

ENVIRONMENT OF PEACE



Security in
a new era of risk



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FOREWORD

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Two cataclysmic events have shaken our world in the space of just three years. The most serious pandemic in living memory has claimed millions of lives, sickened countless more people and caused economic damage measured in trillions of dollars. Now, Russia's invasion of Ukraine has killed many thousands and created millions of refugees; it threatens to wreak havoc in the world's food supply, raises the spectre of nuclear conflict to a level not seen since the end of the cold war, and has raised questions anew over institutions designed to secure peace in Europe and globally.

These events, so close in time but so different in causality, illustrate graphically that despite all the advances humankind has made, we remain vulnerable to shocks and hazards of many kinds, whether foreseeable or not.

And hazards are increasing. There are more conflicts around the world, more displaced people and higher expenditure on arms than a decade ago. As well as in Ukraine, millions more people in Afghanistan, Ethiopia, Syria, Yemen and other countries are being drawn into deepening insecurity. On top of this security crisis, humankind is creating an environmental crisis. Degradation of soil threatens food security, drought compromises water access, melting mountain glaciers and rising seas create flood hazards, the razing of forests removes essential resources and protection. In climate change and other issues, we are fast approaching tipping points that would make a return to stability much harder.

You might ask what environmental degradation has to do with peace and security. The evidence assembled for this report shows that the answer is: everything. The twin security and environmental crises are linked in ways that we are only beginning to understand, with impacts we are only beginning to feel. Climate change is a risk multiplier for both new and pre-existing sources of tension. The impacts fall hardest in places already marked by poverty, dysfunctional governance and conflict history. But given the extent of interconnections in the 21st century, they have consequences right across the world—connecting people and populations in an environment of insecurity.

This is not the first time that humanity has faced serious security and environmental threats. Fifty years ago, acid rain was decimating forests, the ozone hole was growing, and chemical pesticides threatened birds and insects. The consequences of this environmental destruction were unknown and deeply concerning.

Humanity has the knowledge and skills to escape from the trouble in which we find ourselves. We can draw hope from the examples of collaborative actions being taken.

The spectre of nuclear war threatened mass annihilation and global radioactive fallout.

Governments began their search for cooperative solutions at the 1972 United Nations Conference on the Human Environment in Stockholm, whose 50th anniversary we mark this year. The conference signified a recognition that common threats can only have common solutions and sparked a global consensus on action. It catalysed the formation of the UN Environment Programme and the establishment of environment ministries in governments across the world. It led to agreements that have addressed issues such as acid rain and destruction of the ozone layer.

These successes, many achieved cooperatively, should give us cause for optimism this year, which will see leaders convening in June for the Stockholm+50 summit: 'A healthy planet for the prosperity of all—our responsibility, our opportunity.' *Environment of Peace* demonstrates clearly that a healthy planet is essential for security as well as prosperity, and shows that including the full diversity of people in solutions is essential for success. In this context, we should especially mark and celebrate the role of often marginalized groups such as Indigenous Peoples, women and youth, whose insights are often invisible to top-down decision making.

I hope that you will take away three principal conclusions from *Environment of Peace*. First, that there is a profound need to begin anticipating and managing the increasing risks to peace stemming from the interlinked security and environmental crises. Second, that without a step change in action on all aspects of environmental degradation—cutting greenhouse gas emissions, reducing pollution, arresting the decline in species and ecosystems, and more—the security challenge will inevitably get worse.

The third conclusion is that there is hope. Humanity has the knowledge and skills to escape from the trouble in which we find ourselves. We can draw hope from the examples of collaborative actions being taken by governments, civil society, local communities and multinational groupings that are successfully addressing hazardous situations. The need is to learn from them and scale up. The principles and recommendations at the end of this report point the way.

Despite these bright notes, we are delivering a report that lays bare a profound problem with deep-lying roots and complex manifestations. And we are delivering it as people across the world wrestle with the impacts of the Covid-19 pandemic and the consequences of Russian aggression in Ukraine. Therefore, some might say this is not the time. I would argue the opposite: this is exactly the time. For one thing, it has to be, given the urgency of the problem; for another, addressing the vulnerabilities exposed by recent events will also build resilience against escalating environmental harm and a darkening security horizon.

As we enter a new era of risk created by the conjunction of the twin crises, let us recall our history and rebuild the cooperative spirit of Stockholm '72 on issues that threaten us all. Through cooperation we can and must find a way from darkness to light once more, and build a lasting environment of peace.

EXECUTIVE SUMMARY

Behind the headlines of war in Europe and the aftershocks of the Covid-19 pandemic, our world is being drawn into a black hole of deepening twin crises in security and the environment. Indicators of insecurity are rising, while indicators of environmental integrity are sinking. The mix is toxic, profound and damaging; and institutions with the power to find solutions, including governments, are waking up far too slowly.

In terms of security, there is an increase in the incidence of conflict and the numbers of dead and displaced people—a trend in existence long before the Russian invasion of Ukraine. Spending on arms and military forces is rising; the use of nuclear weapons seems to be less unthinkable than it was previously. In terms of the environment, manifestations of decline include more extreme weather, rising seas, constraints on water availability, the decline in mammals and pollinating insects, plastic pollution, dying coral reefs and shrinking forests.

The darkening security horizon presents one layer of risks to peace; environmental decline adds a second layer. The interaction of the two trends produces a third, more complex set of risks, whose significance humanity is only beginning to grasp.

However, it is clear that the two crises do interact. Countries facing the highest levels of ecological threat are statistically likely to be those where peace is at its most tenuous. They also tend to be marked by fragility and low capacity for resilience.* For the most part, these countries have done little to cause the global environmental crisis, but they bear the brunt of its effects. Half of the ongoing United Nations peace operations are in countries with the highest exposure to climate change impacts. These correlations are not coincidences.

This is the entry point for *Environment of Peace*.

The link between environmental integrity, peace and human well-being should not really be contentious. Since the 1972 UN Conference on the Human Environment in Stockholm, countries have recognized that ecological integrity is essential to human development. In agreeing the Sustainable Development Goals in 2015, governments declared: 'There can be no sustainable development without peace and no peace without sustainable development.' In 2021, the UN Human Rights Council formally recognized a healthy environment as a fundamental human right.

* Fragility is defined as 'the combination of exposure to risk and insufficient coping capacity of the state, systems and/or communities to manage, absorb or mitigate those risks' (OECD).

Reducing insecurity and conflict in this new era of risk means fundamentally changing how we think about peace.

Yet our environment is rapidly degrading. Although every government is aware of climate change and wider environmental decline, and some have made progress on issues such as pollution and deforestation, they are collectively failing to tackle the major drivers with sufficient urgency. Among other impacts, degrading the natural environment makes it more likely that diseases will spread from wild animals into the human population. And the last two years have shown how devastating such diseases can be.

Beyond their direct effects, climate change and the wider environmental crisis contribute to insecurity. The evidence shows that they often generate social and political instability, which, unresolved, can escalate into violence. Armed conflict not only damages the environment, but it makes effective environmental governance harder to achieve. Confrontation, disputes and conflict also sour the international atmosphere for arriving at cooperative responses to environmental challenges.

Because of these interlinkages, the idea of security that drives this report is an inclusive one. The traditional defence- or state-centred standpoint tells part of the story of security and insecurity. The more people-centred, human security concept tells another part. For a truly peaceful and secure world, we need to get both parts right.

What, then, is to be done?

As the evidence will show, reducing insecurity and conflict in this new era of risk means, as a starting point, fundamentally changing how we think about peace. With environmental degradation part of the security problem, restoring environmental integrity needs to be part of the security solution. This also implies an overwhelming need for more ambitious and more effective cooperation between governments on peace and security at every level, from conceptual to operational; because when the threat affects all countries, militarization and national assertiveness are clearly not going to be an effective response. They may perhaps be inevitable when faced with acute situations such as the invasion of Ukraine, but they cannot be a solution to the broader and escalating crises. In the long run, cooperation is self-interest.

If one defining characteristic of an effective response is cooperation, another is adaptability. The crises are going to evolve, creating risks and impacts that cannot be precisely known. The responses of people will also change. Decision makers will need to intervene, learn from experience and intervene again.

Currently, governments are spending money in ways that stoke insecurity rather than tackling it. Subsidies that fund environmental harm by supporting activities such as fossil fuel extraction and use, overfishing and deforestation amount to trillions of dollars per year. Given the link between environmental decline and insecurity and conflict risk, these can also be regarded as conflict subsidies. Looked at through this lens, the wisdom of continuing with them appears doubly questionable.

At the same time, the world's richest countries are conspicuously failing to generate the international financing needed to tackle climate change and biodiversity loss—further exacerbating

insecurity and conflict risk. Moreover, funds to aid adaptation to environmental decline and to build resilience are not being spent in the most needed areas; the most fragile states, which by definition have the clearest need, receive just 1/80th per capita of the climate financing that flows to non-fragile states.

Resilience allows communities and countries to survive shocks without resorting to conflict, and to rebuild swiftly afterwards. It is essential for security in all its forms. Yet the security and environmental crises erode resilience.

Combatting vulnerabilities and building resilience against climate shocks will also provide a buffer against non-climate related threats. In 2010, a heatwave fuelled by climate change contributed, via a decimated grain harvest in Russia and a consequent spike in bread prices, to the Arab Spring. In 2022, Russian and Ukrainian grain harvests are likely to be substantially lower than usual, a prospect that is already pushing world prices dangerously high again. Different cause, similar risk; increasing resilience would protect against both.

Resilience can ameliorate the risks posed by environmental degradation, but it cannot tackle the causes. Halting and then reversing environmental decline involves making transitions in many aspects of society at unprecedented pace and scale. But transitions can fracture and dislocate communities. Across the world, particularly in the Global South, initiatives in biofuels, hydropower, nature conservation and climate adaptation—often conceived with good intentions—have regularly stoked insecurity and conflict. Many times, they fail because of it. The environmental crisis is now too big to permit failure; so, the myriad transitions needed in energy, transportation, industry and above all land use have to work. That means actively involving communities in their design and implementation in order to achieve just and peaceful transitions, which are then more likely to be successful ones.

The nature of governments and their relationship with their citizens is also going to be key to making good decisions. The recent rise of autocrats and populists has not been good for either security or the environment and has undermined the resilience of global institutions that facilitate cooperation on both issues. Tackling shared, complex problems will be much easier in a world where governments treat their citizens and each other with respect, involve their citizens in decision making, and ground their policies in evidence.

As we show in this report, there are real examples of hope to draw on. In the UN system, at regional level and within countries, the links between environmental degradation and insecurity are in places being taken more seriously. Most governments are open to cooperation on these issues, and in some cases they are pursuing it. Non-governmental organizations are actively building peace through environmental enhancement. These examples are models that can be upscaled, provided the vision and will are there.

We conclude by presenting a series of six recommendations for action, and a set of five principles to guide it. The principles include cooperation and adaptability, which, in the face

When the threat affects all countries, national assertiveness is not going to be an effective response. Cooperation is self interest.

of an unpredictably changing risk landscape, are just common sense. So is inclusion, because solutions in which all parties have a say are more likely to succeed. Solutions will have to take account of the fact that the problem is both pressing and deep-rooted, meaning that action has to begin immediately yet be guided by far-sighted vision.

Some of our recommendations for action concern the UN system, some are aimed at national governments, and some connect with the private sector, civil society and other sectors. Although many types of entity can and should play a role, governments are central due to their unique power as legislators, rule-makers and allocators of resources. Governments can also enact change quickly; and time is undeniably short. Chapter 5 sets out the recommendations in detail, but in summary:

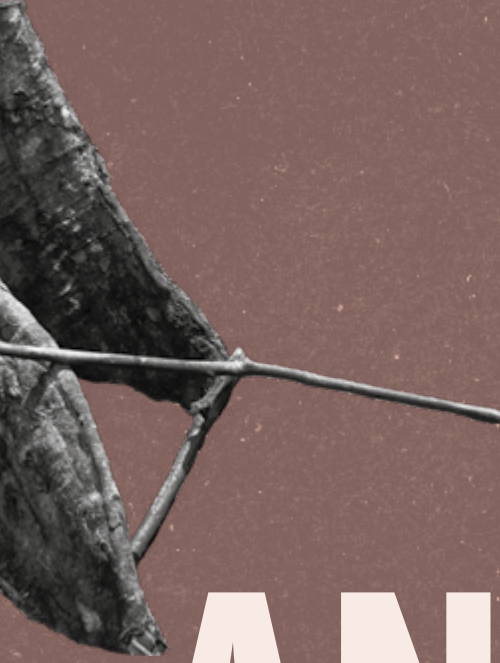
- 1 Address the linked crises with joint solutions.** Identify and implement measures that build both peace and environmental integrity.
- 2 Invest in preparedness and resilience.** Build capacity to detect signs of growing threats and defuse tensions.
- 3 Finance peace, not risk.** Meet international funding obligations, ensure funding reaches the most fragile communities and end conflict subsidies.
- 4 Deliver a just and peaceful transition.** Assess and address possible negative outcomes of pro-environment measures before implementation.
- 5 Be deliberately inclusive.** Involve marginalized groups fully in decision making and share the benefits.
- 6 Research, educate, inform.** Understand and communicate the risks and build cooperation through education.

