Background information - Megatrends

PLACARD Foresight Workshop - How can foresight help to reduce vulnerability to climate-related hazards?

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The following pages provide an overview about possible relevant Megatrends (possible key drivers) that might have implications on CCA and DRR research.

The project team tried to provide key elements of the selected megatrend and identify possible Drivers, Trends, Implications for society, Implications for CCA and DRR, Wildcards and the relevant References.

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Urbanization greatly accelerates with large regional disparities

Nowadays, half of the world’s population already lives in cities. According to several estimates, this figure is expected to rise to around 70% by mid-21st century. Nevertheless, such urbanization increase will not be constant throughout the globe, but will rather showcase important regional disparities. The largest growth will take place in Asia, Africa, and South-America. For instance, 11 megacities of more than 10 million inhabitants are predicted to appear in China and India alone, by 2050. Although cities occupy only 0.5% of the world’s surface, they consume more than 75% of its natural resources. The rapidly increasing urbanization poses serious issues for cities, which will have to build appropriate infrastructure and answer challenges related to the greater need for living space, rising energy consumption, expanding waste volumes and increased air pollution. Addressing these issues will create important business opportunities and will enhance the power of cities within their country.

**Drivers**

- Population increase
- Industrialization of the global South
- Agricultural mechanization
- Environmental degradation
- Economic development
- Increased attraction of urban areas

**Trends**

- Large increase of urbanization
- Regional disparities: greater increase in developing world than in developed regions

**Implications for society**

- Requires “megaprojects” to build city infrastructure and support new trade flows
- Cities might become as powerful as nations

**Implications for CCA and DRR**

- Increased vulnerability of urban infrastructure and urban dwellers (informal settlements)
- Increased environmental pressures (particularly when developing new infrastructure)

**Wildcards**

- Context-specific drivers of urbanization
- Dystopian urban future (slums & informal economy vs civilization’s global urban renewal (green infrastructure, smart technology, ...)
- Disruptive technologies

**References**

- Pwc, 2013. Five megatrends and possible implications.
Technological Change (technological breakthroughs)

The pace of technological change, particularly in the fields of information, communication, nano- and bio-technologies, is unprecedented. This provides opportunities to reduce humanity’s impact on the environment and reliance on non-renewable natural resources, while improving lifestyles, stimulating innovation and green growth. (EAA, 2015) “The combination of the internet, mobile devices, data analytics and cloud computing will continue to transform our world. Many companies across all sectors are grappling with how these developments will affect consumer expectations, the way they interact with their customers and the underlying business models that support this.” The following graphic showcases a survey among CEOs on megatrends and the top global megatrends they believe will transform their business over the next five years. (PWC, 2016).

PWC identified in their analysis the following eight essential technologies a) Internet of things, b) Augmented reality, c) Virtual reality, d) Blockchain, e) Artificial intelligence, f) 3D printing, g) Drones and h) Robots

Drivers
- Access to services
- Increased demand and comfort with technology
- Economic development
- Education, skills

Trends
- Global economic growth
- Cheaper access to technology
- Globalisation of technology
- Innovation is becoming more global
- Multiplier effect of technology
- Digital connectivity for everyone to everything, anywhere and at anytime
- Tools for analysing and using digital data in new ways

Implications for society
- Creation of new job categories, but maybe slower job growth
- Business-opportunities

Implications for CCA and DRR
- Environmental pressure and unsustainable use of resources
- Decreasing vulnerability of people and society
- Improved early warning and planning due to better technology used in vulnerable areas e.g. coastal areas, riverbanks, cities

Wildcards
- Least Developed Countries may not be able to start catch-up process
- Elderly people less vulnerable due to improved health-care
- Elderly people more vulnerable due to high prices of health-care
- New complex challenges due to unknown effects of new technologies (GMOs, nanoparticles)

