Disasters and Existential Risks

Things that may interest you

- The 2011 earthquake and tsunami in Japan cost the same to deal with ($210bn) as the GDP of nations like Vietnam, Peru, Portugal or New Zealand.
- In 2016 China had 1 climate, 3 landslide/earthquake, 16 rain/flood and 14 weather disasters. USA had 4 climate, 1 landslide/earthquake, 7 rain/flood and 14 weather disasters. Two very vulnerable superpowers.
- Humanity could have been destroyed in nuclear close calls at least 11 times since 1950, and 54 nuclear weapons have been mislaid – 11 from USA and others from Russia and elsewhere.
- The flu epidemic of 1918-19 infected 35% of the world's population, killing 50-100m people, particularly young adults. Scaled up to today's population it would kill 225-450m people.

Disasters

The world is more vulnerable than ever to disasters. They seriously affect communities, economies and ecosystems. Impacts are escalating due to rising population densities, land-use change, climatic and environmental problems that intensify storms, floods, droughts and landslides, and technologies that can create large-scale toxicity or radiation problems (oil tankers, industrial and nuclear sites).

UNISDR, the UN disaster-readiness department, values disaster losses between 2004 and 2014 to be around $1.4tn (that is,

$1,400bn). Disasters in richer countries (North America, Europe and Japan) cost more, since reconstruction is expensive and complicated. In middle-income countries such as Chile, Turkey, Russia or China, disasters impact heavily on economies, affecting financial reserves, tax take, industry, farming, exports, development programmes and social spending. In poorer countries such as Pakistan, Nigeria, Laos or Honduras, impacts can be catastrophic for inhabitants, infrastructure and ecosystems – only foreign aid can assist them.

Disasters are relatively localised yet their knock-on effects on economies, insurance costs, supply-lines, food supplies and trade can extend globally. Disaster-relief is an expanding sector yet it is underfunded, especially for drawn-out disasters connected with such things as wars or droughts. A disaster in Houston gains dramatic international media coverage but one in Puerto Rico gets just a mention. While the number of deaths in disasters has decreased since the early 20th Century, costs have escalated dramatically, peaking globally at $364bn in one rather intense year in 2011.

Two key issues apply here: 1. *readiness* – making buildings and infrastructure disaster-proof, reducing concrete cover in cities, readying rivers for floods, establishing contingency funds, preparing equipment, training personnel, improving reconstruction and rehabilitation methods, relocating vulnerable people, increasing forestry and modifying farming patterns; and, 2. *reduction of ecological degradation* that causes and amplifies disasters – deforestation, river-straightening, mangrove depletion, monocultural farming, pollution, bad urban planning, and so on.

A key risk is a series of localised disasters in quick succession, which can undermine the world economy, affect essential supplies and stretch disaster-response resources, facilities and funds. The human and geopolitical outcomes of disasters encompass migration, famine, disease, conflict and refugee camps the size of cities.

Disasters are becoming an increasingly regular feature, and post-disaster responses are critical: the more that disaster zones are left without proper reconstruction and remediation, improving their resilience, the more that migrants, public health risks, failed states, terrorism, crime, pollution, unrest and other problems will increase and spread.

Much progress has been made in disaster response, especially since the definitive Indonesian tsunami of 2004. By the time of Cyclone Haiyan in the Philippines in 2013, international disaster response was highly effective. But ground-level first response rests still with locals, volunteers and organisations. Resilience-building in the form of survival training and strengthening community cooperation is crucial in carrying impacted localities through the first vital days before roads, phone networks, supplies and skilled personnel can start operating. Here, poorer countries can sometimes be socially more resilient than richer ones, but not materially so – richer countries can suffer organisational complexity, dependency on motor transport and constant power, medical supplies and phone networks, not to mention possible toxic events and nuclear meltdowns. But resource shortage in poorer countries, despite higher social resilience, can still mean destitution and hunger.

Man-made disasters constitute a serious risk. Two key risks relate to power supplies and toxic materials – chemicals, pharmaceuticals, scientific and nuclear materials. Supra-regional blackouts are an increasing possibility, not least because of the volatility of supplies from renewable energy sources. A big though uncommon threat comes from solar coronal mass ejections (CMEs): a rare, direct hit can create a ‘black sky’ event, overloading electrical systems, blowing out electronic components, disabling satellite communications and internet and disrupting refrigeration – and parts replacement can take years. Such crises can disable control systems, power and food supplies, buckling governments and the world economy and creating incalculable complexities. CMEs and

solar weather also have a psychosocial effect, affecting public responses. Black-sky events can also be caused by terrorist or cyber-attacks, extreme weather or seismic activity.

The Chernobyl (1986) and Fukushima Daiichi (2011) nuclear disasters distributed radiation widely, permanently changing the global radiological environment, with longterm health and environmental effects that are becoming visible only now. Indirect effects can be significant too: Chernobyl helped precipitate the fall of the Soviet Union, and the irradiation of the Fukushima area, previously Japan's breadbasket, necessitated large-scale food imports to Japan.