All our recommendations can, given the will, be implemented within a few years. We would urge governments, communities and other decision-making institutions to commit to doing so. Active crises such as that unfolding in Ukraine may command attention for their duration, but environmental degradation will continue until governments act to end it, as will the creation of complex risks by the interaction of the twin crises.

Security and environmental integrity are both headed in the wrong direction, to the detriment of every country and our collective common good. It is a mutually damaging situation deserving of a mutually beneficial solution.



1 TWO CRISES



With the toll of conflict rising and the natural environment degrading fast, our world is facing twin crises—and governments are only just waking up to the scale of the risks these crises pose to humanity.

AND A DEFICIT

Forests logged out of existence, mountain glaciers melting away, plastic pollution permeating land and ocean. More deaths in conflict, more money spent on weapons, more people going hungry. Human society may be richer than it was, but it is also markedly less secure. Governments have been looking the other way, and in some cases making matters worse by actively stoking insecurity, fear and environmental degradation. Without a fresh approach, the twin crises can only deepen.

The growth of the human footprint on the Earth has been astonishingly rapid (see figures 1A–1F). In 1950, humanity numbered 2.5 billion people, with global gross domestic product (GDP) around \$9 trillion. By 2020, just 70 years later, the population had tripled to 7.7 billion, while GDP had soared 13-fold to \$133 trillion.^{1*}

By some measures, this rapid expansion in human activity and prosperity is a remarkable success story. But it has come at a remarkable price. The cost is borne by forests, rivers, the atmosphere, animals, plants and the global ocean. The cost is also borne by humanity, because forests, rivers, the atmosphere, animals, plants and the global ocean provide services essential to life and well-being. As they become impoverished, so too does human society, sparking a cycle of insecurity—or deepening one that already exists—and eroding development gains made over decades.

Modern humanity's demand for resources is so big that it has significantly altered three quarters of the world's land surface and two thirds of the marine environment, squeezing living space for everything else.² The demand for water has swollen almost 8-fold since 1900,³ and 94% of fish stocks are being exploited to or beyond their maximum sustainable limit, reducing food security.⁴ The litany of environmental ills includes ozone depletion, plastic pollution, destruction of natural habitats from tropical rainforests to coral reefs, decimation of wild animals and plants, desertification of once

* On a purchasing power parity basis, current US dollars.

fertile land, acidification and de-oxygenation of the global ocean, and climate change.

The human influence is so stark that many scientists argue humanity has started a new epoch in the Earth’s history: the Anthropocene.⁵ For 4.5 billion years the world was shaped by natural processes, such as continental drift, volcanic eruptions, photosynthesis and evolution; in the last 70 years, human influence has overtaken them all.

Much of the global population became more secure during that 70-year period, as economic and social development reduced poverty, hunger and ill health. The meeting of basic needs lessened the likelihood of conflict over essential resources. However, the rapid degradation of the natural world is now threatening to turn back elements of progress, creating new and substantial security risks.

This is especially concerning because the world is already facing a security crisis. The indicators of insecurity are rising, and the impacts of nature loss and climate change are adding fuel to the fire. While failing to deal with the security and environmental crises separately, governments are also generally failing to appreciate their interactions and the additional risks they will generate.

Identifying an effective approach to security in this new era of risk is the central quest of *Environment of Peace*. We begin by mapping the realities of the security crisis, the present and future

Increasing human footprint

Figure 1A
Global population

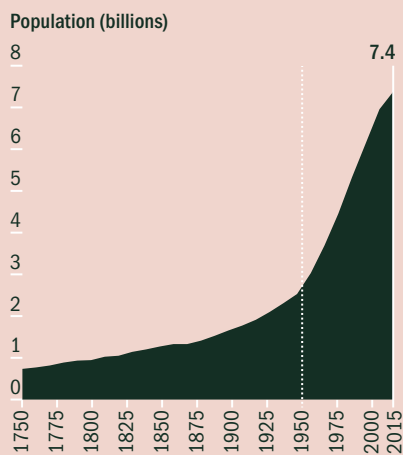


Figure 1B
Global GDP

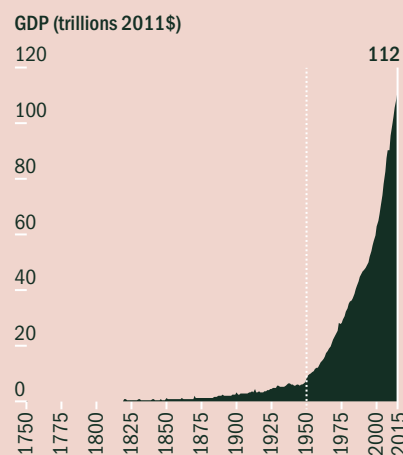
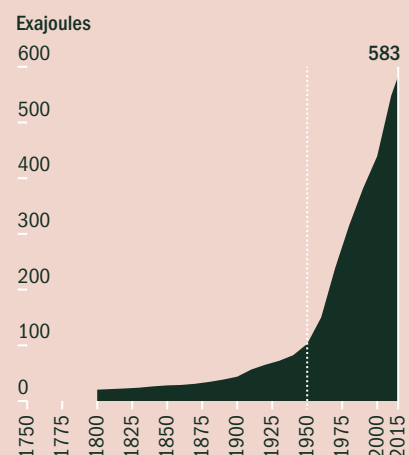


Figure 1C
Global primary energy use



Sources: **1A** 1750–1940: International Geosphere-Biosphere Programme (2015); 1940–2015 UN Population Division (2021). **1B** 1750–2015: Bolt and van Zanden (2020). **1C** 1750–2015: Ritchie and Roser (2020).

of the environmental crisis, and the currently inadequate approach to governance. These three strands then run throughout the report, providing a lens through which to see the world and a framework for moving from analysis to recommendations.

The security crisis

In 2010, the number of state-based armed conflicts documented around the world stood at around 30, having progressively fallen since the break-up of the Soviet Union. The trend has now reversed. Between 2010 and 2020, the number nearly doubled (to 56), as did the number of conflict deaths.^{6,*} This doubling can also be seen in the numbers of refugees and other forcibly displaced people, which rose from 41 million in 2010 to 82.4 million in 2020.⁷

The overall trend is unmistakable: the world is becoming less safe and secure for a large proportion of its inhabitants.

In recent years, most armed conflicts have taken place within rather than between countries.⁸ However, outside forces are intimately involved in many of the most lethal situations, with four conflicts—Iraq, Libya, Syria and Yemen—partially shaped by external powers.

* These deaths are largely due to the conflict in Syria.

** Percentage decrease of average terrestrial species abundance relative to abundance in undisturbed ecosystems.

Figure 1D
Global atmospheric concentration of CO₂

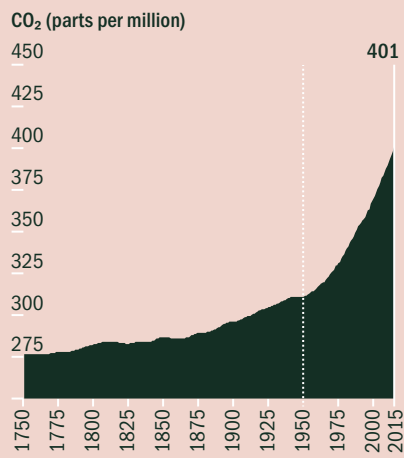


Figure 1E
Global freshwater use

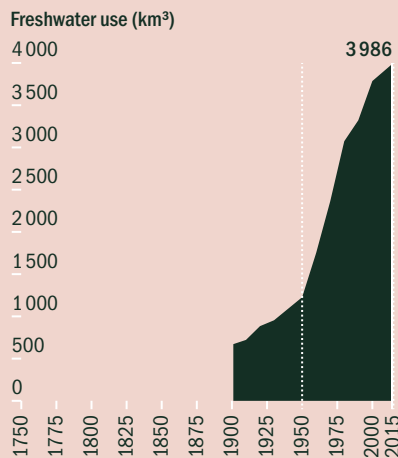
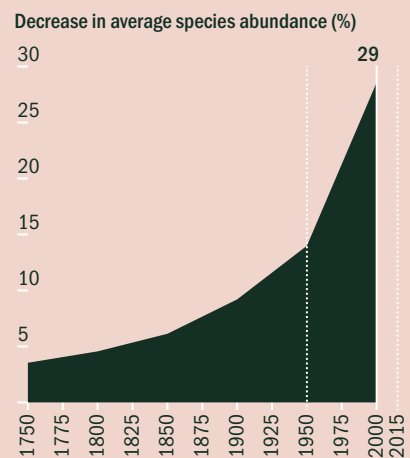


Figure 1F
Decrease in average species abundance**



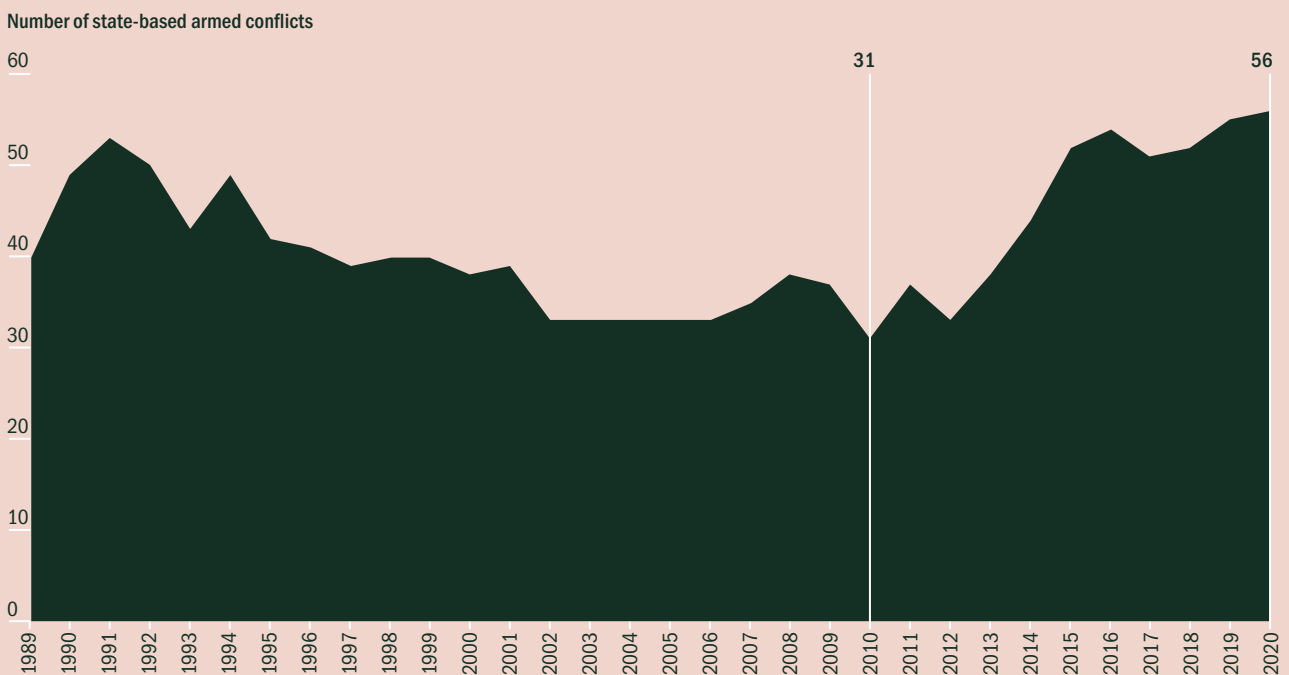
Sources: **1D** 1750–1958: International Geosphere-Biosphere Programme (2015); 1959–Present: US NOAA (2022). **1E** 1901–2014: Ritchie and Roser (2017). **1F** 1750–2000: International Geosphere-Biosphere Programme (2015).

Within the last three years, the Persian Gulf has seen missile strikes, proxy attacks and challenges to freedom of navigation. Tensions between India and Pakistan have escalated to the level of armed clashes,⁹ as have those between India and China.¹⁰ Warfare has arisen anew in Ethiopia and the South Caucasus.¹¹ Although conflict over water between countries is extremely rare, conflict over water within countries doubled between the 2000s and the 2010s.¹² The global ocean has not escaped the trend, with conflicts over fishing quadrupling since 2000.¹³


Even before the Russian invasion of Ukraine, geopolitics was becoming discernibly more fraught. A particular feature has been the increasingly frosty relationship between China and several Western powers, notably the United States. The USA has imposed trade sanctions on China,¹⁴ China has declared jurisdiction over a large tract of the South China Sea, and disputes have continued over cyberespionage and human rights. Within the last 10 years Russia has attempted to destabilize other countries via cyberattacks and electoral interference,¹⁵ and North Korea, Russia, Saudi Arabia and the USA have all carried out illegal killings on foreign soil.¹⁶

The months leading up to the invasion of Ukraine saw Russia restricting gas exports to send energy prices soaring in Europe and other regions,¹⁷ while Belarus attempted to weaponize migration along its border with Poland.¹⁸ The invasion has now

Figure 2 Number of state-based armed conflicts between 1989 and 2020



Sources: Petterson et al. (2021); Gleditsch et al. (2002).



