(Klae Mcguinness/Moment/Getty Images)

ENVIRONMENT

Scientists Warn Multiple Overlapping Crises Could Trigger 'Global Systemic Collapse'

MARLOWE HOOD, AFP
5 FEB 2020

Overlapping environmental crises could tip the planet into "global systemic collapse," more than 200 top scientists warned Wednesday.

Climate change, extreme weather events from hurricanes to heatwaves, the decline of life-sustaining ecosystems, food security and dwindling stores of fresh water – each poses a monumental challenge to humanity in the 21st century.

Out of 30 global-scale risks, these five topped the list both in terms of likelihood and impact, according to scientists surveyed by Future Earth, an international

research organisation.

In combination, they "have the potential to impact and amplify one another in ways that might cascade to create global systemic collapse," a team led by Maria Ivanova, a professor at the Center for Governance and Sustainability at the University of Massachusetts, said in a 50-page report.

Extreme heat waves, for example, speed global warming by releasing planet-warming gases from natural sources, even as they intensify water crises and food scarcity.

Biodiversity loss, meanwhile, weakens the capacity of natural and agricultural systems to cope with climate extremes, also putting food supplies at risk.

Scientists worry especially that rising temperatures could tip the planet's climate system into a self-perpetuating spiral of global warming.

As it is, humanity is struggling – so far unsuccessfully – to cap CO2 and methane emissions, mostly from burning fossil fuels.

If at the same time a warming Earth also begins to emit large amounts of these gases from, say, thawing permafrost, such efforts could be overwhelmed.

"Many scientists and policymakers are embedded in institutions that are used to thinking and acting on isolated risks, one at a time," the report said.

"We call on the world's academics, business leaders and policy makers to pay attention to these five global risks and ensure they are treated as interacting systems."

Nearly 1,000 decision makers and top CEOs highlighted the same threats in a similar survey last month ahead of the World Economic Forum meeting in Davos, Switzerland.

"2020 is a critical time to look at these issues," said Amy Luers, Executive Director of Future Earth.

"Our actions in the next decade will determine our collective future."

Far West free-for-all

In October, the world's nations are set to gather for a major United Nations meeting in Kunming, China to try to stanch the destruction of ecosystems and the decline of biodiversity.

Scientists agree that Earth is at the outset of a mass extinction event – only the 6th in half-a-billion years –

which could drive a million species, or one-in-eight, into oblivion over the coming decades or centuries.

The following month, a critical UN climate summit in Glasgow will reveal whether the world's major economies are willing to ramp up carbon cutting pledges that fall far short of what is needed to keep the planet hospitable for our species.

2020 is also a critical year in ongoing negotiations over the high seas, where a Far West free-for-all has led to overfishing and unrestrained resource extraction.

Some scientists have begun to look at the likelihood and impacts of cascading environmental crises.

Recent research has shown, for example, that some parts of the world may soon be coping with up to six extreme weather events at once, ranging from heat waves and wildfires to diluvian rains and deadly storm surges.

"Human society will be faced with the devastating combined impacts of multiple interacting climate hazards," Erik Franklin, a researcher at the University of Hawaii's Institute of Marine Biology and co-author of a key study in late 2018, told AFP.

"They are happening now and will continue to get

worse."

That is true even in optimistic emissions reduction scenarios.

If, for example, humanity caps global warming at two degrees Celsius (3.6 degrees Fahrenheit) above preindustrial levels, New York City will likely face one major climate hazard every year, on average, by 2100.

The 2015 Paris climate treaty calls for holding the rise in temperature to "well below" 2C.

If, however, carbon pollution continues unabated, the Big Apple could be hit by up to four such calamities at once, including extreme rain, sea level rise and storm surges.

In all such scenarios, tropical coastal areas suffer the most.