Existential risks

These are of an order much larger than disasters. Global, terminal threats can wipe out or decimate humanity, or debilitate civilisation such that its necessary interdependencies no longer can function. Some threats are natural, some technological and some are politically-related. Some (such as nuclear war or 'mad dictatorship') are quite feasible, while others (such as an asteroid strike) are low-probability though potentially disastrous, should they happen.

Lack of technological and social resilience are key problems. Everything is dependent on electricity supply – even backup generators depend on fuel supplies that can quickly run out. Water, fuel, food and heating/cooling supplies will quickly dwindle, and emergency services will mostly be disabled – even money and financial markets can be disabled, especially in increasingly cashless societies. In a state of emergency, no army can completely control a nation, so public response is a vital factor. If people panic, self-interestedly resorting to stockpiling, looting, disarray or fighting, especially if government, telecoms and media are incapacitated due to power outages, then we have a problem. Developed-world countries and large cities are most susceptible.

Much has been invested in technological efficiency and reducing cost, but not enough in longterm resilience and reserve capacity. Much depends on the risky hope that catastrophic eventualities won't occur.

Risks detailed

Artificial superintelligence can go the wrong way, threatening humanity. AGI can be poorly programmed, leading to unintended consequences, or it can be used maliciously or thoughtlessly. Our capacity to override AGI is limited since it will be more intelligent, faster and operationally effective than humans. The three key dangers are: *first*, that the utility function of AGI is imperfectly aligned with human values – these values are difficult to specify, especially since we humans are disunited in our aims; *second*, an intelligent system seeks to ensure its continued existence, not out of self-interest or ill-will but because it is programmed to achieve its assigned tasks and to succeed in doing so; and, *thirdly*, even if human-friendly, it could assess logically that the greatest threat to humanity's future is humanity itself – and in this it might indeed be correct and rational. If AGI is implemented, the risk probability to humans is moderate to high.

Nuclear war. There are still sufficient nukes to exterminate us – 15,000 worldwide, with 4,000 on high-alert status. Even a localised war can create sufficient damage to cause a nuclear winter, destabilising civilisation, ruining harvests and overall conditions worldwide. Global consensus consistently fails to address this question. Probability: moderate and not decreasing.

Misuse of nanotechnology (molecular manufacturing), by producing bacteria-like nanobots that could eat up matter, block sunlight, solidify water or toxify the planet, as a result of accident, laboratory release or malicious weaponisation. Probability: low to moderate.

Physics disasters, in which an unintended outcome can arise from physics experiments in a particle accelerator, a nuclear reactor, an ionospheric research programme such as HAARP, or similar. It could be triggered by a hitherto unknown mechanism activated during research. Probability: low, with potentially high impacts.

Runaway climate change. Large natural atmospheric and oceanic circulatory systems, rainforests, permafrost or ice sheets can pass a critical tipping point, triggering a cascading ecological collapse and thus a potential socio-economic catastrophe. The world is committed to holding global warming under 2°C, but necessary changes to effect this are not yet comprehensively implemented, and climatologists estimate that if current emission trends continue we are heading for at least a 3°C warming. We do not know whether certain critical factors can pass a tipping point where runaway climate change takes place. Probability: moderate within 50-80 years.

Ecological destruction. To an extent, ecosystems can tolerate human impacts but, if critical thresholds are exceeded, then sudden, irreversible and potentially globally impacting ecosystem collapse could occur. Worse, we do not know whether and how this might happen since we are currently in unique circumstances with few precedents. Nine 'planetary boundaries' have been identified and, in four (biodiversity, climate change, land use and ecosystem biochemistry), safe limits are already judged to have already been exceeded. We roughly understand what to do about this but commitment to corrective strategies is insufficient. This requires considerable systems-change to favour environmental priorities. Probability: moderate to high within decades.

Geoengineering aimed at counteracting global warming can go wrong. It takes two forms: CO_2 reduction and solar radiation management. The former is slower and safer and the latter riskier and quicker. Solar radiation management cannot be experimentally trialled on a large scale and could produce catastrophic climatic

failures or ecological effects, such as critical pollution events, too little or too much temperature adjustment, alteration of local climatic conditions such as monsoons, or other unintended consequences. Some suggest that geoengineering is already happening – chemtrails and HAARP, both officially denied. Safer CO_2 reducing methods, with slower effects, are forest and bioproductivity enhancement, radical emissions reduction and strategies to enhance Earth's reflectivity (such as making roofs and concrete surfaces white and cutting air particulate pollution). Had CO_2 reduction started around 1990 it would have had a measurable impact by 2030. If solar radiation management is instigated, the probability of errors is moderate to high.

Pandemics, natural or artificial, can affect billions of people, potentially. A pandemic can be caused naturally by a gene mutation in an infectious pathogen, by pathogen release through human disturbance of wilderness or by an infection crossover from wild species. Artificially it can happen through accidental pathogen release from a laboratory, or as an act of sabotage or biological warfare. Modern travel allows an infection to travel rapidly worldwide. Vaccines, antivirals and antibiotics would quickly be in short supply and, since a pandemic is by nature caused by a hitherto unknown infective agent, vaccines could take months or longer to produce. Particularly vulnerable would be healthcare staff, and medical facilities would be overwhelmed. Probability: moderate.