References
- PwC, 2016, Tech breakthroughs megatrend: how to prepare for its impact
- WEF, 2015, 6 technology mega-trends shaping the future of society, Hans Brechbuhl, Executive Director, Center for Digital Strategies, Tuck School of Business, Dartmouth College
Economic development to continue but economic power to shift

The financial crisis of 2008 and 2009 significantly reduced economic output in many developed countries, particularly in Europe. While its continuing impacts are apparent in less optimistic long-term economic projections for Europe, virtually all mainstream outlook studies foresee economic expansion globally in the coming decades as Asia’s huge populations continue their shift to Western patterns of production and consumption (EEA, 2014). Popular projections on economic development can change quickly – they have been downscaled regularly due to the economic/financial crisis. Global inequality may decrease in the 21st century, as the remaining nations could start to catch up (Hellebrandt and Mauro, 2015), but current trends are contested. The relationship between economic growth and resource use (decoupling, green growth) is uncertain but can be influenced by policies. Projections only provide insights into how an economy may develop if the underlying assumptions hold true. Even if the income gap would not decrease, much greater reductions in inequality in health and education may continue, in part because measures such as life expectancy and years of schooling have upper bounds to which countries eventually converge.

Drivers
- Increasing demand
- Technology development
- Trade, tax, environmental and other government policies
- Research and development
- Maturity of financial markets, business-friendly institutions
- Environmental degradation (inhibitor)
- Education, skills, cultural traits

Trends
- Continued but uneven economic growth
- Towards a multipolar world
- Shift of power to developing countries (Asia)

Implications for society
- Increased wellbeing for many societal groups
- Adaptation to lesser role of Europe and other OECD countries

Implications for CCA and DRR
- Increased vulnerability of remaining poor
- Increased environmental pressures (including climate change)

Wildcards
- Regional or global geo-political or economic conflicts
- Stability of financial markets
- Decoupling growth from resource consumption
- Boost by novel technologies
- LDCs may not be able to start catch-up process

References
- IMF. World Economic Outlooks
Growing and ageing population

The global population doubled to 7 billion in the last half century and will continue growing fast in coming decades that may reach beyond 9.7 billion (UN, 2015) by 2050.

In advanced economies, populations are ageing and in some cases reducing in size, while growing and younger populations are occurring in developing-world urban areas. Although regional trends differ markedly, the distribution and structure of populations is affected by migration, as people move in search of higher earnings or to escape conflict or environmental degradation.

A global growing population poses serious challenges in term of social issues; employment, health, education, sustainability of living standards in an ageing population and an increasing affluent middle class, together with environmental challenges that are exacerbated by an increase in demand which always puts more pressure on natural resources.

Drivers:
- Fertility and mortality
- Economic development
- Education
- Access to services
- Migration

Trends:
- Global population growth
- Ageing population
- Shifting migration pattern

Implications for society
- Economic and environmental impacts of expanding work-forces
- Challenge to ensure employment opportunities (young and fast-growing workforces)
- Threats to social cohesion
- Increase burdens of ageing population
- Create age friendly-environment (new market opportunities)
- Elderly active workforces, caregiving and volunteering

Implications for CCA and DRR
- Environmental pressure
- Unsustainable use of resources (scarcity of food and water)
- Adaptation and mitigation programmes
- Migration
- Greenhouse gas emissions will increase in developing countries
- Increase vulnerability of people and society to CC and disasters
- Elderly people more vulnerable to CC (e.g. heatwaves, extreme weather events), at

By midcentury, there will be more people on this planet over 60 than under 15 years old. (WEF, 2015)

Africa is the most youthful continent in the world. Today half are aged under 20 years. By 2050 this median age will have risen to 25.

In 2050, 27% of the European population is projected to age 65 and over.
- Risk of poverty (unsustainability of pension and healthcare system)
- Vulnerable areas; coastal areas, riverbanks, megacities, poor urban planning...