Humanity under threat from perfect storm of crises – study

Climate, extreme weather, biodiversity, food and water crises could lead to 'systemic collapse'

Fiona Harvey *Environment correspondent*

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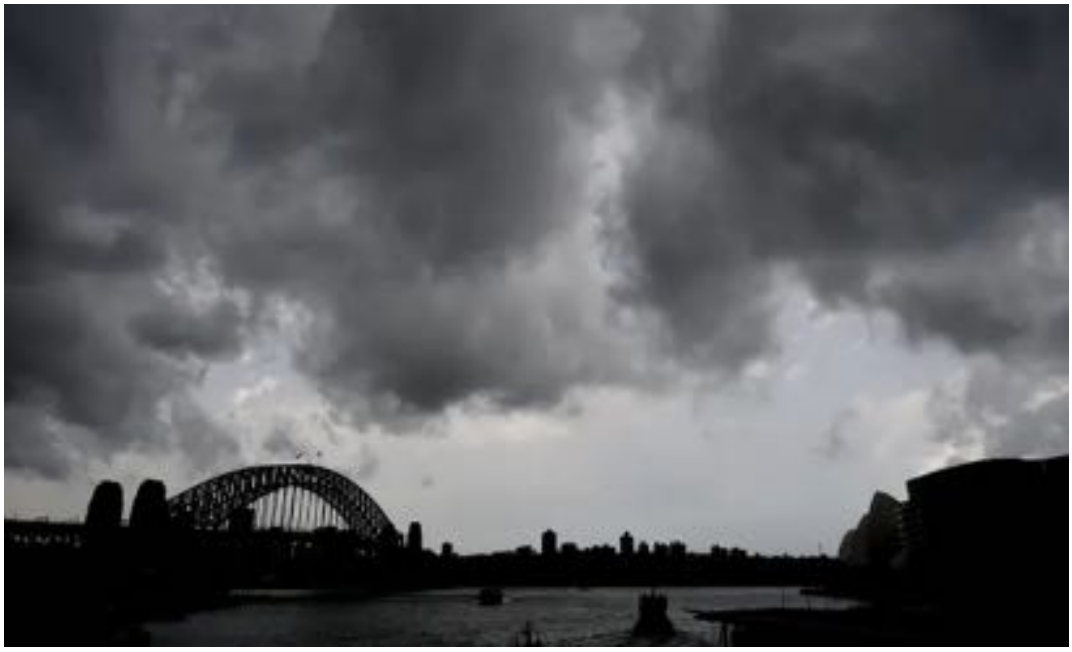

Storm clouds over Sydney. Confronted with multiple emergencies that amplify one another's impacts, communities around the world are struggling to cope. Photograph: Peter Parks/AFP via Getty Images

The world is facing a series of interlinked emergencies that are threatening the existence of humans, because the sum of the effects of the crises is much greater than their individual impacts, according to a new global study.

Climate breakdown and extreme weather, species loss, water scarcity and a food production crisis are all serious in themselves, but the combination of all five together is amplifying the risks of each, creating a perfect storm that threatens to engulf humanity unless swift action is taken.

The links among the crises are clear in many cases, but the methods the world has chosen to try to solve them do not take account of these connecting factors. For instance, extreme heatwaves can add to global heating, because they release vast amounts of stored carbon from affected ecosystems, in a feedback loop. It has been seen clearly in the Australian bushfires, which are already contributing significantly to the store of carbon in the atmosphere.

The links do not stop there: as the heatwaves damage natural ecosystems, killing off wildlife and flora, they also lead to greater water scarcity, and in turn damage agriculture. These combined effects exacerbate the harm done to people struggling with food and water shortages, in a vicious cycle.

Faced with these crises in nature individually, it could be possible to fix the problems causing them. But confronted with multiple interlinked emergencies

that in combination amplify one another's impacts, people are facing unprecedented dangers and many communities cannot cope.

The report, which took the form of a survey of 222 leading scientists from 52 countries, conducted by the international sustainability network Future Earth, found that the responses to these emergencies by governments, civil society, business and institutions did not recognise their interlinked nature. Trying to solve the problems individually, without taking account of the "cascading" impacts, was likely to be ineffective, the scientists said.

More than a third of the scientists surveyed said the five crisis types would worsen one another "in ways that might cascade to create global systemic collapse".

While the risks are amplified when they are connected, so too are the solutions, however. Whenever action is taken to remedy environmental problems, the benefits also cascade: for instance, nurturing wildlife and flora in a wetland can also reduce water pollution and soil erosion, and protect crops against storm damage, alleviating water scarcity and allowing for more food production.

"Despite the ubiquity of connections [between these looming crises] many scientists and policymakers are embedded in institutions that are used to thinking and acting on isolated risks, one at a time," the report says. "This needs to change, to thinking about risks as connected."

Amy Luers, the executive director of Future Earth, said: "2020 is a critical time to look at these issues. Our actions in the next decade will determine our collective future on Earth."