\$2.1tn

Global military spending exceeded \$2 113 000 000 000 in 2021, nearly doubling since 2000.*

* Lopes da Silva, D. et al. (2022).

created Europe's worst security crisis in a generation. The social and economic impacts will spread globally. Energy poverty is a possible long-term consequence for poorer countries and communities, food prices have reached their highest level in at least 30 years¹⁹ and there is a considerable likelihood of food shortages due to the world's dependence on grain grown in Russia and Ukraine, as well as Russia's fertilizer exports.²⁰

At diplomatic level, the challenge is profound, shattering whatever points of consensus remained between Russia and the West. The fact that Russia held the presidency of the United Nations Security Council as its invasion began has elevated existing concerns about the Council's relevance and utility.²¹ Russia's scarcely veiled threats of nuclear weapon use have returned a cold war chill to Europe.²²

Countries are spending more money on their armed forces—both a symptom and a driver of worsening international security. In 2021, global military spending surpassed \$2.1 trillion, which is a near doubling in real terms from the levels in 2000 and the highest since the end of the cold war.²³ The volume of the arms trade has also swollen since 2010.²⁴ Several European countries will boost defence spending further as a bulwark against Russian aggression.²⁵

One unequivocal success during the period immediately after the cold war was the falling number of nuclear warheads maintained by the nine nuclear states. At nearly 70 000 in 1985, the total is now around 13 000.²⁶ However, since 2010 the nuclear arms control process has stalled, as relations between the USA and Russia, and now the USA and China, have deteriorated. About one third of the warheads are operationally deployed, ready for use. The reduction in the overall number of warheads is continuing, but in 2020 the number operationally deployed grew, the first increase documented for many years.²⁷ In January 2022, the five permanent members of the UN Security Council,* recalling the words of Soviet General Secretary Mikhail Gorbachev and US President Ronald Reagan in 1985, declared that 'nuclear war cannot be won and must never be fought'.²⁸ Russian rhetoric just two months later has both betrayed that insight and highlighted the risks posed by the continued existence of so many warheads, not least due to the possibility of accidental launch.²⁹

The use of chemical weapons recurred in the last decade, with documented deployment in the Syrian conflict³⁰ and alleged use in the battle to drive Islamic State from Iraq.³¹ Deployment of battlefield weapons that take decisions using artificial intelligence is now a realistic prospect, raising new questions over the risk of accidental attacks.³²

A state of international security is both a prerequisite for sustainable development and an outcome of achieving it. Even before the Covid-19 pandemic, progress on achieving the UN Sustainable Development Goals (SDGs) was lagging.³³ More children across the world were in education, several communicable diseases were in decline and more people had access to safe drinking water. However, the number of people

* China, France, Russia, the UK and the USA.

suffering from food insecurity was rising, and dramatic levels of inequality persisted in all regions of the world—overall, the rate of progress was insufficient to deliver on all the SDGs by 2030.³⁴ The pandemic has now put even this limited progress into reverse, while Russia’s military action in Ukraine is likely to compromise food security still further³⁵ and may push tens of millions into extreme poverty.³⁶ An estimated 2 billion people live in countries where progress on issues such as health, education, poverty alleviation, and access to water and sanitation is compromised by fragility, conflict and violence.³⁷

More wealth is being created, but societies are demonstrably becoming less secure.

The environmental crisis

All life on Earth resides within the biosphere and is sustained by it; humanity is no exception.³⁸ But in the scale of its effect on the biosphere, *Homo sapiens* is exceptional: no other single species in history has affected the planet so profoundly in such a short length of time. Human impacts extend from the polar regions to the Equator, from the upper atmosphere to the bottom of the ocean. Pollution in all its forms is now ubiquitous, and greenhouse gas emissions are changing the climate faster than in any other period scientists can identify. The consequences for the biosphere are huge:

- Species are becoming extinct between 10 and 100 times faster than they would without human influence; about 25% are currently at risk of extinction.³⁹
- The combined mass of wild mammals on Earth has shrunk to about one sixth of its level before human civilization began;⁴⁰ in the last 45 years, the number of wild animals has fallen by nearly two thirds.⁴¹
- Insects, including pollinators, are in decline worldwide, with numbers in rainforests and many other localities falling by at least 75% in the last 40 years.⁴²

The biggest driver of species extinctions is land clearance, primarily for agriculture.⁴³ Some countries, such as China, are successfully restoring forests and other ecosystems,⁴⁴ but elsewhere destruction is increasing: Brazil recently registered its highest rate of deforestation in 15 years.⁴⁵ Human expansion into forested areas, usually to extract natural resources or clear land for farming, has led to diseases transferring from wild animals to humans. Recent zoonoses* facilitated by environmental degradation include Ebola, SARS, Nipah virus and, possibly, Covid-19.⁴⁶ Some countries enjoy conservation ‘wins’ within their borders while importing unsustainably sourced resources, such as timber or fish, from the Global South—effectively exporting the impacts of their demand.

* A zoonosis is a disease that can pass between other animals, wild or domestic, and humans.

Land clearance and use, for agriculture and other purposes, is affecting soil and water quality. About one third of the world’s soil is now degraded; this could rise to 90% by 2050, while demand for food is predicted to increase by 60%.⁴⁷ About 4 billion people—more than half the world’s population—experience severe water scarcity for at least one month of the year, while 733 million live in countries where water stress is already critical.⁴⁸

The services that nature performs are indispensable to human life, security and well-being. Among the 18 ecosystem services identified by the UN are regulation of air and water quality, regulation of the climate, formation and maintenance of soil, and pollination.⁴⁹ For many peoples across the Earth, nature is also the foundation of culture and identity.

Despite the acknowledged importance of intact ecosystems and the services they provide, many human activities undermine them. There have been five global mass extinction events in the Earth’s history, when events such as an asteroid strike wiped out more than 90% of living species.⁵⁰ The sixth is now firmly underway;⁵¹ and this one is entirely humankind’s creation.

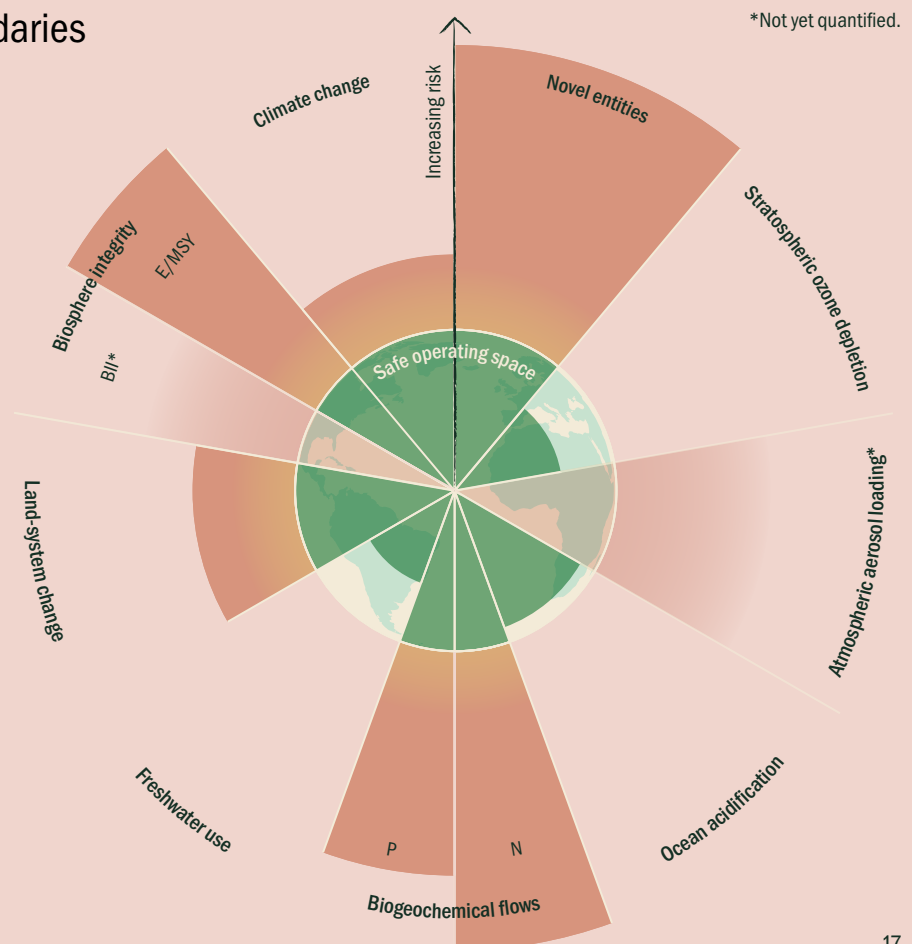
Since the 1950s, human society has collectively produced an estimated 8.3 billion tonnes of plastic waste.⁵² It clogs drains and watercourses in major cities. Microplastic particles are found throughout the world’s soil⁵³ and in sediments on the ocean floor

Figure 3 Planetary boundaries

The planetary boundaries concept looks at nine processes that are essential for environmental integrity. For each, it uses scientific evidence to assess whether the trend has gone so far as to cross the boundary of a ‘safe operating space for humanity’. Crossing the estimated boundaries increases the risk of triggering large-scale abrupt or irreversible environmental changes.

- BII** = Biodiversity Intactness Index
- E/MSY** = extinctions per million species-years
- P** = phosphorous cycle
- N** = nitrogen cycle
- Novel entities** = toxic and long-lived substances such as synthetic chemical pollutants, heavy metals, and radioactive materials

Source: This version is based on the original illustration designed by Azote for Stockholm Resilience Centre, based on analysis in Persson et al. (2022) and Steffen et al. (2015).



Climate change is forecast to reduce the yield of major crops such as maize, rice and wheat, and increase the risk of simultaneous harvest failures.

where they are eaten by fish, entering the food chain.⁵⁴ They have even been found in the human bloodstream.⁵⁵ Plastic has spread to the highest and lowest points on the Earth's surface, from the top of Mount Everest to the bottom of the Mariana Trench.⁵⁶ Pollutants such as mercury and toxic pesticides are found even in the Arctic, both on the surface of the ice and in the bodies of animals.⁵⁷ This ubiquity means that many pollutants are found in people's bodies, including toxins such as heavy metals that accumulate in the food chain.⁵⁸

Air pollution is a significant health hazard in many regions of the world, particularly in major cities of the Global South.⁵⁹ Indoor air quality has improved, largely through the advent of modern cooking stoves in the poorest countries.⁶⁰ But outdoors the situation has worsened: 4.5 million people die from outdoor air pollution each year, a rise of 57% since the year 2000.⁶¹ An estimated 90–95% of the global population now breathes outdoor air polluted beyond the safety levels calculated by the World Health Organization (WHO).⁶² Burning fossil fuels is the main source of air pollution.

