhaps however, this result is a function of that fact that Brazil's level of economic inequality has actually been dropping at a faster rate than that of almost any other country. Indeed, between 2003 and 2009, the income of the poorest has grown seven times as much as the income of the richest. "Poverty has fallen during that time from 22% of the population to 7%. Contrast this with the United States, where from 1980 to 2005, more than four-fifths of the increase in Americans' income went to the top 1% of earners earners."[46]

Figure 36. Percentage of respondents most worried about a growing income inequality



Overpopulation

13% of all respondents said that overpopulation was the risk they were currently most concerned about. Respondents from India were particularly worried, with 1in 4 choosing this risk over anything else. Perhaps this is a function of India's burgeoning population which is projected to overtake China by 2030 and has grown at a rate of nearly 18% over the last decade. Whilst this rising population presents an undoubted economic opportunity, there is also concern of a "demographic deficit" with "millions of uneducated, unskilled and unemployed young people on the streets, angry and a threat to peace and social stability."[47]

Respondents from GB and Australia were also concerned about overpopulation with 16% of those sampled in both countries identifying this as the risk they are currently most worried about. With regards to GB, perhaps this is because of the common perception, reinforced by some recent indicators of overpopulation, that GB is already too densely populated.[48]

On the face of it however, the most interesting result is with respect to Australia, where concerns about overpopulation ranked joint-top, despite the country's relatively small population for its geographical size. Clues to explain this result can perhaps be found in 2010's Federal Election campaign were, according to come observers at least, both parties looked "to cash in on population fears."[49]

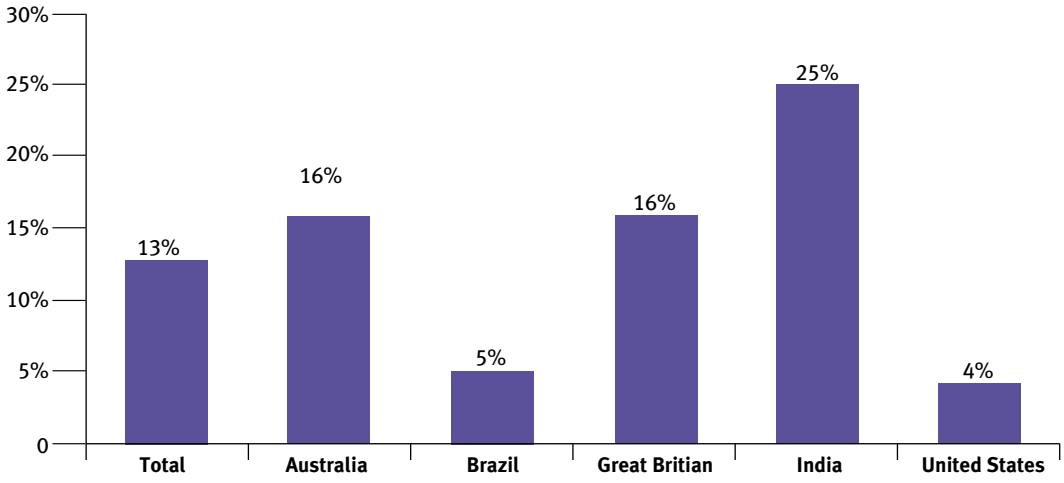
46 Tina Rosenberg (Jan 2012) ***To beat back poverty, pay the poor***, article for New York Times http://opinionator.blogs.nytimes.com/2011/01/03/to-beat-back-poverty-pay-the-poor/#more-75577 (accessed January 2012)

47 Soutik Biswas (March 2011) ***India's census: The good and bad news***, Article for BBC News: http://www.bbc.co.uk/blogs/thereporters/soutikbiswas/2011/03/indias_census_the_good_and_bad_news.html

48 Samira Shackle, ***Top 10: the world's most overpopulated countries***, article for the New Statesman http://www.newstatesman.com/blogs/the-staggers/2010/07/population-index-overpopulated (accessed January 2012)

49 Tim Blair, ***Too many people isn't going to kill us***, article for the Australian Daily Telegraph, http://www.dailytelegraph.com.au/news/opinion/too-many-people-isnt-going-to-kill-us/story-e6frezz0-1225876147760 (accessed January 2012)