**Wildcards**

- Geopolitical tensions and conflicts
- Global economy turmoil
- Decline of fertility (family planning and contraception in Africa)
- Major pandemic
- Population ageing as a supremely powerful market driver (WEF, 2015)

*The geographical distribution of the world population will encompass significant adjustment. Africa’s contribution will expand from 9% in 1950 to 39% in 2100. (UN Population Division 2012)*

**References**

- UN, 2015. World population prospects: the 2015 revision, United Nations Department of Economic and Social Affairs, New York, US.
Changing disease burdens and risks of pandemics

“The global burden from non-communicable disease now outweighs that from communicable disease. This has been influenced by increase ageing, and by rapidly changing economic and social conditions. Nonetheless, the threat of global pandemics continues, partly driven by increasing mobility. Around a quarter of the burden of disease and deaths are attributable to environmental causes. The effects of climate change are likely to exacerbate this” (EEA, 2014).

Drivers
- Environmental degradation
- Climate change
- Increased urbanization
- Increased mobility
- Increased migration

Trends
- Great increase of non-communicable diseases (notably cancers and diabetes)
- Spatial heterogeneity of communicable diseases (global South much more impacted), but overall decrease (notably HIV/AIDS)
- Pandemics are threatening public health emergency, although no clear trends in future development
- Growth of health inequalities, particularly in developing countries, between urban and rural areas

Implications for society
- Increased poverty
- Challenged health care systems and countries’ economy
- Increased inequalities

Implications for CCA and DRR
- Increased vulnerability of the population (diabetes increase heat-related vulnerability)
- Closely linked to extreme climatic events and natural disasters

Wildcards
- Technological change and medical advances
- Rise of “new” diseases and drug-resistant diseases strains
- Healthcare 2.0 and people’s lifestyle
- Unexpected effects of nature-based solutions (at local level)

References
Pressures on ecosystems, environmental pollution and climate change

Continuous growing pressures on ecosystems are driven by the combination of climate change with rising global population associated to its demands for food, mobility and energy, as well as its evolving consumption pattern. As a consequence, the observed and projected trends show an increase in global biodiversity loss and ecosystem degradation. Environment degradation exacerbated by climate changes and continuous pollution from human activities are affecting economic growth, menacing global food security, threatening human health, well-being and infrastructures, increasing regional inequality and intensifying natural hazard risks. Climate change and environmental impacts of human activities should be reduced through efficient international adaptation and mitigation measures.

Drivers
- Population, consumption, and economic growth
- Food and bioenergy
- Competition for land and water (land grabbing)
- Pollution induced by human activities: fossil-fuel combustion, fertilizers and pesticides in agriculture, growing use and complexity of chemicals

Trends
- Air pollution, release of pollutants to aquatic systems and soils
- Ecosystem degradation
- Loss of global biodiversity (terrestrial and marine)
- Conversion of ecosystems for agriculture, forestry and infrastructure (Forest, drylands and wetlands)
- Overfishing, nutrient pollution, eutrophication, hypoxia, ocean warming and acidification, coral bleaching
- Global and regional changes in temperatures (global mean temperature increase), precipitations, sea-level rise and changes in intensity and frequency of extreme events
- Alien plant species colonization

Implications for society
- Reduction of human health and well-being and economic activities
- Negative impacts on global agricultural productivity
- Escalating competition for food, water and other natural resources
- Regional instability
- Increase risk of conflict
- Unequal distribution of impacts
- Increase risk costs and exposure
- Increase of environmental migrants

Implications for CCA and DRR
- Loss/reduction of ecosystem services (provisioning, regulating, cultural services)
- Reduced CC mitigation potential and adaptive capacity (carbon sink, coastal protection, landslide...)
- Increase risk exposure (coastal erosion, floods, drought, extreme events...)

Global fertiliser use is projected to increase markedly during the 21st century, from around 90 million tonnes in 2000 (Winiwarter et al., 2013) to potentially more than 150 million tonnes in 2050 (FAO, 2012).