Superimposed on this global picture of unsustainable demand and increasing environmental degradation is the growing footprint of climate change. It is now certain that humanity's greenhouse gas emissions are changing the climate; it is equally clear that this is increasing both detectable impacts and risks that can be anticipated, if not predicted with precision.⁶³

Concentrations of the three main gases driving climate change, carbon dioxide, methane and nitrous oxide, have increased to levels unprecedented for at least 800 000 years and probably much longer.⁶⁴ The bulk of the increase has occurred since the dawn of the Industrial Revolution, with a marked acceleration in the last 50 years. The average temperature across the Earth's surface is now 1.1 degrees Celsius higher than in pre-industrial times, with further increases inevitable.⁶⁵

At the 2015 UN climate summit in Paris, governments agreed to attempt to limit global warming to the 'guardrail' of 1.5°C.⁶⁶ By the conclusion of the 2021 summit in Glasgow, they had collectively made pledges that, if delivered in their entirety, could limit global warming to 1.8°C. However, on the basis of the policies in place, by 2100 the Earth is set to heat up by around 2.7°C, possibly as much as 3.6°C.⁶⁷

Some of the observed impacts of climate change include:⁶⁸

- rising sea levels across the globe, increasing flood risks
- the melting of ice in mountain ranges, changing river flows and provision of freshwater
- the perturbation of weather systems, including winds and rainfall patterns
- the increasing incidence and length of heatwaves, also driving droughts and wildfires
- increases in the frequency and intensity of extreme weather events such as hurricanes and flash floods (flood disasters have quadrupled and drought events tripled since 1980)

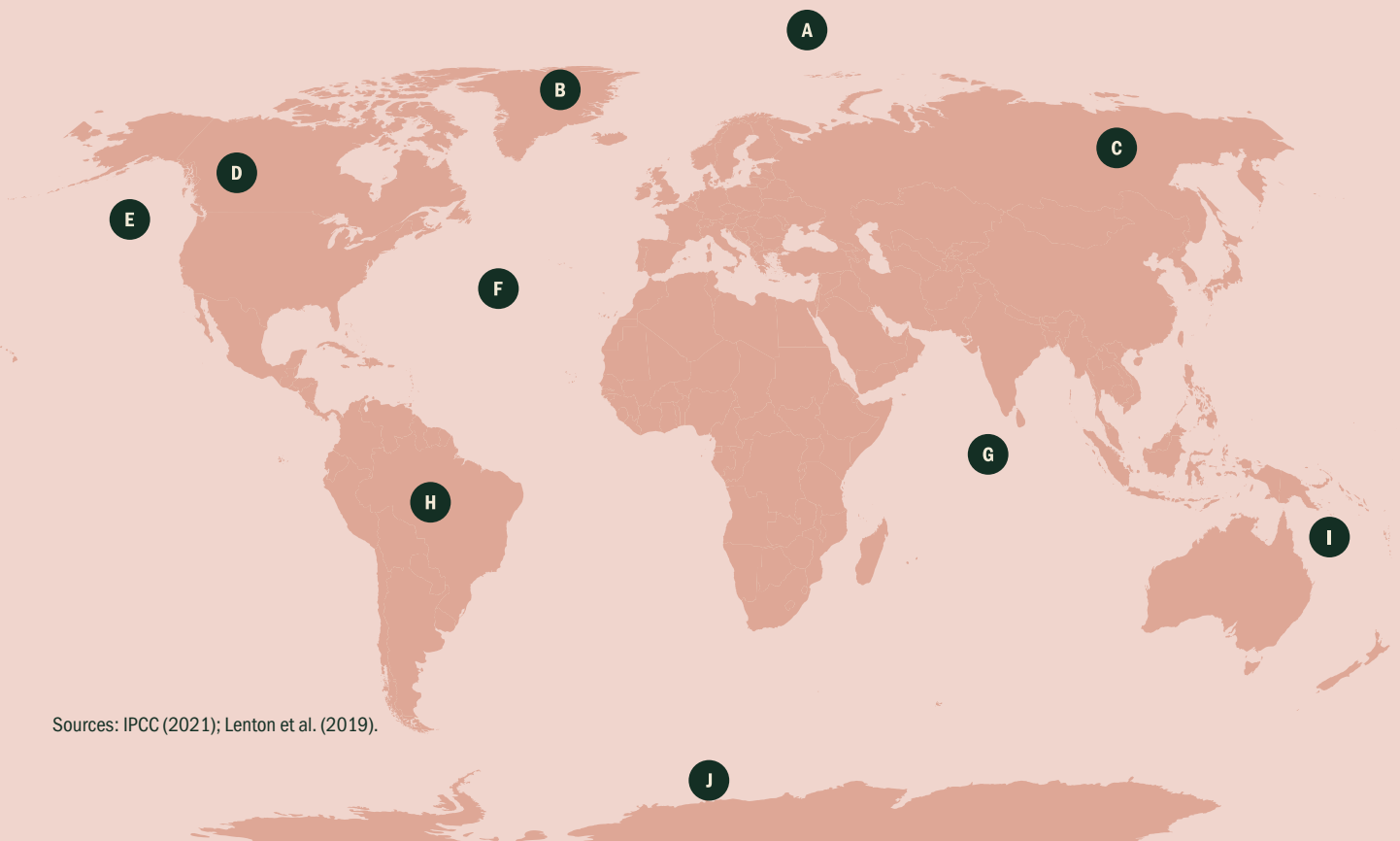
- the warming, acidification and de-oxygenation of the global ocean⁶⁹
- shifts in climatic zones suitable for growing important food crops.

All of these impacts can affect security in varying ways—reducing harvests, reducing freshwater supplies, compromising livelihoods and sparking migration—but much worse lies ahead. Each of the trends above is forecast to continue and some are accelerating, such as the rate of sea level rise, which has tripled since the 1970s.⁷⁰ Even on an emissions trajectory leading to 1.5 °C of global warming, 700 million people will be exposed to extreme heatwaves every 20 years or fewer. At 2 °C, the number rises above 2 billion. Climate change is already affecting food production on land and in the ocean; in coming decades it is forecast to reduce the yield of major crops such as maize, rice and wheat, and increase the risk of simultaneous harvest failures in major producing countries.⁷¹

Very few human societies live with an average annual temperature above 30 °C. Yet an estimated 1.6–2.5 billion people may be living in those temperatures in 50 years' time, using a mid-range projection of greenhouse gas emissions.⁷² Every fraction of a degree increases the risk of passing 'tipping points' where, for example, the disappearance of the Greenland ice sheet or the drying of the Amazon Basin becomes inevitable.⁷³ Passing these tipping points would have global consequences such as accelerating sea-

Figure 4 Select tipping points

A Arctic sea ice: reduction in area. B Greenland ice sheet: ice loss. C Permafrost: thawing. D Boreal forest: fires.
E Methane clathrates: releasing methane. F Atlantic circulation: slow down. G Global monsoons: destabilize precipitation patterns.
H Amazon: dieback and drought. I Tropical coral reefs: large-scale die-offs. J East and West Antarctic ice shelves: ice loss.



level rise or reducing the amount of CO₂ taken up by forests—in turn contributing to climate change.

UN Secretary-General António Guterres described the August 2021 report from the Intergovernmental Panel on Climate Change (IPCC) as ‘Code Red for humanity’.⁷⁴ He has sounded a similar alarm about the loss of nature, which also shows no sign of abating despite repeated promises from governments. At the 2010 UN biodiversity summit in Nagoya, Japan, governments made 20 pledges* that collectively aimed to slow and eventually reverse the global decline in nature. As of 2020, every one had been missed.⁷⁵

The governance deficit

It is clear then that across the world, governments are failing to deal adequately with both escalating insecurity and threats to the environment.

For most of human history, the most serious risks have been the most direct: the lack of a key resource, or the threat that another community or country would take it away. The resource in question could be land, food, wealth or something less tangible; but essentially the best defence has been to avert the threat through diplomacy or deterrence.

Now, many of the most serious threats are shared. Rising temperatures, plastic pollution in the ocean, and the loss of ecosystem services provided by forests and plankton all pose universal risks. Every government knows this; every one signs off on reports from the IPCC, including the risks to security that it documents. In 2019, governments signed off on an equally cogent warning from the IPCC’s counterpart in the natural environment sphere, the Intergovernmental Platform on Biodiversity and Ecosystem Services.⁷⁶ But with few exceptions, they do not act as though they have appreciated the severity of the crisis.

Since the birth of the UN climate convention in 1992, developed countries have reduced their collective greenhouse gas emissions by only 13%.⁷⁷ Governments from Australia to Saudi Arabia continue to behave as though climate change had a cause other than burning coal, oil and gas.⁷⁸

The USA, the world’s wealthiest country and the biggest cumulative emitter of carbon dioxide in human history, spends more than \$750 billion per year on defence but is currently providing only \$6 billion per year on international climate finance—around one eighth of its fair share obligation.⁷⁹ Overall, major governments, the UN and its agencies, and international finance institutions such as multilateral development banks have done little to mobilize the trillions of dollars per year needed to accelerate the clean energy transition and safeguard the natural environment on the scale that science indicates is prudent.⁸⁰

Access to climate finance is a constant challenge for the smallest and poorest countries, given the bureaucracy and other

* The Aichi Biodiversity Targets.



67%

Humanity has altered
three quarters of the world's
land surface and **two thirds**
of the marine environment.

Governments are failing to plan for a future that will increasingly be defined by environmental deterioration and responses to it.

obstacles involved;⁸¹ while within countries, the (usually male) elites often monopolize the finance available.⁸² In terms of building resilience against climate and other shocks, the most fragile states have the clearest need; yet per person, they receive 1/80th of the climate financing that flows to non-fragile states.⁸³

Faced with the more salient and equally shared threat of Covid-19, governments had a choice between cooperation and competition, and overwhelmingly chose the latter. Governments of wealthy countries could have approached vaccination as a global good, funding production of vaccines for distribution on a basis of need. The WHO and UN Secretary-General Guterres were among those urging this approach and warning of the dangers of vaccine nationalism.⁸⁴ But nationalism is exactly what materialized.⁸⁵ Most governments failed to engage seriously with the WHO's COVAX initiative⁸⁶ and some—notably the United Kingdom and the European Union (EU)—even launched into tit-for-tat arguments about this basic life-saving commodity.⁸⁷ The global cost of vaccine nationalism has been estimated at \$1.2 trillion per year; every dollar that wealthy countries decided not to invest in supporting global vaccination reduced global wealth by nearly five dollars.⁸⁸

As governments began to implement plans to stimulate economic growth after the Covid-19 pandemic, UN Secretary-General Guterres was among those urging that money should be spent in ways that also tackled environmental degradation—a concept that became known as 'build back better'.⁸⁹ Through 2020 and 2021, governments of the Group of Twenty (G20) countries committed an estimated \$14 trillion to economic recovery. But they spent just 6% of that on environmentally beneficial measures, and a further 3% on anti-environment activities such as stimulating the use of coal.⁹⁰ 'Building back' certainly occurred; 'better' appeared largely to have gone missing.

Some leaders deliberately shaped their pandemic response around populist rhetoric diametrically opposed to science, promoting misinformation on fake cures and scare stories about vaccinations, wilfully exposing their populations to far greater risks than were necessary.⁹¹ This too provides a cautionary tale for the far greater challenge of overcoming the security and environmental crises. To be effective, responses must be based on evidence as well as cooperation; combatting climate change is hard enough without autocrats enthusiastically embracing misinformation as a weapon in a self-aggrandizing culture war.

In terms of security, too, authorities sometimes go further than failing to be part of the solution and become a central part of the problem, actively driving insecurity. The corruption of politicians is often linked to organized crime syndicates involved in narcotics, people trafficking or other illegal activities.⁹² Armed factions move into these criminal activities to make money; organized criminals involve themselves in factional politics to gain protection and influence. In Mexico, the narcotics trade has claimed 100 000 lives in the last decade alone.⁹³ In such situations, violence is a daily threat for many. In the worst situations, crime and violence

are not a challenge to order—they are the order. The involvement of agents of the state in terrorism and cybercrime provides further examples of authorities deliberate stoking insecurity.

Victims of violent impunity include those seeking to prevent environmental destruction. The year 2020 was the deadliest yet for environmental defenders, with 227 people killed for attempting to preserve their local environment against intrusive industries such as mining and logging.⁹⁴

Against populism, corruption, impunity and other forces, democracy struggles for survival. The 2021 Global State of Democracy report found that in each of the last five years the world has become less democratic. It notes also that the Covid-19 pandemic has offered an easy excuse to restrict free speech and weaken the rule of law.⁹⁵ For security and for the environment, this matters. Democracies are less likely to go to war with each other; and when they do, conflicts result in fewer casualties.⁹⁶ Countries with well-functioning governments—and in the developed world, those with the highest levels of democracy—are also more likely to maintain higher levels of environmental integrity.^{97,*}

One further governance issue that Covid-19 clearly illustrates is lack of resilience. In many cases this was a consequence of inadequate access to resources and expertise, but in some it resulted from decisions made by the government.⁹⁸ Very few countries actively prepared for a pandemic, even though the WHO repeatedly signalled the risk. Governments were forewarned, but for the most part chose not to be forearmed.

Economies and societies are also becoming more fragile in other ways. Growing reliance on information technology increases the consequences of cyberattacks, which are being aimed at critical infrastructure and even at elections.⁹⁹ Inequality between and within countries is a hotly debated topic, but one indisputable fact is that collectively governments have allowed themselves to become poorer while wealth has accumulated in private hands—reducing the resources available for building resilience.¹⁰⁰

Eighty-five percent of countries have marginal-to-low food self-sufficiency, which means they are unable to supply enough food for their own people and are reliant on imports to a greater or lesser degree.¹⁰¹ Just three crops—wheat, rice and maize—provide 42% of food calories worldwide. Russia supplies 20% of the world's wheat exports and India one third of rice exports.¹⁰² The global food system has evolved this way mainly because it is efficient and economic—but it also confers fragility.**

On the global ocean, illegal, unreported and unregulated (IUU) fishing accounts for half the global catch, by some estimates.¹⁰³ Countries to which fishing vessels are registered seem unable or unwilling to exert control.¹⁰⁴ IUU fishing ignores any notion of sustainability or ecological safeguards, deprives ocean countries of income and weakens food security. There are also links with piracy, human trafficking and drug running.¹⁰⁵ In Somalia and West Africa, the impacts of social and economic upheavals on land (fuelled by corruption, land grabs and illegal evictions) have

* The correlation does not necessarily extend to globally significant environmental performance, e.g. a country's greenhouse gas emissions.