Figure 37. Percentage of respondents most worried about over population



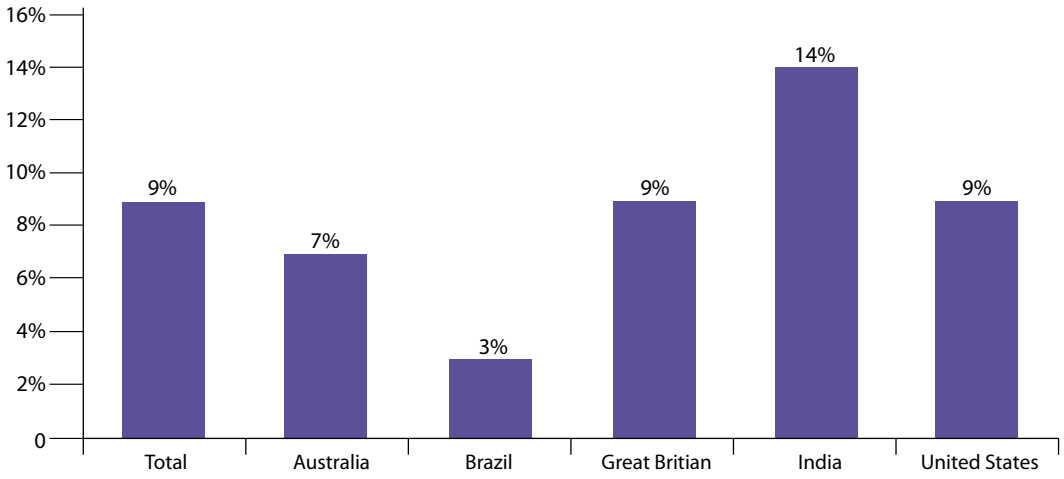
Major terrorist attack

The forth key risk which respondents were most worried about is the threat of a major terrorist attack with roughly 1 in 10 choosing this option. Respondents from India were most concerned about the threat of terrorism followed by respondents from GB and the US. The fact that respondents from these countries appeared most worried about the risk of terror is perhaps reflected by their recent experiences. India, for example, and particularly Mumbai has been subject to a number of severe terrorist attacks over the last decade whilst for GB and the US, 9/11 and 7/7 are still fresh in the memory.

Respondents from Brazil appeared to fear terrorism the least, with just 3% identifying it as the key risk despite the fact that Brazil is due to hold the World Cup in 2014 and Olympics in 2016. This result may be a function of the fact that Brazil, officially at least, "has no terrorists" as it is one of a group of Latin American countries to have refrained from adopting anti-terror laws. Princeton law professor Kim Lane Scheppele explains that; *"these [i.e. Latin American countries] are places that had civil wars…where the country ripped itself to pieces trying to fight terrorist organizations. Once they got out of it and managed to put in place a democratic system, they said 'never again.'"*[50] However, whilst respondents from Brazil did not appear particularly worried about terrorism (or at least a certain conceptualisation of it), they were concerned about the associated prospect of violent conflict with 1 in 10 citing this as the key risk facing their country.

50 Juliana Barbassa (March 2011) ***Brazil terrorism laws: No one is a terrorist***, article for Huffington Post: http://www.huffingtonpost.com/2011/09/03/brazil-terrorists_n_947784.html (accessed January 2012)

Figure 38. Percentage of respondents most worried about terrorism



What about the environment?