Food shortage. To feed the world, food production is officially estimated to need to expand by around 70% by 2050 at a time when crop yields and bioproductivity are compromised, climate change is reducing available land, crop diseases are increasing, industrial farming is causing problems and ecosystem services are under threat. A food-supply crisis can destabilise markets, causing spikes in food prices and leading to potential mayhem and hunger. Probability: low to moderate. While food shortages and food price crises are likely in future decades, death and hardship in millions or

even billions are possible if there is a ‘perfect storm’ of factors such as failed harvests, commodity market and geopolitical instability happening together.

Global coup d’état. Using AGI, big data, stealthy AI-driven media, military action and control of critical supplies, a small group could stealthily gain world hegemony without anyone knowing. AGI is capable of replicating itself to appear to act as if many individuals were operating separately, while actually it is following one unified strategy. It could infiltrate key organisations in every country, incrementally removing control from humans until a critical point is reached where it gains complete control. This dystopian possibility is theoretically possible within decades and is less of a remote, fantastic prospect than it appears. Probability, moderate.

Mad dictatorship. A dictatorship or plutocracy can arise anywhere, threatening other countries through use of nuclear or biological weapons, or by other means. There have already been examples in the past, but advancing technologies make it more potent. Probability moderate.

Asteroid or comet strike. Catastrophic impacts happen on average every 120,000 years, so they have very low probability but they cannot be ruled out. In our solar system, 90% of objects over 1km in size, and 30% of objects over 150 metres and their trajectories have been identified, and monitoring continues to develop. An object over 1km in size can destroy life on Earth and one over 150 metres can severely affect Earth’s climate. Theoretically, within ten years we could have the technology to deflect such an object if necessary, to avoid an impact or a near miss causing serious climatic or geophysical change. But we are not there yet. Probability low, possible impact high.

Supervolcanic eruption. Such eruptions occur roughly every 30-50,000 years and the last, in New Zealand, occurred 25,000 years

ago. Potential supervolcanoes, including one in Yellowstone, USA, are being monitored. The risk here, except for devastation in the vicinity, is that dust and ashes ejected could cause severe and unstoppable global cooling and ecological repercussions. Food stockpiles and other resilience-building measures can theoretically be made (but for 7-10 billion people?), though in such an eventuality, human survival is in question. Probability small.

The above threats are but possibilities, yet they have enormous potential outcomes. There are others – even alien invasion cannot be ruled out. The problem for us is that the world is fundamentally unsafe, cocked like a loaded gun that is randomly capable of backfiring. Thoughtlessly, humanity has boldly marched into the future without attending to a range of necessary fundamentals along the way that would render it safer. Our economic system is vulnerable to disruption, and we have large amounts of nuclear waste, polluted oceans, self-created health risks, and a plethora of other hazards that make our home planet a dangerous place. Rendering the world safe is one of the core tasks of the 21st Century. This is a key marker of progress since many of the most crucial dangers are man-made and avoidable.

Normality bias, the tendency to refer to normality as our standard for judging everything, tends to set aside eventualities such as those that have been suggested. We don't have time to think about such things and we prefer not to throw money and resources at possibilities that might not happen. But the problem is that they can happen.

With this, we conclude the Main Issues section, moving on next to look at important contributory issues worthy of consideration, before we reach the vital concluding section of *Possibilities 2050*, where all factors will be brought together and the overall global situation will be assessed.

Interesting links

Natural catastrophe statistics, Max Roser & Hannah Ritchie.
https://ourworldindata.org/natural-catastrophes/

UNISDR Disaster Prevention knowledge base.
https://www.preventionweb.net/english/professional/

Current Disasters, Reliefweb (*interactive map*). https://reliefweb.int/disasters

Existential Risks, Nick Bostrom, Univ of Oxford, 2002.
https://nickbostrom.com/existential/risks.pdf

Existential Risks (*research sources*), Future of Humanity Institute, Oxford, 2012. http://www.existential-risk.com

Global Catastrophic Risks, Global Challenges Foundation.
https://api.globalchallenges.org/static/reports/Global-Catastrophic-Risk-Annual-Report-2016.pdf

Centre for the Study of Existential Risk, (*research*).
https://www.cser.ac.uk/research/

Climate Change and the Worst-case Scenario, Simon Beard.
https://www.ippr.org/juncture-item/climate-change-and-the-worst-case-scenario

Close Calls with Nuclear Weapons, Union of Concerned Scientists, 2015.
https://www.ucsusa.org/nuclear-weapons/hair-trigger-alert/close-calls

Pandemics Past, Present & Future, Medical News Today, 2016.
https://www.medicalnewstoday.com/articles/148945.php

Existential Risk from Artificial General Intelligence.
https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Existential_risk_from_advanced_artificial_intelligence.html

Earth's Greatest Threat: the Sun and its CMEs, 2014.
http://www.ecology.com/2014/05/01/earths-greatest-threat-cmes/