The authors of the report urged a change in the way risks were handled: "We call on the world's academics, business leaders and policymakers to pay urgent attention to these five global risks, and to ensure they are treated as interacting systems, rather than addressed one at a time in isolation."

The report also warned of social problems that scientists identified as potential major risks for the future. These included the rise of populism and fake news, trends in migration and the rise of artificial intelligence.

NEWS RELEASE 6-FEB-2020

Humanity's greatest risk:

Cascading impacts of climate, biodiversity, food, water crises: scientists

Survey reveals common concern of global scientists: interlinkages between crises; Part of Our Future on Earth, 2020, a 50-page synthesis of latest peer-reviewed, state-of-the-planet research and its interconnected complexities

FUTURE EARTH

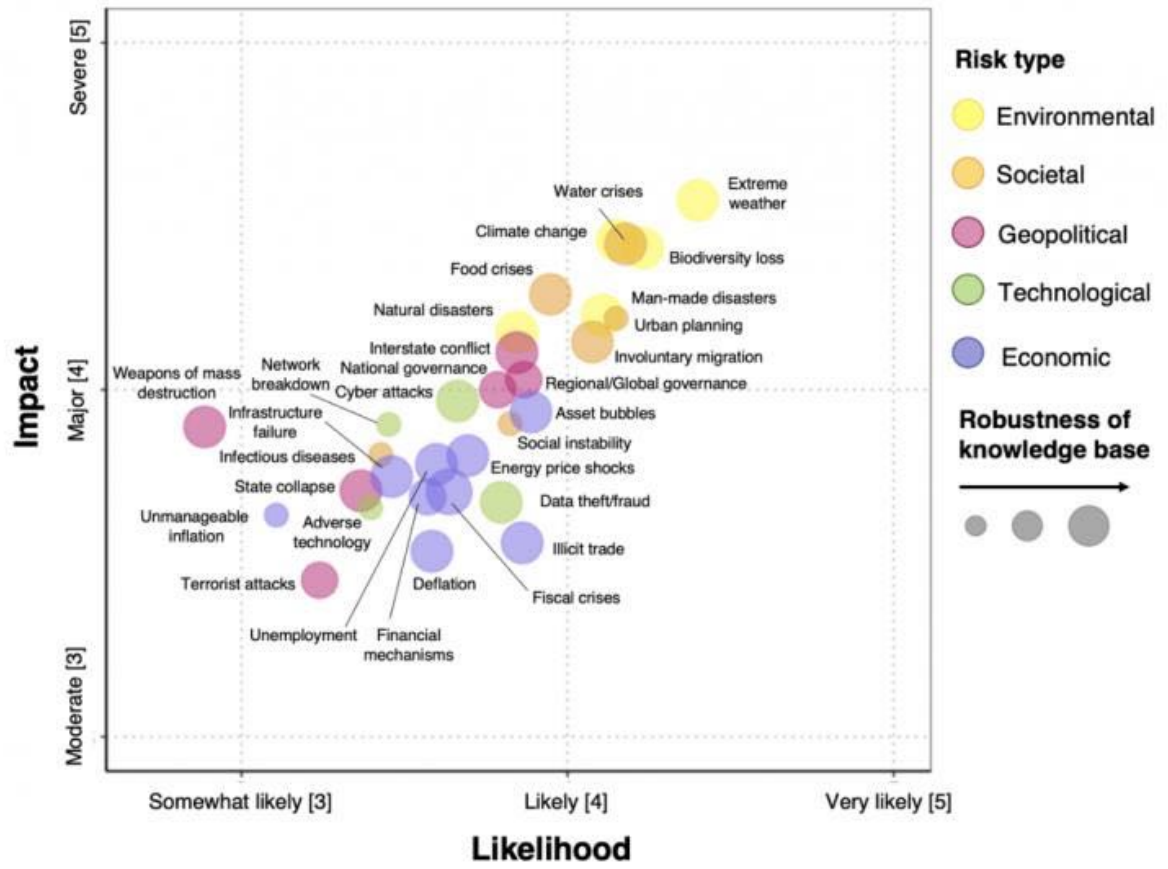

IMAGE: MEAN RANKED LIKELIHOOD AND IMPACT OF GLOBAL RISKS AND ROBUSTNESS OF THE KNOWLEDGE BASE SURROUNDING EACH RISK (SIZE OF THE CIRCLE) FOR THE 30 GLOBAL RISKS IN 5 CATEGORIES (COLORS). **view more**

CREDIT: FUTURE EARTH GLOBAL RISKS SCIENTISTS' PERCEPTION SURVEY

The greatest threat to humanity hides in the potential cascading of impacts of five highly-related, highly-likely risks -- a collision that can amplify these effects catastrophically, according to a new survey of 222 leading scientists from 52 countries.