** Ukraine supplies a further 9% of wheat exports and 13% of maize exports, both of which, along with Russian output, are likely to be absent from the global market for the rest of 2022 at least.

combined with overfishing by foreign fleets (much of it IUU).¹⁰⁶ The effect has been to remove an artisanal source of food and livelihoods, perpetuating instability and state fragility on land. Globally, governments have collectively paid lip-service to solving the problem of IUU fishing but have yet to implement anything like a serious attempt to stop it.

The most important governance deficit is that governments and other institutions of power and responsibility are failing to plan for a future that will increasingly be defined by environmental deterioration and responses to it. One arm of a government tends to assess security, another deals with environmental issues. Within the UN system, the Environment Programme broadly oversees one field, the Security Council another. As the two crises interweave and propagate jointly, the moves that are underway to bring together these agendas need to be dramatically accelerated.

Two crises and a deficit combine

Governments, notably those in the Global North, have collectively failed to find solutions to the major issues of climate change and loss of nature, and increasing insecurity is among the consequences. Some African countries spend nearly 10% of their annual GDP on climate adaptation measures.¹⁰⁷ Somalia's government estimates that its climate adaptation needs each year are roughly equal to its entire GDP.¹⁰⁸ In the Caribbean, extreme weather events made more severe by climate change are causing economic damage that can exceed a country's annual GDP.¹⁰⁹

Even if governments take decisive action on climate change, large tracts of the world, predominantly in the Global South, face an unstable future of more weather extremes, economic losses and damage to agriculture and infrastructure, which will increasingly hinder development.¹¹⁰ Global water demand is likely to rise by at least 20% by 2050, with an additional one billion people living in places where the sustainable supply cannot keep up with their basic needs.¹¹¹

Among countries, statistically there is already a relationship between low levels of peace and resilience, and a high degree of ecological threat. The Institute for Economics and Peace concludes that the 19 countries with the highest number of ecological threats are all among the world's 40 least peaceful; 16 of the 20 countries facing the most severe ecological threats are among the least resilient.¹¹² Countries with a UN peace mission are, by definition, in a state of insecurity and conflict risk. As of late 2020, half of the UN's 21 missions were in countries highly exposed to climate change impacts.¹¹³ The Global Environment Facility* invests more than a third of its funding in countries affected by major armed conflict.¹¹⁴

* The Global Environment Facility is a partnership for international cooperation, bringing together 183 countries as well as international institutions, civil society organizations and the private sector to address global environmental issues. It serves as a financial mechanism for five multilateral environmental agreements, including the UN climate change and biodiversity conventions.

Subsidies that contribute to climate change and wider environmental destruction are doubly damaging given that they also exacerbate insecurity and conflict risk.

Poverty, insecurity, environmental degradation and poor governance interact in mutually reinforcing ways:

- unsustainable use of basic resources contributes to environmental decline
- environmental decline worsens insecurity and reduces the potential to develop resilience
- poor governance fosters unsustainable resource use, environmental decline and insecurity.

Meanwhile, wealthy countries may maintain high environmental standards within their borders, but cause enormous harm overseas through unsustainably high consumption. No country has achieved a high level of human development without a large international footprint in demand for resources and carbon emissions.¹¹⁵

The environmental crisis has multiple drivers, but one that governments have the power to solve quickly is subsidies. Governments' subsidies for fossil fuels collectively exceed \$500 billion per year¹¹⁶—or 10 times that, if failure to price in the cost of damage caused by burning them is included in the calculation.¹¹⁷ Including giveaways that drive overfishing, biodiversity loss, water consumption and other issues, the global total for subsidies that are potentially harmful for the environment is estimated at \$5–7 trillion per year.¹¹⁸ The IPCC concludes that eliminating fossil fuel subsidies could reduce greenhouse gas emissions by up to 10% this decade.¹¹⁹ As the Dasgupta Report on the economics of biodiversity observed in 2021, 'governments almost everywhere exacerbate the problem by paying people more to exploit nature than to protect it'.¹²⁰ On multiple occasions, governments have pledged to phase out subsidies for fossil fuels, overfishing and other harmful activities,¹²¹ but have not done so.

Subsidies that fuel climate change and wider environmental destruction are doubly damaging given that climate change and environmental decline exacerbate insecurity and conflict risk. Subsidizing conflict is in no one's best interest.

Establishing and sustaining peace in the 21st century while restoring environmental integrity requires a transformation in thought and action. It begins with appreciating the sheer complexity and interconnectedness of the global trends outlined above and the risks they generate—risks that are emerging in many parts of the world, with devastating effects on livelihoods and communities.



2

A NEW ERA

OF RISK

The twin crises of insecurity and environmental decline interact in complex, often unpredictable ways. This is creating new forms of risk to lives, livelihoods and the natural world—risks that in extreme cases can overwhelm societies, even entire countries.

Unrelated events in two different parts of the world combine to create an unforeseen risk in a third location. A climate change-fuelled weather disaster creates shocks throughout a global supply chain. Violence and crop disaster jointly make life unliveable for many thousands of farmers, contributing to migration. All over the world, predominantly in places already hampered by poverty and poor governance, the combination of rising insecurity and environmental degradation is creating a new era of risk.

Climate change and other types of environmental degradation do not by themselves create insecurity and conflict. They can worsen living conditions for people and so raise the risk of insecurity and conflict; but what transpires depends on the choices that people make. These choices will in turn largely depend on pre-existing social and economic conditions.

For example, if a climate change-fuelled storm hits a cohesive community that is prepared for such an event, it is less likely to generate serious insecurity than if it lands in a fractured, tense and corruption-riddled setting where people live on the poverty line.

Nevertheless, the confluence of the security and environmental crises increases risks for all—with both crises pushing in the same direction. Hunger provides a fitting example. Since 2015, the number of hungry people around the world has grown.¹²² The biggest driver is violent conflict, the second biggest is climate change,¹²³ and a growing number of people are experiencing both on an ongoing basis.

One logical consequence of the rapidly evolving twin crises is that processes and institutions that were adequate for safeguarding peace and security in the past may prove inadequate in the future, as impacts accelerate and risks multiply.

Resource sharing under pressure

The 1947 partition of India, creating independent India and Pakistan, drew an international border through the middle of the Indus River Basin and launched simmering disputes around its waters. The Indus and one of its major tributaries rise in China and flow through India into Pakistan. Other tributaries rise in India, and one rises in Afghanistan. Both India and Pakistan use the river's water heavily—80% of Pakistan's agricultural output comes from the basin¹²⁴—and tensions over access have been constantly present.

The Indus Waters Treaty of 1960 divides rights between the two regional powers.¹²⁵ India has the right to use the three eastern tributaries as it wishes, but must let water from the three western rivers flow into Pakistan unhindered. India has built projects on these western rivers, as the treaty allows. According to Pakistan, these projects reduce the amount of water it receives. India rejects this, saying that the real strains on Pakistan's water resources result from wasteful practices. Politicians on both sides regularly call the terms of the treaty into question. But for more than 60 years, the treaty's mechanisms have successfully settled these disputes, dampening tensions and contributing to stability.

If nothing else changed, it would be rational to expect this situation to continue. But much is changing. The populations of India and Pakistan are growing, along with their food production and need for water for energy and industry. Meanwhile, water demands in Afghanistan and China are also rapidly rising. Both of these countries are now developing projects on their stretches of the Indus, but neither belongs to the Indus Waters Treaty or holds a water cooperation agreement with its downstream neighbour. These factors have pushed the extraction of water to its absolute limit and injected new sources of tension.¹²⁶

Now, into this already fractious situation comes climate change.

The headwaters of the Indus are fed by glaciers and snowfields high up in the Tibetan Plateau. Glaciers are shrinking, and snow melts away earlier each year.¹²⁷ Precipitation is predicted to become more variable. Across the Himalayas, climate change is making rivers flow more erratically and increasing the amount of rubble and debris carried in peak flow periods. Water availability is likely to vary much more between years and between seasons, even as demand continues to grow.¹²⁸

Permanent tension between powerful regional rivals; a resource already used to its limit; the rise of new geopolitical players; an environmental stress whose precise impact cannot be predicted but which can only be negative. Taken as a whole, these developments raise a question mark over the prospects for continuing peace.

The Indus is by no means the only example of a shared resource facing new pressures as climate change progresses.

It is a particularly pertinent example, though, as India, Pakistan and China all possess nuclear weapons.

Most importantly, it illustrates the reality that in this new era of risk, institutions of all types will need to adapt. As the IPCC concluded in 2022, transboundary management and cooperation need to be climate-informed in order to remain effective as risk factors mount up.¹²⁹

Are the policy tools in place for the Indus adequate for the increasing risks ahead? Are the Indian and Pakistani authorities preparing for years and seasons when droughts are much deeper and floods far higher than they have been? Are water users being consulted about contingency plans? The Indus River Basin includes four countries; its water resources depend on a larger Himalayan ecosystem increasingly impacted by climate change, environmental degradation and uncoordinated infrastructure development unforeseen when the existing management arrangements were drawn up 60 years ago. How can the region's governance mechanisms advance and adjust to answer these risks?

Here and elsewhere, will governments respond to the greater risks climate change has brought with greater assertiveness or greater cooperation? Will these new challenges, which every country will face to a greater or lesser extent, be a pathway to cooperation or conflict?

Pathways to conflict

However severe the stress generated by environmental change, conflict is far from inevitable. The outcome will depend on the decisions that people take. There are potentially many pathways that can lead from environmental degradation to violent conflict, but four have been clearly identified across many contexts and regions:¹³⁰

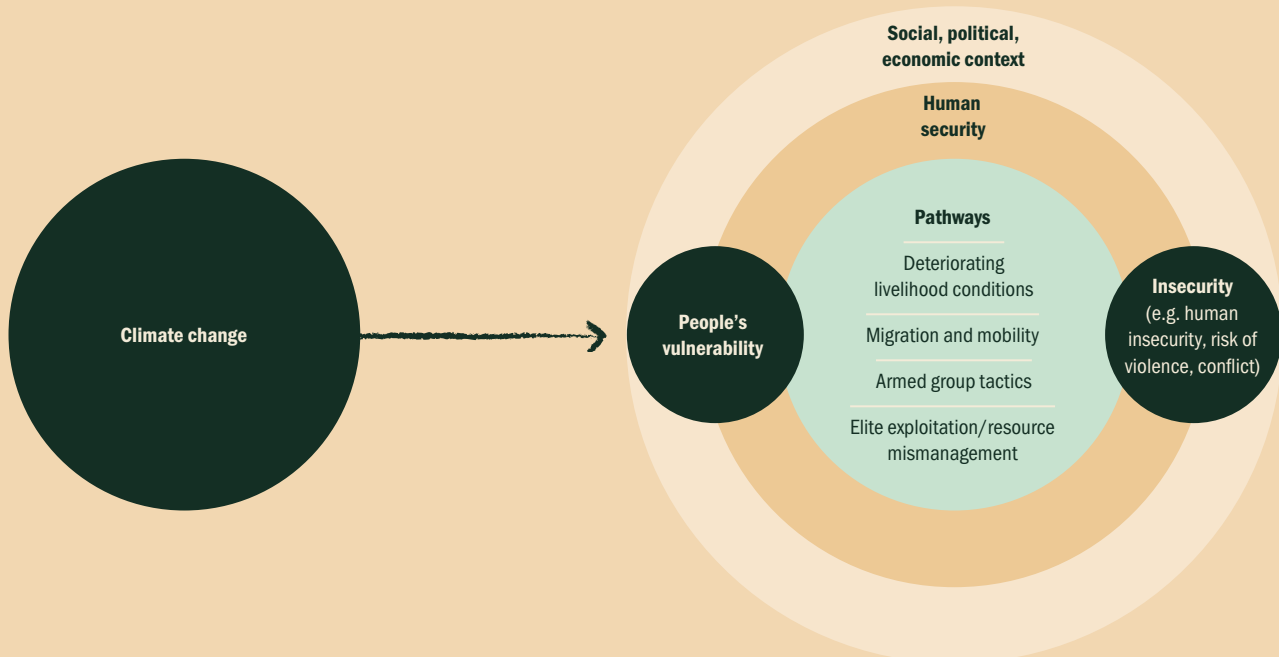
- In **deteriorating livelihood conditions**, due either to a sudden or progressive impact, people may resort to violence to secure possession of an increasingly scarce or unequally available resource, such as water or grazing land. For example, in Kenya's Turkana region, exceptionally dry weather has depleted pasture and water resources, which has increased competition over natural resources and violence between pastoralists.¹³¹
- Climate change and other environmental trends can increase **migration and mobility**, as a response to stress. If this brings migrants into competition with host communities, conflict can result, even in areas that are less vulnerable to the effects of climate change. In the 1980s, natural disasters and poverty drove large-scale migration into India's Tripura state, leading to migrant-host competition over land resources and culminating in close to a decade of violent urban riots.¹³²
- Climate change can influence **armed groups' tactics**. They may move into new areas or change behaviour in order to secure resources such as food, or use climate impacts or government

failures in response as a recruiting tool. In the Lake Chad region, Boko Haram and Islamic State West Africa Province have offered financial incentives to gain support and recruits in communities where climate change and environmental degradation have undermined livelihoods.¹³³

- Rapid-onset disasters create stressful and sometimes chaotic conditions ripe for **exploitation by elites and resource mismanagement**. Elites can seek to increase their influence by controlling who benefits from aid, or from finance for climate mitigation or adaptation projects; they can also seize control of land that others had to leave due to conflict or deteriorating livelihood conditions. On the Brahmaputra-Jamuna floodplain in Bangladesh, marginalized communities are particularly exposed to the effects of climate change and the predation of powerful elites, who have used private militias to violently bar displaced people from returning to their land.¹³⁴

In each of these pathways, the environmental change, whether sudden or progressive, is only part of the picture. The social and economic context forms the rest. This means that there are multiple opportunities to intervene, including by reducing the vulnerability of communities to environmental impacts, and building community and institutional resilience.