From 1990 to 2010, annual global emissions from fossil fuels rose by 50%, from around 6 billion tonnes to almost 9 billion tonnes (UNEP, 2012).
Wildcards

- Change in current lifestyles and diet patterns (Springmann et al., 2016), entomophagy (FAO, 2013)
- Change to global sustainable agriculture practices (permaculture)
- Change in legislative frameworks and policies
- Increase in oil price (shift from global to local economy)
- Technological advances, rapid development of competitive alternative energy technologies
- Uncertainties, complex system with nonlinear ways of interactions, ecosystem tipping points thresholds, cascade effects, melting of gas hydrates
- Too conservative scenarios of projected changes (temperature, precipitation, sea level)
- Multipolar world governed by populist climate-deniers

References

- UN, 2015. World population prospects: the 2015 revision, United Nations Department of Economic and Social Affairs, New York, US.

Global terrestrial biodiversity will decline by at least another 10% by 2050 (OECD, 2012).

Projected Impacts on Crop Yields in a 3°C Warmer World (WEF, 2016)

Meat consumption is expected to increase by more than 70% globally between now and 2050 (FAO, 2012).
There are sufficient natural resources at a global level to well into the future, but distribution is unequal and price development uncertain

As they grow, economies tend to use more resources — both renewable biological resources (e.g., food, water) and non-renewable stocks of minerals (e.g., for fertilizer), metals and energy (e.g., fossil fuels). Industrial and technological developments and changing consumption patterns associated with growing prosperity all contribute to this increase in demand. The world is a closed material system, implying finite limits on the amounts of resources available. Even if they are not scarce in absolute terms, resources may be unevenly distributed globally, making access uncertain and potentially fostering conflict. Climate change will make it more difficult to produce food in the same ways and same places as in the past. Innovation plays a complex role in shaping the demand for and supply of resources. Ground-breaking technologies can create new uses for resources and new ways to locate and exploit deposits, but also enable societies to reduce their use of finite and polluting resources and shift towards more sustainable alternatives (EEA, 2014). Main paradigms driving decisions are fragmented and sometimes conflicting: threats of material exhaustion, concern about rising costs, long-term abundance, and social injustice focused on distributional challenges (WEC, 2014). Political, economic, and social interconnections are critical but often underestimated.

Drivers
- Rate and structure of economic development
- Technological development and innovation
- Policies, prices
- Environmental change
- Population growth (less important)

Trends
- Global growth in resource consumption
- Increasing efficiency, but maybe insufficient
- Increasing prices, but variable across resources

Implications for society
- Risk of price volatility
- Risk of conflicts over land, water, other resources
- Implications for employment
- Unequal distribution

Implications for CCA and DRR
- Increase in environmental pressure due to scarcity of renewable biological resources (land, water, bio-energy)
- Increased vulnerability of population in resource scarce areas with increasing water demand, e.g., communities dependent on groundwater-irrigated agriculture

Wildcards
- Steep price increases/decreases
- New demands, new pressures
- New technologies, new opportunities

References
- EEA (2014) Assessment of global megatrends — an update. Global megatrend 7: intensified global competition for resources. EEA, Copenhagen, Denmark
- UNEP. Assessment reports of the International Resource Panel
Large scale involuntary migration greatly accelerates with large regional socioeconomic disparities, conflicts and environmental pressures

**Large-scale involuntary migration** includes forced migration caused not only by violence and conflicts, but also for environmental or economic reasons. Global refugee flows have reached a level that is unprecedented in recent history. In 2014, 59.5 million people were forcibly displaced in the world, compared to 40 million at the time of World War II. The trend is **upwards**: during 2014, the number of people displaced – 42,500 per day – was four times greater than in 2010. Although the recent crisis in Europe has dominated headlines, the challenge is global with most regions affected (WEF 2016).

Since the 1960s, there has been a trend of migration from less developed to more developed regions. In 2010, however, the **growth rate of the international migrant stock in developing countries surpassed that of developed countries for the first time** (e.g. Kuwait, South Africa and Thailand).