Conducted by Future Earth, the international sustainability research network, the survey identifies five global risks -- failure of climate change mitigation and adaptation; extreme weather events; major biodiversity loss and ecosystem collapse; food crises; and water crises -- as the most severe in terms of impact. Four of them -- climate change, extreme weather, biodiversity loss, and water crises -- were also deemed by scientists as most likely to occur.

Business leaders and policymakers, in a survey released in January by the World Economic Forum, likewise assigned these same five risks, chosen from a set of 30, top rank positions in terms of impact.

More than one-third (82) of the scientists, however, underlined the threat posed by the synergistic interplay and feedback loops between the top five-- with global crises worsening one another "in ways that might cascade to create global systemic crisis."

Extreme heatwaves, for example, can accelerate global warming by releasing large amounts of stored carbon from affected ecosystems, and at the same time intensify water crises and / or food scarcity; the loss of biodiversity weakens the capacity of natural and agricultural systems to cope with climate extremes, increasing vulnerability to food crises.

Some 173 of the scientists surveyed volunteered additional risks, beyond the list of 30, as deserving of greater global attention.

Commons themes included erosion of societal trust and values; social infrastructure deterioration; rising inequality; rising political nationalism; overpopulation; and mental health decline.

Said the report: "Interestingly, the majority of these touch on issues of societal well-being and social security, suggesting that societal risks may be growing and in need of greater consideration. This is especially pertinent as we consider how society can transition to a climate-safe and equitable future..."

"Perhaps the most interesting theme to emerge from these responses was the failure to take into account feedback across different systems."

"Despite this ubiquity of connections, many scientists and policymakers are embedded in institutions that are used to thinking and acting on isolated risks, one at a time. This needs to change to thinking about risks as connected."

"As the scientific advisors for this survey, we call on the world's academics, business leaders, and policymakers to pay urgent attention to these five global risks, and to ensure that they are treated as interacting systems, rather than addressed one at a time, in isolation."

The survey (in full from Feb. 12: futureearth.org/initiatives/other-initiatives/grp), was led by Maria Ivanova, University of Massachusetts, Boston, and scientific advisors Markus Reichstein, Max Planck Institute, Germany; Matthias Garschagen, Ludwig-Maximilians-Universität München, Germany; Qian Ye, Beijing Normal University, China; Kalpana Chaudhari, Institute for Sustainable Development and Research, India; and Sylvia Wood, Science Officer, Future Earth, Canada office.

Joined-up thinking: Our Future on Earth, 2020

Publicly available at futureearth.org/publications/our-future-on-earth

The survey is presented as a chapter in a new report, Our Future on Earth, 2020, in which scientists summarize the latest peer-reviewed research on the state of our planet and distill the many, interconnected complexities into an authoritative, 50-page synthesis.

Today's environmental problems, the report says, represent a blend of physical, chemical, biological, and social change that all interact and feedback on each other.

"Trying to understand how our impacts in one area, such as river extraction, affect another, such as food provision, is a complex task," the report says. "But that's what scientists, sociologists, economists, ecologists, and others are trying to do."

"And while our problematic practices in one area can impact many other areas, the good news is that so can our restorative ones: improving biodiversity in a wetland ecosystem can also reduce water pollution and soil erosion, and protect crops against storm damage, for instance."

"We are making our own Anthropocene, and we can make it a good one."

Among the issues highlighted in the report:

- The rise and impact of populism, "characterized by a denial of complexity, including the complexity of environmental damage

and the systemic, multi-layered interactions required to achieve sustainability," as well as "fake news."