Figure 5 Pathways of climate insecurity



Source: SIPRI Climate Change and Risk Programme.

Five complex risks

In today's interconnected world, stresses, impacts and risk factors can combine in a number of ways. Sometimes, two impacts of environmental degradation will combine to produce a complex risk. On other occasions, an environmental impact will combine with something completely different, such as an economic shock, the emergence of a conflict or a disease outbreak.¹³⁵ The effects of an event in one part of the world can be felt in another, irrespective of national borders. At the extreme end, a set of shocks can occur that is profound enough to shake an entire system—a country, a community or an economically productive activity.

The multiple ways in which risk factors interact make this a 'wicked problem' with no simple solutions.¹³⁶ Analysing situations occurring in different parts of the world (and some that span the world), and building a framework of understanding from that analysis, reveals just how wicked the problem is.

The situation in the Indus River Basin is an example of one type of complex risk, a **compound risk**. This is when two or more factors interact in a given region to generate a new type of risk that would not otherwise exist.

PHOTO

Confluence of the Indus and Zaskar rivers,
Veda Nimkhedkar



In today's interconnected world, stresses, impacts and risk factors can combine in multiple ways making this a 'wicked problem' with no simple solutions.

Another compound risk situation concerns the 2015 Chennai floods in India, which killed nearly 200 people and displaced 200 000 from their homes.¹³⁷ Unusually heavy monsoon rains were the driving factor, but not the only one. Chennai is a rapidly growing city, and many mangrove swamps have been converted into roads and parking lots. Whereas mangrove swamps absorb rainfall, acting as a natural buffer, the hard surfaces of roads do not.¹³⁸ In 2015, the water accumulated with lethal results. Chennai is far from being the only city in the world where urbanization has exacerbated the flood risk by both removing natural drainage and bringing more people into the at-risk area.

Like a stream coursing down a mountainside, an impact can flow through various elements of today's interlinked world, creating a **cascading risk**. A storm can lead to a power cut, which closes a hospital, which is then unable to stem a disease outbreak, which ... and so on, through a sequence of events unfolding across time and space, including across national borders.

Between 2012 and 2014, the coffee crop in Guatemala was decimated by coffee rust, a fungal disease that needs warm and wet conditions.¹³⁹ Harvests across Central America fell, resulting in a wage decrease of 13–27% in the region.¹⁴⁰ Around the same time, the price of coffee on international markets was falling and production costs were increasing, further compromising prospects for Guatemalan growers. Coffee rust is among the plant diseases forecast to spread as the climate changes.¹⁴¹

Staple crops like maize and beans are also important for Guatemalan households. Subsistence farmers have indicated that changes in rainfall have had negative impacts on production and availability of these crops.¹⁴²

Guatemala is a deeply unequal society, marred by corruption.¹⁴³ Land ownership is concentrated among the elite, and nearly half of the population lives below the poverty line.¹⁴⁴ Violence, driven largely by organized crime, is a reality for many. Organized crime is estimated to provide about a quarter of political funding.¹⁴⁵

The effects of climate change on livelihoods and food security, along with violence and poverty, have increased the number of Guatemalans trying to emigrate. The number of migrants travelling to the southern border of the USA from Central America rose markedly between 2016 and 2019; about 31% of those apprehended on the Mexico-USA border in 2019 came from Guatemala.¹⁴⁶ The US government's response at the time was to increase the militarization of its border.¹⁴⁷

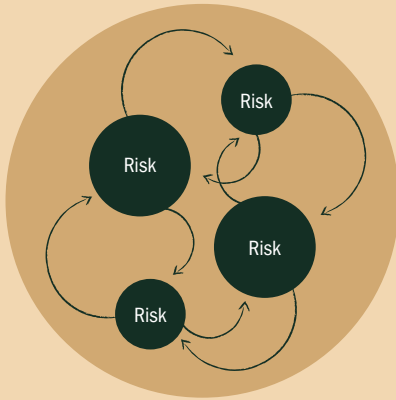
Two or more seemingly independent factors in different parts of the world can combine to generate an **emergent risk**. That these factors are unrelated makes such risks hard to foresee. For example, the underlying cause of the Arab Spring, the series of civil uprisings and resulting conflicts that began across the Middle East and North Africa a decade ago, was undoubtedly dissatisfaction with governments that many citizens saw as oppressive, corrupt and out of touch. But events in two other parts of the world contributed as well.

In 2010, Russia saw a major heatwave that caused its worst drought in 40 years. Across large tracts of the country, temperatures

Figure 6 Five types of risk

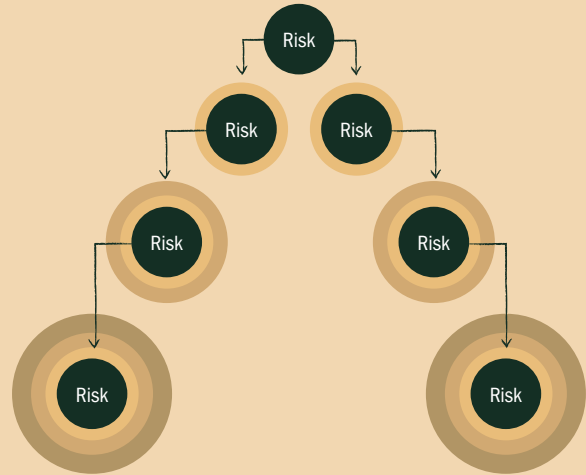
COMPOUND RISKS

Two or more factors interact in a given region or context to generate a more complex set of risks with greater impacts than any of the individual risks pose alone.



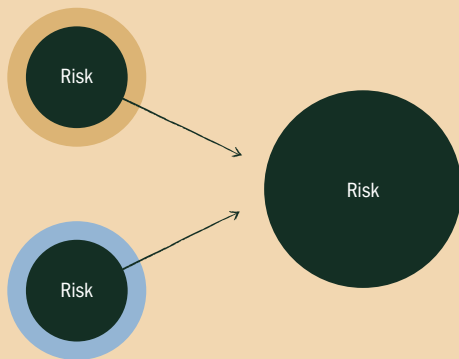
CASCADING RISKS

An initial event creates risk(s) that spill over into other regions or sectors, generating further impacts that snowball to produce new risks distinct from and potentially greater than the original event.



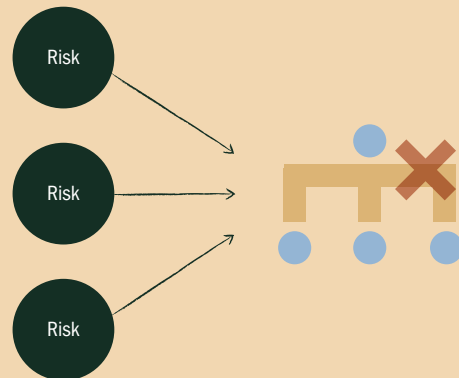
EMERGENT RISKS

Two or more independent factors, occurring in separate regions or contexts, interact to create a new risk that would not otherwise exist.



SYSTEMIC RISKS

Multiple shocks or pressures interact with sufficient severity and at sufficient scale to generate cumulative risks that can threaten the integrity or stability of societal or environmental systems: an economy, community, or even a country.



EXISTENTIAL RISKS

A mixture of drivers creates conditions so severe that they threaten the end of something profoundly important, such as country or a culture, or they may lead to a large number of casualties.



Source: SIPRI Environment of Peace

When multiple shocks interact with sufficient severity and on a sufficient scale, the result can be a systemic risk. This puts the very stability of a system, a community or even a country at risk.

rose above 40°C. Tinderbox conditions sparked forest fires. An estimated 55 000 people died from a range of conditions, including direct heat stress and smog created by the worst wildfires in living memory.¹⁴⁸ Deaths also occurred in other countries, including India and China.¹⁴⁹ Subsequent analysis of the Russian heatwave showed that human-induced climate change had made it three times more likely to happen.¹⁵⁰

The heatwave caused the Russian grain harvest to fail, and the government decided to suspend grain exports.¹⁵¹ As a major supplier in the globalized food supply chain, this drove up prices everywhere, including in the Middle East and North Africa.¹⁵² The export ban lasted into 2011. Meanwhile, in the USA the government was encouraging farmers to turn their crops into biofuels, reducing grain exports. In 2011, for the first time, more US maize was used to produce ethanol than went into the global food market.¹⁵³ Another factor affecting supply was speculation—companies holding grain back from entering the market and deliberately exacerbating the shortage to drive prices higher.¹⁵⁴

With food prices already high and frustration over poor governance and corruption rife across much of the Arab world, the resultant sharp increase in the cost of staples, particularly bread, helped spark an outpouring of anger onto the streets.¹⁵⁵ In Egypt, this was exacerbated by government subsidies for staple foods not keeping pace with the rise in international prices. These combined pressures played a role in spurring a sequence of conflicts that partly contributed to the Syrian civil war.¹⁵⁶

Poor governance resulting in public unrest in one region, extreme weather conditions in another, biofuels policy in a third and commodity speculation in trading rooms. All these unrelated factors combined to generate a security and conflict risk with profound consequences for millions of people.

When multiple shocks interact with sufficient severity and on a sufficient scale, the result can be a **systemic risk**. This puts the very stability of a system, a community or even a country at risk.

The last two years have shown in the starkest possible light how a new disease can affect every part of the world and every aspect of society—a truly systemic impact. The Covid-19 pandemic has killed millions of people and sickened hundreds of millions. Governments have imposed civil restrictions in a way rarely seen outside wartime, closed borders and interrupted children's education. Families have been kept apart for months, even years. Businesses from airlines to street cafes have closed, putting employees out of work. And many countries have seen bitter street protests about restrictions that citizens viewed as either too strict or too lax.

Experience from the 2008–2009 financial crash indicates that some countries, particularly small island developing states that depend heavily on tourism, may not see full economic recovery for many years after the pandemic ends (see box 2.1, Haiti's systemic shock).¹⁵⁷ The legacy of 'long Covid' is also unknown, as is the mental health burden among people of all ages who lived in isolation for months on end.¹⁵⁸

Given how unready most countries were for a pandemic despite repeated warnings, how prepared are they for climate change and wider environmental degradation sparking further systemic risks?

The fifth and final type of complex risk relevant to today is **existential risk**. Here, a mixture of drivers creates conditions so severe that they threaten the end of something profoundly important such as country or a culture or they may lead to a large number of deaths.

Communities are already being moved to new locations because rising sea levels, a consequence of man-made climate change, make continued existence impossible. Other impacts of environmental degradation that could bring about similarly profound changes include desertification of cropland and pastures, migration of fish stocks, disappearance of freshwater sources and persistent extreme heat. The cocktail of threats facing marine life—pollution by chemicals and plastic, ocean acidification, overfishing, temperature rise, de-oxygenation, decline of plankton and increasing algal blooms—is certainly proceeding apace, without any clarity about the eventual impacts. In some cases, a single impact could be enough to end a country's existence, as in the case of low-lying atolls such as Tuvalu and Kiribati.¹⁵⁹ In others, a mixture of impacts could potentially bring the same end. How the world would deal with that is unknown; but it is likely to become reality at some point.



BOX 2.1 HAITI'S SYSTEMIC SHOCK

Haiti is the poorest country in the Americas, beset by decades of political instability, natural disasters and removal of tree cover, which in turn has left communities exposed to disasters such as storms and landslides.¹⁶⁰

In January 2020, the Haitian Parliament dissolved after elections were postponed, with President Jovenal Moïse attempting to rule by decree against a backdrop of continuing public unrest.¹⁶¹ Two months later, Haiti reported its first cases of Covid-19. The government declared a state of health emergency, with a familiar mix of school and business closures, limitations on transport and gatherings, and a night-time curfew.¹⁶²

With three fifths of the population already living below the poverty line and anti-government sentiment running high,¹⁶³ people refused to abide by the regulations, which increased the infection rate.¹⁶⁴ Agricultural production fell, and food prices rose by more than 25%.¹⁶⁵

In August, Tropical Storm Laura came to Haiti, ruining 50–80% of crops in the south-east.¹⁶⁶ Unusually dry months followed, which

depressed harvests by up to 80%. Entering 2021, food prices were running 40% above normal.¹⁶⁷

In May 2021, with Covid-19 cases soaring, the government reimposed a state of emergency.¹⁶⁸

In July, Tropical Storm Elsa hit the same south-east regions devastated by Laura the year previously.¹⁶⁹ Four days later, for reasons that remain unclear, gunmen assassinated President Moïse, unleashing a further period of political turmoil.¹⁷⁰ Soon afterwards, the United Nations Food and Agriculture Organization declared that nearly half of the Haitian population was in acute food insecurity.¹⁷¹

Perhaps a country with stable politics could have coped with the impact of the two storms in quick succession. Perhaps without the restrictions around Covid-19, political order could have been restored. But the combination of the previous decades of environmental destruction and political turmoil, unrest in the streets, Covid-19 and two significant storms has dealt Haiti a systemic blow. Millions are left without sufficient food or prospects, the only certainty being that more insecurity lies ahead.