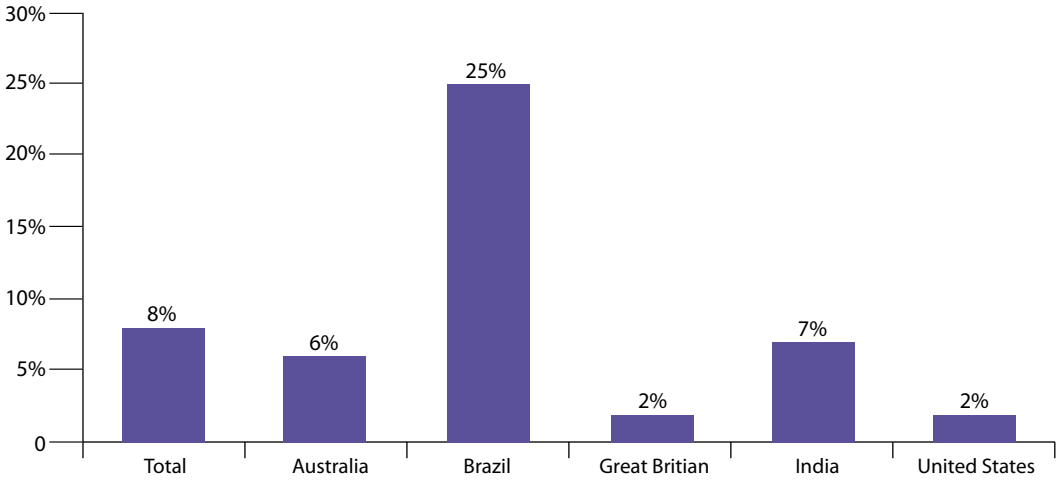
For the most part, few respondents chose environmental risks such as climate change, catastrophic weather events or energy crises as the main risk facing their country. The exception here is the risk of a **severe fresh water shortage** – the top risk according to respondents from Brazil. A quarter of Brazilians said that this risk caused them the greatest concern by comparison to only 1 in 14 of respondents in India and Australia.

Concerns raised by Brazilian respondents perhaps reflects their history of water shortages particularly in the Northeast region, where frequent droughts are a major problem, and whilst subterranean water is an alternative, it is generally very salty because of rocky soils. Indeed, according to one government official, water in these wells has an average of about 3,000 parts per million of salt, three times what the World Health Organisation considers suitable for human consumption.[51]

Parts of India have also experienced frequent fresh water shortages, but it seems as though our survey respondents prioritised other risks such as over population, rising income inequality, and the threat of terror first. It should be noted however, that these risks are not mutually exclusive and have many interlinkages. For example, a substantial rise in population could put greater pressures on national infrastructure including universal access to fresh water. Therefore access to fresh water might still be a serious concern for many of our Indian respondents, but the results were unable to pick this up.

51 Mario Osava **(Feb. 2007) Clean Water - Hold the Salt**, article for Inter Press Service, http://ipsnews.net/news.asp?idnews=36421 (accessed January 2012)

Figure 39. Percentage of respondents most worried about severe fresh water shortages