- Increasing financial risk of climate and environmental change. Now deemed by insurers as their industry's top risk, the report notes the first climate-change-related bankruptcy: California's largest electric utility company, PG&E went under last year after sparking a huge forest fire.
- Trends in migration, and the impacts of digital technologies, including artificial intelligence, on sustainability.
- The ecological and social science of climate change, our food systems, and the collapse in biodiversity; developments in regulating the high seas; the rise of green finance mechanisms; and the new field of studying "transformations" in society: how, exactly, can we uproot ingrained ideas about economic development or wellbeing and wrench them into new, more sustainable frameworks?

"2020 is a critical time to look at these issues," says Amy Luers, Executive Director of Future Earth. "Our actions in the next decade will determine our collective future on earth."

Our Future on Earth, 2020 is the first of a series of such reports.

Chapter summaries

Introduction: Charting the future
Author: Gaia Vince, journalist and author, London.

We are a vast global population facing unprecedented environmental challenges, yet we still have the time and the capability to prevent

extreme outcomes. The past year has been one of extraordinary social awakening to the hazards of environmental change, and of demands for action towards a sustainable future.

"Green deals" have been proposed by several nations, and if passed into legislation they could prove transformative. The global population is expected to be 9.7 billion by 2050. Their future is in our hands: can we make it more sustainable, resilient and fair?

Climate: Dialing down the heat
Lead author: Diana Liverman, School of Geography and Development, University of Arizona

Over the last 18 months, major assessments by the Intergovernmental Panel on Climate Change (IPCC), the US National Climate Assessment, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), have all argued that time is running out to reduce greenhouse gas emissions that are causing the climate to warm.

This has inspired declarations of a climate crisis or climate emergency by the leaders of more than 700 cities, states and governments. Yet, during 2019, the concentration of CO2 in the atmosphere reached more than 415 ppm, and the five years from 2014 to 2018 were the warmest recorded over land and ocean since 1880.

Despite the evidence, "many countries have not yet risen to the challenge or are reversing prior commitments." What is needed to dial down the heat?

This chapter also includes independently-authored boxes looking at the climate and social causes and impacts of wildfire; and the (predominantly negative) impacts of climate change on human health.

Politics: Populism versus grassroots movements

Author: Richard Calland, University of Cambridge's Institute for Sustainability Leadership; Associate Professor of Public Law, University of Cape Town.

Right-wing populism is on the rise around the world: a breed of politics that exploits peoples' fears during times of economic decline and growing inequality, and that focuses on nationalist tendencies to clamp down on borders and reject immigrants. Populism is often characterized by a "denial of complexity", preferring to identify simple, seductive culprits for the erosion of society, the economy, and the welfare of the masses. This often leads to a denial of climate change facts or impacts. But grassroots organizations are emerging as a potentially strong, countervailing force. But is it politically strong enough and will it work?

Ocean: Governing the high seas

Lead author: Robert Blasiak, Stockholm Resilience Centre, Stockholm University

Over three billion people are dependent on functioning marine ecosystems as their primary source of protein, and the livelihoods of nearly half of humanity are linked to marine and coastal biodiversity. While the ocean was once considered too big to be significantly altered through human activity, it is now clear that it too has entered the Anthropocene, an age in which humans are the dominant influence.

Stressors from climate change to pollution, fishing and shipping, have on average nearly doubled over the past decade. Officials from around the world are now negotiating a new United Nations treaty to govern the high seas (Biological diversity of areas Beyond National Jurisdiction), which may be hashed out in 2020. What are the expectations and

challenges for regulating fish, seafloor mining, biodiversity and more?

This chapter includes spotlights on plastic pollution in the ocean; and the rise of conflicts over seafood resources, sometimes called "fish wars".

Forced Migration: Empowering mobility when moving isn't a choice
Lead author: David Wrathall, Oregon State University, College of Earth, Ocean and Atmospheric Sciences

As of September 2019, the Syrian Conflict had resulted in over 5.6 million refugees seeking refuge mainly in Turkey, Lebanon, and Jordan. As of 2018, 800,000 people had fled their home countries in North Africa as asylum seekers and refugees, some embarking on often-deadly boat trips across the Mediterranean.

For many observers in the wealthy, industrialized global North, the influx of migrants from Central America and the Middle East has been seen as a sign of an impending flood: their assumption is that climate change impacts will spur violence and/or push hundreds of millions of people into their borders, causing yet more violence and other problems.

The truth is more nuanced. Humanity is not at the mercy of forces seemingly beyond our control: it is policy, not climate change, behind the real crises.