Communities are already being moved to new locations because rising sea levels, a consequence of man-made climate change, make continued existence impossible.

PHOTO
King tides break sea wall in Kiribati,
Jeremy Sutton-Hibbert

The impact of underlying tensions

All of these risks occur in specific contexts, sometimes amplifying underlying political or social tensions.

For example, in Thailand, the floods of 2011 hit a country that had been living in a cycle of organized protests and government suppression for three years. The ‘red shirts’ of rural inhabitants and the working class lined up against the ‘yellow shirts’ rooted in the urban middle class—sometimes in violent, pitched battles on city streets.¹⁷²

Floods are common in Bangkok. But because of the pre-existing tensions, on this occasion the national and city governments—led by opposing parties—each attempted to operate the water management system to spare areas under their control, while flooding those loyal to the opposing faction. And although the evacuation centres in some districts were well stocked, in others the shelves were empty.¹⁷³

Another example is the Sahel (see box 2.2, The Sahel’s fragile web), where tension between farmers and pastoralists was a fact of life even before the impacts of water over-extraction and climate change emerged. Now that they have, the death toll is mounting, with thousands of lives lost across the region in recent years. About 13% of the population are pastoralists, yet pastoralists account for nearly one third of all battle-related fatalities.¹⁷⁴

The Sahel illustrates how environmental stress and an inadequate or biased government (the authorities usually side with sedentary farmers rather than nomadic pastoralists) can amplify conflict. With the pastoralists’ traditional livelihoods and personal security increasingly under threat, one response is to join a militia. That decision cannot solve the long-term issues ranged against them—it diminishes security overall across the region—but in such an extreme situation, it can be understood as a logical short-term response.

The case for preparedness and resilience

As well as increasing temperatures, droughts and wildfires, climate change is already increasing the severity of hurricanes and storms. Again, the impact on people’s lives depends heavily on preparedness and resilience, which has human and environmental components.

BOX 2.2 THE SAHEL'S FRAGILE WEB

The experiences of communities across the Sahel graphically illustrate how environmental degradation and conflict interact, and how ineffective governance facilitates their mutual exacerbation.

Lake Chad, the biggest freshwater source in the region, is at the centre of a long-standing and complex humanitarian crisis.¹⁷⁵ Over-exploitation of water for livestock, ill-conceived irrigation projects, increasing population pressure and persistent conflict reinforce each other.¹⁷⁶ Climate change is a clear and present threat, with rainfall diminishing and drought across the Sahel becoming more frequent since the 1960s.¹⁷⁷

One consequence is migration. People move to cities, and pastoralists take livestock to find other sources of water, both of which can increase the risk of conflict. Extremist groups then take advantage of the situation, fomenting conflict between farmers and pastoralists and using desperation as a recruiting agent, commonly for young men.¹⁷⁸ Transhumance* too is principally for men, with women staying behind. Should men migrate away from their families, the women remaining

behind may face risks in their new roles as breadwinners for their households.

Young men in particular are subject to recruitment into armed militias, including from camps for internally displaced people—a legacy of previous decades of lethal conflict and extreme weather events. In Mali, there is evidence that climate change, by reducing the availability of water and fertile land, increases the likelihood of recruitment into armed factions.¹⁷⁹ The situation is only likely to worsen as the climate changes further, with rising temperatures and changes to rainfall patterns disrupting traditional ways of life and livelihoods.

These experiences show how pre-existing insecurity interacts with environmental stressors to worsen security for all people.¹⁸⁰ The risk of conflict rises with desperation. The prospects for socio-economic development through improved health, education and livelihoods recede, as do the chances of governments and communities having the time and resources to adapt to their changing environment and manage it in more sustainable ways.



For example, Cyclone Sidr struck Bangladesh in 2007, causing an estimated 3400 deaths.¹⁸¹ This compares with the death toll of 140 000 from Cyclone Gorky in 1991, another category 4 storm that hit Bangladesh. The difference between the impacts is largely attributable to two issues:

- By 2007, the government had put in place early warning systems and evacuations strategies, and had built more storm shelters and protective coastal embankments.¹⁸²
- Gorky made landfall on exposed coastline, Sidr on the Sundarbans, the largest mangrove forest in the world.¹⁸³ The forest acted as a brake and baffle, drawing the worst of Sidr's power.

This comparison graphically shows the difference that preparation, adaptation and resilience can make against disasters; and the resilience conferred by keeping natural defences intact, in this case mangrove forests.

Hurricane Katrina, which devastated New Orleans, USA, in 2005, further illustrates the case for environmental protection and resilience. It killed 1200–1800 people, permanently displaced a further 400 000 and caused more than \$100 billion worth of property damage.¹⁸⁴ Despite the fact that a Katrina-sized

* Transhumance is the practice of moving livestock between grazing grounds in a seasonal cycle.

hurricane was an ever-present risk, authorities had been reducing the city's resilience for decades—failing to adequately maintain levees and flood barriers, allowing wetlands to degrade and (as in the case of Chennai) permitting building on floodplains.¹⁸⁵ Consistent failure to tackle structural poverty and racism played a major role in determining who was most impacted, with black and lower-income communities disproportionately affected as a result of having to live in low-lying, flood-prone areas.¹⁸⁶

A long-term failure of governance, including permitting degradation of nature, had already put communities at risk—communities which, largely through economic disadvantage, had little chance to move elsewhere. Into that risky situation came a hurricane made worse by climate change in two separate ways: warmer ocean temperatures boosted Katrina's destructive power;¹⁸⁷ and sea level rise through the 20th century increased the height of the storm surge.¹⁸⁸

PHOTO

Katrina floods. Master Sgt.
Bill Huntington/US Air Force



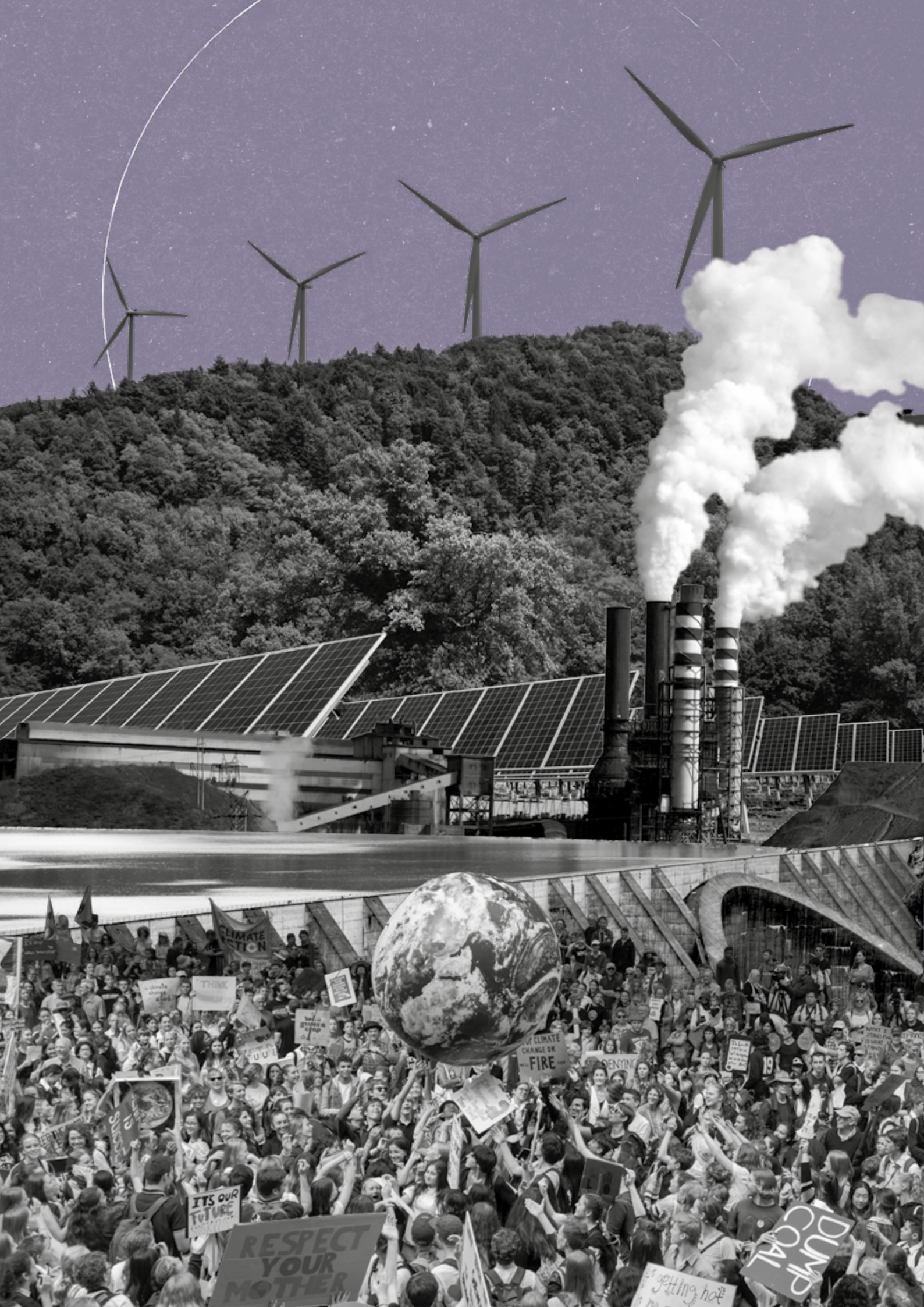
The case for both managing risks and removing causes

The real-life situations described in this chapter show clearly that the world has entered into a new era, characterized by compound, emergent, cascading, systemic and existential risks:

- A major heatwave in Russia and energy policy choices in the USA rippled through the global food supply system to increase tensions in the Middle East.
- In Haiti, a long history of poverty and insecurity combined with extreme weather and a pandemic to deliver a systemic shock.
- In Thailand, a security situation caused by poor governance combined with an environmental threat to enhance the security risk.
- In the Sahel, social tensions combined with inadequate governance and environmental decline to produce a bigger security risk.
- In the USA, historically poor governance amplified the extent to which a climate change-charged extreme weather event affected security.

The security crisis, the environmental crisis and governance deficits are interacting in new and dangerous ways—some predictable, others not. Four conclusions emerge as result, whereby the world would gain from:

- looking ahead and planning
- increasing resilience
- addressing root causes—including solving existing security problems, reversing environmental decline and governing well
- working together.





3

A JUST AND PEACEFUL

TRANSITION

Huge changes in our energy system and land use are needed to halt and reverse the tide of environmental decline—which will also reduce risks of insecurity and conflict. But to succeed, these transitions will need to be just and peaceful.

It may sound straightforward: protect 30% of land in the next eight years, plant trees to absorb carbon dioxide, build out renewable energy five times faster than now. But people live on land that would be set aside for nature and carbon storage; people have jobs in the fossil fuel economy. We can draw lessons on how not to enact a just and peaceful transition from the chequered history of forced conservation, biofuels and hydropower dams.

Halting climate change and restoring the natural environment will entail myriad changes in a number of economic sectors, including energy, transport, manufacturing, mining, forestry and agriculture. The changes will need to be at an unprecedented scale and speed, given the size and urgency of the problems.¹⁸⁹ Holding global warming at the 1.5 °C guardrail may mean, for example, building out renewable energy 3–5 times faster than at present and expanding electric car uptake 5–12 times faster.¹⁹⁰ So acute is the threat to nature that conservation scientists advocate protection of land and ocean on a scale never previously seen.¹⁹¹ The inevitable increase in climate change impacts means the need for climate adaptation will also expand in coming years.

Rapid change carries with it the potential for generating injustice and conflict, in many ways and at various scales.¹⁹² Individual workers can lose their jobs, with no chance to re-skill. Communities can shed crucial industries, or have ‘solutions’ imposed on them. Countries can quickly lose a substantial proportion of their national income.