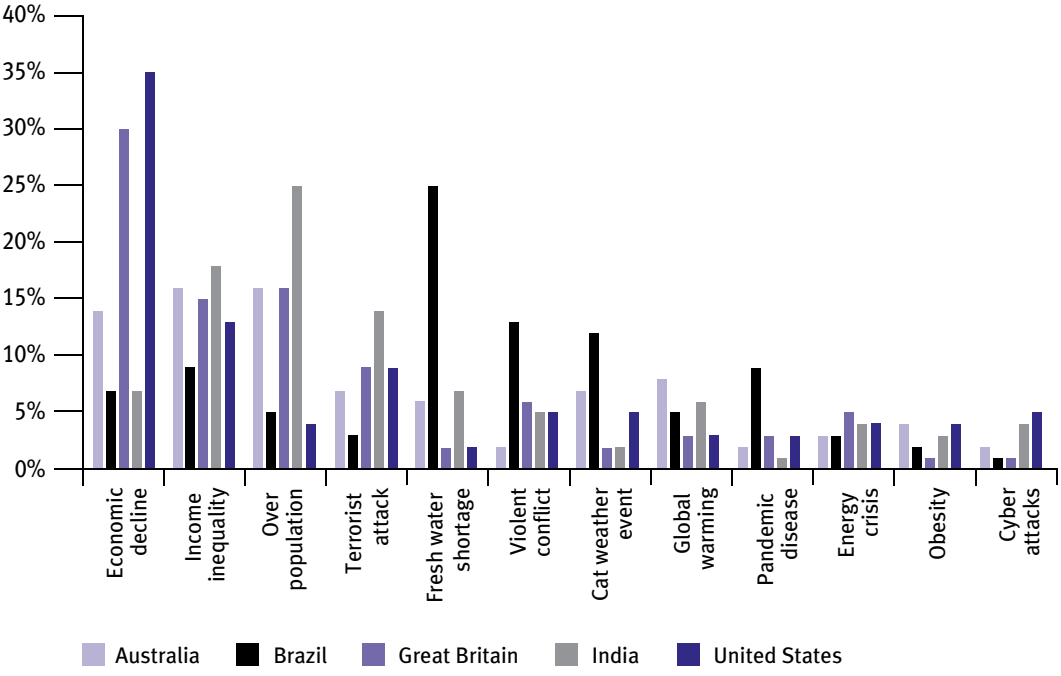


"The unholy trinity" – pandemic flu, obesity and cyber attacks

These were the risks least chosen by respondents – though 9% of Brazilian respondents were concerned about flu which perhaps reflects their recent exposure to the Swine Flu epidemic. Cyber attacks and rising obesity came last, which could be because they are perceived as long-term concerns – not immediate threats like terrorism or economic decline. This proposition will be investigated further in future reports within our centenary series.

Overall results

Figure 40. Participants were asked which one of the following, if any, are you most worried about in your country at the present time?



Optimism about the future

As well as seeking to identify current perceptions on emerging risks, we also asked respondents a general question about their optimism for the future – specifically over the next forty years.

Across the whole of our global sample, more people were optimistic (57%) than pessimistic (33%) though there were substantial differences between countries.

Respondents from India were overwhelmingly the most optimistic (88%) of which half answered "very optimistic" and only 8% pessimistic. Brazil was the second most optimistic country with 59% of respondents optimistic and 23% pessimistic. These results suggest, perhaps, that despite concerns over emerging risks, respondents from both countries believe that their country will be able to ride out whatever storms come their way over the course of future generations.

By contrast, GB is overwhelmingly the most pessimistic country – the only country where more people sampled were pessimistic (53%) about their long-term future than optimistic (36%). Indeed the most pessimistic demographic group across the entire sample was British citizens aged between 50 and 64 – with 63% of this group pessimistic. The results for GB suggest that respondents from this country, and particularly the older generation, are unconvinced that GB will be able to prevail in the face of some of the headwinds outlined above. Even the US, another developed country with serious question marks over its future economic prospects, is more optimistic (50%) that pessimistic (42%).

The young and well educated are the most optimistic group about their future. Across our global sample, 63% of those aged 35 or under are optimistic about their country's long-term future by comparison to 49% of 50-64 year olds. Similarly, 73% of those that are highly educated are optimistic by comparison to 49% of those that are less well educated. Interestingly these demographic differences do not seem to influence the results with regards to participants from India, where changes in age and education did not impact upon the level of optimism.

Implications

The results suggest an interesting divergence between the developed and the developing countries surveyed. Participants from two of the developed countries (GB and the US) were most concerned about economic decline and rising income inequality and they were relatively pessimistic regarding their futures – with respondents from GB particularly negative.

By contrast, respondents from India and Brazil did not appear particularly worried about economic decline and nor did Brazilians appear particularly concerned about income inequality. Rather than highlighting economic risks, respondents in India were most worried about overpopulation whilst Brazilians appeared most concerned about fresh water shortages. In response to these risks, whilst the two developed countries seemed relatively pessimistic regarding their futures, respondents from India and Brazil appeared optimistic, suggesting, perhaps, a real confidence in the ability of their countries to overcome some of the challenges that lie ahead. For detailed results please see Appendix A.

5. Concluding remarks: questioning underlying assumptions

> *The key to success is to risk thinking unconventional thoughts. Convention is the enemy of progress. If you go down just one corridor of thought you never get to see what' s in the rooms leading off it.*
>
> Trevor Baylis, inventor of the clockwork radio

Is it right for the UK to be more concerned about sustained economic decline than a major terrorist attack, global warming or an energy crisis? Should India be more concerned about over population than pandemic disease or a significant cyber attack on government and businesses? These questions are of course difficult to answer, especially without a considered understanding of the possible impact and likelihood of the various risks occurring which are both, in turn, likely to change over time. It is therefore vital that key decision makers continually reassess which risks should be prioritised from one moment to the next.