This chapter also includes an independently-authored box on growing urbanization and solutions to make cities more liveable.

Media: Industrializing disinformation
Lead author: Owen Gaffney, Potsdam Institute for Climate Impact Research & Stockholm Resilience Centre.

The flow of information in the world is changing. Today, around half of the planet's 7.6 billion people are online, where they are deeply influenced by social media, search engines and eCommerce algorithms. These digital platforms tend to favour the spread of information designed to engage with emotion over reason, can cause the propagation of "fake news", and can lead to social harms like an erosion of trust in vaccines. Some politicians are now calling for the tech giants to be split up, arguing that their power and dominance is bad for democracy. Digital information technologies and media, though messy, could support global action for sustainability. Yet it remains unclear whether information technologies will drive the Earth towards a pandemic or away from it; towards a destabilized climate or a potentially-manageable 1.5°C warmer world.

Biodiversity: The unravelling web of life
Lead author: Cornelia Krug, Department of Geography, University of Zurich, Switzerland.

Humans have now "significantly altered" 75% of our planet's land area; about a quarter of species in assessed plant and animal groups are threatened. In 2018, the world's last male northern white rhino died in his Kenyan enclosure. The Brazillian blue parrot, Spix's Macaw, was declared extinct in the wild, amongst a handful of other birds. And yet studies continue to show that biodiversity helps to make landscapes more resilient to climate change. Countries are now in the process of negotiating a "Global Deal for Nature": a new global biodiversity framework to be discussed through the Convention on Biological Diversity (CBD) in 2020. Reversing the trends of loss of life on this planet will require some new ways of thinking about conservation.

This chapter also includes a box on the long-term historical perspective

of biodiversity change and extinctions, to better contextualize how altered ecosystems can cope with future change.

Finance: Making money work for green goals
Lead author: Kristina Alnes, CICERO Center for International Climate Research, Norway

Finance is a risky business. But the global situation today--economic, political, and environmental, especially thanks to climate change--is conspiring to make it riskier. Examples like the 2019 bankruptcy of the Californian utility PG&E illustrate the impacts of climate on financial risk; recent reports like that by the Network for Greening the Financial Services show how the financial world is starting to take this seriously. Efforts like the nascent Task Force on Climate Related Disclosure are helping to grapple with the issue.

The "great acceleration" of economic growth over the 20thcentury put a lot of pressure on earth systems. There is an opportunity now to reverse this trend. This piece looks at the potential for green bonds, sustainability-linked loans and more, to promote sustainable development.

Food: Rethinking global security
Lead author: Jiaguo Qi, Center for Global Change & Earth Observations, Michigan State University, USA

The amount of food produced per person on the planet has gone up more than 40 percent since the 1960s. Yet, ironically, the prevalence of undernourishment--which had been declining for decades--has started to tip upwards again: the total number of people undernourished in 2018 stood at more than 820 million people, up from a record low of 785 million in 2015. We will need to squeeze ever-more food out of the

same amount of land for our growing population in our changing climate.

Strains on food production are expected to increase, as a result of various forces including climate change, biodiversity loss, and a global population on the rise. Solutions may include eating less meat, precision agriculture supported by new technologies, ensuring less waste, and taking a holistic approach to food production that looks at water, ecosystem protection, social welfare and more.

Transformation: How to spur radical change
Lead author: Sandra Waddock, Carroll School of Management, Boston College

When more than 150 world leaders met in 2015 to develop the United Nations 2030 Agenda for Sustainable Development, their key phrase was "transforming our world." Transformative change goes well beyond incrementalism or reform, both of which allow existing practices, goals, and structures to stay in place.

Transformation involves a step change, often in fundamental norms or assumptions. An emerging field of research is just starting to unpick exactly how to encourage, guide, and enact such changes, from a shifting mindset about single-use plastics to a revolution in how we think about economic growth.

Digital Innovation: Harnessing technology for good
Lead author: Dirk Messner, President, German Environment Agency (UBA), Co-Director, Centre for Global Cooperation Research, University of Duisburg-Essen, Germany

Massive amounts of data, new computational abilities, and artificial

intelligence are spurring disruptive progress: technical systems are becoming as good (or even better) than humans at recognizing faces and voices, diagnosing cancer, translating languages, and producing news articles, music and paintings. Artificial general intelligence (AGI)--a technical system able to accomplish any cognitive task at least as well as humans--could be achieved within the 21st century.