The world population may rise beyond 9.6 billion by 2050, despite the rate of growth slowing. Most of the increase will occur in developing-world urban areas. Growing and younger populations in the developing world, the global growth of an affluent middle class, and ageing populations in developed countries will affect resource use and the environment. **Such unequal developments are likely to increase migration**. Europe, with an ageing population, could face pressure from and for immigration. Economic growth also impacts migration patterns, as **development discrepancies seem to be a driver of migration**. Although **economic and social motives are still key drivers for migration**, environmental degradation and **climate-change impacts are becoming increasingly important** due to increased exposure to natural hazards and the corresponding threats to livelihoods (EEA 2014).

Moreover the average duration of displacement lengthened from nine years in the 1980s to 20 years by the mid-2000s. Less than one in 40 conflicts is now resolved within three years and more than 80% last for more than 10 years. However, the institutional architecture for refugees focuses on providing a short-term response to people displaced by conflict and violence and the Geneva Convention does not cover environmental migrants, whose numbers are expected to rise for reasons explored above (WEF 2016).

**Drivers**
- Unequal economic development
- Unequal social development
- Demographic shifts
- Continued ecosystem destruction
- Environmental degradation
- Climate change
- War and conflict
- Governance and religious issues

**Trends**
- Increase global migration flows
- Increase migration flows ‘within’ developing regions
- Increase environmental/climate migration flows

**Implications for society**
- Environmental pressures
- Fuel for multiple risks in host and destination countries (including cross-border tensions)
- Large scale migrations from rural areas will power urbanization growth
- Migration and immigration will have profound impacts on workforces and economic development

**Implications for CCA and DRR**
- Increased vulnerability of urban infrastructure and urban dwellers (informal settlements)
Increased environmental pressures (particularly when developing new infrastructure)

Wildcards
- Due to the high degree of complexity and uncertainty in calculations, projections for climate change-induced migration by 2050 vary from 25 million people to one billion people

References
- Pwc, 2013. Five megatrends and possible implications.

Diffusion of Power
The diffusion of power among countries will have a dramatic impact by 2030. Asia will have surpassed North America and Europe combined in terms of global power, based upon GDP, population size, military spending, and technological investment. China alone will probably have the largest economy, surpassing that of the US a few years before 2030. In a tectonic shift, the health of the global economy increasingly will be linked to how well the developing world does — more so than the traditional West. In addition to China, India, and Brazil, regional players such as Colombia, Indonesia, Nigeria, South Africa, and Turkey will become especially important to the global economy. Meanwhile, the economies of Europe, Japan, and Russia are likely to continue their slow relative declines.

The shift in national power may be overshadowed by an even more fundamental shift in the nature of power. Enabled by communications technologies, power will shift toward multifaceted and amorphous networks that will form to influence state and global actions. Those countries with some of the strongest fundamentals—GDP, population size, etc.—will not be able to punch their weight unless they also learn to operate in networks and coalitions in a multipolar world. (US National Intelligence Council, 2012) What will ultimately decide the fate of any country is how well it adapts to the new nature of globalized networks. Having the most money or people won’t necessarily keep a country powerful if others are more adept at staying connected to data and resources.

“Emerging powers ... are no longer policy takers. These countries now increasingly influence the pattern and scope of international trade, creating new supply demand pulls flexing their in organizations.” (Pascal Lamy, Director-General, WTO)

Drivers
- Shifts of economic power and globalisation
- Decrease/Increase of military power
- Technological change
- Education
- Population growth (less important)
Trends
- Technological investment
- Improved and new communication technologies

Implications for society
- Risk of conflicts over land, water, other resources
- Implications for employment
- Unequal distribution

Implications for CCA and DRR
- Instability for citizens and management of extremes
- Increased/decreased vulnerability of population in access to e.g. resources like water, food

Wildcards
- Steep price increases/decreases
- New demands, new pressures
- New technologies, new opportunities
- New conflicts and risks

References
- EY 2015, Megatrends 2015 – Making sense of a world in motion