As the earlier historical analysis showed, the pace of change can be fast and brutal – evidenced by the unprecedented transformations in the nature of demographics, politics, economics, technology and the environment over the past 50 years. In such a dynamic environment it is vitally important to question underlying assumptions about the world in which we live and continue to re-evaluate the prevailing wisdom. History is littered with failures to do so resulting in dangerously overt confidence in spurious forecasts. Consider for example, Gordon Brown's now infamous assertion about the "end of boom and bust" before the onset of the financial crisis which is eerily reminiscent of Irving Fisher's declaration that stocks had reached "a permanently high plateau" before the great Wall Street Crash of 1929.

The choices made by our survey respondents to prioritise certain risks over others may therefore be right today but hopelessly inadequate tomorrow. Not only is the relative likelihood and impact of an event likely to change, but so are the number of events themselves. For example, a risk register from the 1960s could not possibly have included "cyber risk" given that the concept did not even exist at the time. The following tongue twisting quote from Donald Rumsfeld neatly sums up the types of uncertainness facing long-term forecasting.

> *[T]here are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – there are things we do not know we don't know.*
>
> Donald Rumsfeld, United States Secretary of Defense

Worries about "unknown unknowns" should not however prevent us from developing some narratives on the long-term future, but merely ensure that we do not become overly confident and dependent upon them. Used well, such futurology can actually help question underlying assumptions about the value we place on certain risks and help us prepare for the unexpected. In this context, our next report in the series will look at some possible **socioeconomic futures**. Experts in economics, financial services, technology, international relations and beyond will set out diverse and compelling narratives on possible future risks as well as opportunities facing governments, industries, societies and populations. We will also be revealing further results from our international survey of risk perceptions.

6. Appendix

Appendix A: Full survey questions and results

Q1. Which one of the following, if any, are you most worried about in (Country) at the present time?	Total	Australia	Brazil	Great Britain	India	United States
Base: All Respondents	2678	527	523	540	503	585
	%	%	%	%	%	%
Sustained economic decline	19	14	7	30	7	35
Growing income gap between rich and poor	14	16	9	15	18	13
Over population	13	16	5	16	25	4
Major terrorist attack	9	7	3	9	14	9
Severe fresh water shortage	8	6	25	2	7	2
Violent conflict	6	2	13	6	5	5
Catastrophic weather event, such as a tsunami or hurricane	5	7	12	2	2	5
Substantial global warming	5	8	5	3	6	3
Major worldwide outbreak of a disease, such as pandemic flu	4	2	9	3	1	3
Major worldwide crisis in the supply of energy.	4	3	3	5	4	4
Big increase in the number of people who are over weight	3	4	2	1	3	4
Major cyber attack on government and businesses' computer systems	3	2	1	1	4	5
None of these	3	7	3	4	1	3
Don't know	4	6	3	4	3	6

Q2. How optimistic or pessimistic would you say you are about the future of (Country) over the next 40 years?	Total	Australia	Brazil	Great Britain	India	United States
Base: All Respondents	2678	527	523	540	503	585
	%	%	%	%	%	%
Very optimistic	22	11	34	5	51	11
Somewhat optimistic	35	41	25	31	37	39
Somewhat pessimistic	23	26	17	37	6	27
Very pessimistic	10	10	6	16	2	15
Don't know	10	12	17	11	3	9
Optimistic	57	52	59	36	88	50
Pessimistic	33	36	23	53	8	42

Appendix B: Statistical reliability

When comparing results across different countries differences may be "real" or may occur by chance (because not everyone in the country was interviewed). To test if the difference is a real one – i.e statistically significant, we have to know the size of the samples, the percentage of respondents giving a certain answer and the degree of confidence chosen (confidence interval). If we assume a "95% confidence interval", the difference between the two sample results must be greater than the values given in the table below:

Size of sample compared	Differences required for significance at or near these percentage levels		
Percentage levels	10% or 90%	30% or 70%	50%
500 and 500 (sample size used for this survey)	+/-4	+/-6	+/-6
1,000 and 1,000	+/-3	+/-4	+/-4

If results differ by more than 4 percentage points for samples of 1000, we can be pretty confident that the difference is real, compared to 6 percentage points needed if we were to use samples of 500.

Please note that in addition to sampling error, question wording and practical difficulties in conducting surveys (especially international ones) can introduce bias into the findings of opinion polls such as this.

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