This will all cause massive disruption to labor markets, democracies, and our understanding of the planet and humanity. So far, these technological changes have largely been used to increase consumption, economic growth and resource extraction, rather than saving the planet or promoting just and fair societies. But the digital sector has immense potential for reducing emissions and empowering people to monitor and protect ecosystems. A new field of digital sustainability could be forged to encourage positive action.

This chapter includes a spotlight on the energy use of the digital sector.

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Please note: the essays express the opinions of the authors and may not encompass the views of the entire Future Earth community.

About Future Earth

Future Earth is an international research organization, collaborating with science and society on solutions to global sustainability challenges. It encompasses nearly 30 research-to-action networks, groups of scientists and practitioners around the world, studying the environmental and human aspects of global change. We help incorporate the latest scientific knowledge into decision-making, with a mission to accelerate transformations to sustainability through research

and innovation.

Future Earth is governed by the International Science Council (ISC), the Belmont Forum of funding agencies, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), the World Meteorological Organization, and the Science and Technology in Society (STS) forum.

Climate crisis fills top five places of World Economic Forum's risks report

For first time, environment is at top of list of issues worrying world's elite

Larry Elliott

Wed 15 Jan 2020 11.45 GMT

Last modified on Wed 15 Jan 2020 18.10 GMT

The damage caused by extreme weather events such as the Australian bushfires is at the top of the WEF's risks report. Photograph: Sam Mooy/Getty

A year of extreme weather events and mounting evidence of global heating have catapulted the climate emergency to the top of the list of issues worrying the world's elite.

The World Economic Forum's annual risks report found that, for the first time in its 15-year history, the environment filled the top five places in the list of concerns likely to have a major impact over the next decade.

Børge Brende, the president of the World Economic Forum, said: "The political landscape is polarised, sea levels are rising and climate fires are burning. This is the year when world leaders must work with all sectors of society to repair and reinvigorate our systems of cooperation, not just for short-term benefit but for tackling our deep-rooted risks."

After a month in which bushfires have raged out of control in Australia, Brende said there was a need for urgent action.

"We have only a very small window and if we don't use that window in the next 10 years we will be moving around the deckchairs on the Titanic."

The WEF report said the retreat from the multilateral approach that helped cope with the 2008 financial crisis made it more difficult to tackle shared global risks.

It said the top five risks in terms of likelihood in the next 10 years were:

Extreme weather events with major damage to property, infrastructure and loss of human life.

Failure of climate-change mitigation and adaptation by governments and businesses.

Human-made environmental damage and disasters, including environmental crime, such as oil spills and radioactive contamination.

Major biodiversity loss and ecosystem collapse with irreversible consequences for the environment, resulting in severely depleted resources for humankind as well as industries.

Major natural disasters such as earthquakes, tsunamis, volcanic eruptions, and geomagnetic storms.

The report was released ahead of the WEF's annual meeting in Davos next week, which will be attended by the chief executives of some of the world's biggest and powerful companies. Despite the large number of participants flying in to Switzerland by private jet, the WEF said Davos would be a carbon-neutral event.

But John Drzik, the chairman of Marsh & McLennan insights, which helped to compile the report, said businesses had to step up their action on global heating.

"There is mounting pressure on companies from investors, regulators, customers, and employees to demonstrate their resilience to rising climate volatility. Scientific advances mean that climate risks can now be modelled with greater accuracy and incorporated into risk management and business plans.

High-profile events, like recent bushfires in Australia and California, are adding pressure on companies to take action on climate risk at a time when they also face greater geopolitical and cyber risk challenges."

Peter Giger, group chief risk officer of Zurich Insurance Group, which also collaborates in the preparation of the risks report, said there was a pressing need to adapt faster to avoid the worst and irreversible impacts of the climate crisis and to do more to protect the planet's biodiversity.

"Biologically diverse ecosystems capture vast amounts of carbon and provide massive economic benefits that are estimated at $33tn (£25tn) per year – the equivalent to the GDP of the US and China combined. It's critical that companies and policymakers move faster to transition to a low carbon economy and more sustainable business models.

“We are already seeing companies destroyed by failing to align their strategies to shifts in policy and customer preferences. Transitionary risks are real, and everyone must play their part to mitigate them. It’s not just an economic imperative, it is simply the right thing to do,” he said.