Transitions at all of these levels could lead to insecurity and an increasing risk of conflict.¹⁹³ Yet the transitions need to happen in order to reduce the increased risk of insecurity and conflict that will come from failing to halt environmental degradation. There is a clear need, therefore, for transitions to be fair and to

take account of the needs of those who will lose out, especially if they are already marginalized.¹⁹⁴ Given that some transitions will take place in situations of pre-existing insecurity and conflict, there is also a need to conceive and implement transitions with peace front of mind. These principles are not only about ensuring justice and promoting peace, they are essential for delivering the transitions successfully and with the urgency that the environmental crisis demands.

Many organizations have begun to map out what a just transition should achieve and the principles under which it should take place.¹⁹⁵ Most focus on the energy system within a given country; aims typically include the provision of re-skilling and new job opportunities, and participatory decision making with communities and workers involved.¹⁹⁶ Some also call for the redistribution of wealth and power, redress for past wrongs (e.g. linked to colonialism) and the enhancement of ecological integrity.¹⁹⁷ The concept is beginning to find traction at a government level, with the Scottish Government in the UK, for example, committing to justice and fairness in its energy transition and assigning a ministerial post to this agenda.¹⁹⁸

However, sectors other than energy face potentially disruptive transitions. Land use change is likely to be particularly challenging, given that countries and corporations in the Global North are looking to forests and other natural resources in the Global South for ways to solve their problems.¹⁹⁹

In order to understand how to make transitions just, peaceful and successful, it is instructive to draw on experiences in recent decades covering interventions in both energy and conservation. Many come with a history of creating negative social or environmental consequences: for example, depleting water resources, contributing to hunger or opening a door to human rights abuse. Unsurprisingly, people then oppose the intervention. Sometimes force is used to support the intervention. If the opposition is successful, the project in question is scrapped, leaving the environmental issue unaddressed; if the opposition fails, the community is left with a legacy of at least resentment and at worst a heightened risk of conflict. Understanding the multiple issues arising in such situations can point to the future and illustrate what is needed to deliver the profound transformations required.

The biofuels backlash

The 'rush to biofuels' provides evidence that attempts to tackle an environmental ill in the Global North can prove highly damaging in the Global South. In the 2000s, the EU and the USA sought to reduce their transport emissions through introducing plant-based alternatives to petrol and diesel. The EU's 2003 Biofuels Directive, for example, set progressively increasing targets for biofuel content



Holding global warming at the 1.5°C guardrail may mean, for example, building out renewable energy 3-5 times faster than at present and expanding electric car uptake 5-12 times faster.

in vehicle fuels.²⁰⁰ Producers then turned to the developing world, where they could obtain land and labour more cheaply.

This contributed to insecurity and conflict in a number of countries. The UN Food and Agriculture Organization noted that between one and two thirds of landgrabs were being made to claim land for biofuel crops.²⁰¹ In Zimbabwe, growing biofuels created water shortages for communities.²⁰² In South Asia, jatropha and other monoculture crops caused land degradation and food scarcity.* Kenya and Brazil are among other countries to have seen similar problems.²⁰³ In 2008, the president of the World Bank, Robert Zoellick, described the rush to biofuels as a 'significant contributor' to the soaring food prices that led to unrest in countries such as Haiti, Egypt and Burkina Faso.²⁰⁴

In addition to stoking opposition, biofuels do not always result in significant carbon savings compared with the fossil fuels they are replacing. If land is cleared of native cover, particularly old-growth forest, the carbon-absorbing impact of that is lost, potentially along with carbon stored in soil. Most of the carbon savings claimed by the EU's initial biofuels programme disappeared once these indirect effects were taken into account,²⁰⁵ while the overall effect of the US Renewable Fuel Standard has probably been to raise rather than lower emissions.²⁰⁶

Despite these long-standing concerns, biofuel production is increasing. Global output reached 154 billion litres in 2018 and is set to rise by 25% by 2024.²⁰⁷ More than half of this expansion is likely to take place in Africa and Latin America.

Biofuels look to have a limited future in road transport, with electric cars set to be the dominant zero-carbon technology. However, the pressing need for low-carbon aviation is opening up a new market. Airlines such as KLM, Singapore and Etihad have already trialled long-distance biofuelled flights.²⁰⁸ The EU is set to mandate that 'sustainable aviation fuels' are available at every major airport as part of its 'Fit for 55' package,²⁰⁹ and the International Civil Aviation Organization is promoting biofuels as part of its CORSIA programme to reduce emissions from international aviation.²¹⁰ With relatively few low-carbon propulsion options available, aviation may end up driving the biofuels market in years to come. This could potentially increase challenges to land rights, food production and nature, all of which could contribute to conflict risk.

Tensions over set-aside

Conversion of land to support the expanding human footprint is currently the leading cause of species extinctions and wider biodiversity loss. This creates a powerful rationale for protecting land to safeguard nature, and puts a special premium on regions and ecosystems that are highly biodiverse such as tropical rainforests. Conservation scientists have proposed a Global Deal for Nature under which 30% of the Earth's surface would

* Monoculture is generally negative for biodiversity.

A growing concern is the extent to which corporations are planning to meet their net zero targets via copious quantities of forest-based international offsetting.

be fully protected from development by 2030 (commonly referred to as '30x30'), en route to protecting 50% by 2050.²¹¹ More than 90 governments now support the 30x30 initiative.²¹² The 30% goal is included in the draft Global Biodiversity Framework for negotiation at the 2022 UN Convention on Biological Diversity summit in Kunming, China.²¹³

Land set-aside on this scale obviously provokes concern over land rights, Indigenous Peoples' rights and food security. The 30x30 initiative could affect up to 300 million people living in 'key biodiversity areas';²¹⁴ the 2050 goal could affect a billion people—about 10% of the Earth's estimated population in 2050.²¹⁵ UN Special Rapporteur on Human Rights and the Environment David Boyd and UN Special Rapporteur on the Rights of Indigenous Peoples Victoria Tauli-Corpuz are among those warning of the potential for 'fortress conservation'.²¹⁶

The draft Global Biodiversity Framework includes provisions for respecting the rights and needs of Indigenous Peoples and other communities, including as regards food security and livelihoods. Among Indigenous groups, opinions on the projected expansion of protected areas vary. In 2021, an international activists' group described it as 'a model of conservation that is often violent, colonialist and racist in approach'.²¹⁷ In the same year, US tribal leaders welcomed the 30x30 initiative as 'necessary to safeguard our communities and our world'.²¹⁸ But the latter noted the necessity of working with Indigenous communities, 'the original stewards of these lands and waters and ... the most effective managers and protectors of biodiversity since time immemorial', both to safeguard rights and to achieve the policy's desired ends.

In part, the concerns over 30x30 are informed by experience of 'coerced conservation',²¹⁹ including eviction using military force. In the aftermath of apartheid, southern African states established transboundary 'Peace Parks', with the aim of conserving nature, reducing poverty and peacebuilding.²²⁰ However, they also removed local people from their land and gave control of resources to an elite group under the premise of conservation.²²¹ A related issue in South Africa has been the outsourcing of conservation to private landowners, who often employ former soldiers to deter poaching. This has led to an 'arms race' in which poachers and rangers escalate to ever more sophisticated weaponry, with obvious downsides for local residents.²²² There are examples from other continents, too, of security forces bearing down on already marginalized communities in the name of environmental protection.²²³

Human activities are degrading the natural environment so rapidly that an initiative on the scale of the Global Deal for Nature may be essential. The key will be to find ways of implementing protection that feature the consent and proactive engagement of local communities, including Indigenous groups. This in turn means establishing mechanisms in which communities and Indigenous groups are empowered and sit at the centre of decision making, and from which they genuinely benefit. There are examples of such approaches (see chapter 4); the challenge will be to make them standard practice.

The downsides of negative emissions

Technologies exist that can bring greenhouse gas emissions to zero in many sectors of the economy. However, in sectors such as aviation and agriculture, and in some industries, there are currently few options. Therefore, in order to reach net zero carbon emissions globally, which is necessary to halt global warming, and to reduce warming if it overshoots the Paris Agreement targets, there is highly likely to be a need for 'negative emissions': ways of pulling carbon dioxide from the atmosphere.

Many countries, subnational governments and corporations have set their own net zero emissions targets, and some are implementing programmes to achieve them.²²⁴ A rapidly growing concern among scientists and environmental campaigners is the extent to which corporations are planning to continue emitting greenhouse gases, and instead meet their net zero targets via copious quantities of forest-based international offsetting. This entails funding reforestation or afforestation programmes, often in the Global South where it is cheaper.²²⁵ Some national net zero



targets also explicitly or implicitly involve substantial amounts of international offsetting.²²⁶

Offsetting is being envisaged at a scale that is clearly infeasible, with Shell's plans alone requiring the planting of an area approaching the size of Brazil.²²⁷ With corporations wanting to purchase offsets at the lowest price possible, the potential for projects that neglect the true needs of people and nature is huge.

These concerns are largely based on nearly two decades of experience with an existing international mechanism aimed at conserving tropical forests, namely REDD+ (Reducing Emissions from Deforestation and Forest Degradation in Developing Countries).^{228,*} REDD+ projects have a documented history of exacerbating and sparking conflict, usually through disputes over land tenure.²²⁹ For example, in Indonesia's Kalimantan province, the enclosure of a forest area in 2008–13 displaced Indigenous people without land title, further marginalizing the already marginalized, exacerbating food insecurity and fomenting conflict.²³⁰ A particular issue is that often the culture of Indigenous groups does not include a Western or legalistic definition of 'land tenure'; but without formal land title they can be excluded from contracts related to REDD+.

Similar concerns surround an engineering approach to negative emissions, namely Bioenergy with Carbon Capture and Storage (BECCS).^{**} In IPCC scenarios compatible with the 1.5 °C global warming target, growing the energy crops necessary to deliver the level of negative emissions needed could take up more than one quarter of the world's cropland.²³¹ That would seem to carry with it abundant potential for negatively affecting food production, water availability and biodiversity.

Although BECCS is not yet a reality (and economic considerations mean it may never be), nature-based solutions are. At the 2021 UN climate summit in Glasgow, governments concluded negotiations on Article 6 of the Paris Agreement, covering carbon trading and other cooperative mechanisms for reducing greenhouse gas emissions.²³² This implies that the scale of international trading for forest-based offsets will rise.

Afforestation is not the only way to expand carbon absorption through nature. Others include restoring degraded peat bogs, planting mangroves and managing coastal wetlands.²³³ All carry similar potential to displace people (some peatlands are farmed, for example) and increase insecurity.

* In 2007, governments meeting under the UN climate convention added conservation, sustainable forest management and the enhancement of forest carbon stocks to the existing REDD framework, adding '+' to mark the evolution.

** In BECCS, an energy crop is grown, taking CO₂ from the air via photosynthesis. It is then burned in a power station to generate electricity, and the CO₂ produced during burning is captured and pumped into storage, often in an underground cavern.

Conflicts over hydropower

The world's biggest source of renewable electricity is currently hydropower,²³⁴ which has a documented history of generating conflict and wider insecurity.

The displacement of villages by dam lakes has caused unrest and conflict on every continent (bar Antarctica).²³⁵ Altogether,

80m.



Hydropower dams
have displaced
an estimated
80 million people.

hydropower dams have displaced an estimated 80 million people, sometimes into areas populated by other ethnic groups, leading to clashes.²³⁶ Other negative impacts include:

- restricted and/or unpredictable water availability for downstream users, as a result of dam operators regulating the downstream flow to optimize electricity production
- disruption to fish stocks, including their seasonal migration routes
- biodiversity loss
- disruption to navigation
- loss of farmland
- loss of access to firewood, hunting and foraging ground, neighbouring communities and infrastructure
- local communities living with the risk of catastrophic flooding, if the dam is poorly built.

Many communities displaced by dams have either been under-compensated for their land and livelihoods, or not compensated at all. The Tucuruí Dam in Brazil affected almost 100 000 people living downstream, including cutting the fish catch by about 60%.²³⁷ The Kariba Dam, built in 1959, displaced Indigenous people from the Zambezi Valley, who did not subsequently receive the electricity they had been promised.²³⁸

Despite the influential report from the World Commission on Dams in 2000,²³⁹ and despite transboundary river basin cooperation agreements, some dams continue to generate opposition and conflict, including lethal action against community activists. In 2016, environmental defender Berta Cáceres was killed in Honduras for leading protests against the Agua Zarca Dam,²⁴⁰ whose developers had seized land illegally from the Lenca Indigenous group. Meanwhile, land for dams in Myanmar has literally been cleared at gunpoint (see box 3.1, Myanmar: Conflict and hydropower). It is worth noting that most hydropower is funded by international donors, with China financing more than 50% of projects in Africa, Asia and Latin America.²⁴¹

As part of the shift to renewables needed to meet the 1.5 °C global warming target, the International Energy Agency (IEA) foresees global hydropower capacity doubling in coming decades from its current 1300 gigawatts.²⁴² The majority of the additional dams would be located in the Global South, with a 10-fold expansion possible in Africa.²⁴³ The potential for further forced displacement, loss of livelihood, loss of food, and conflict is clear unless the governments, agencies and companies involved commit to, and follow, best practice.

BOX 3.1 MYANMAR: CONFLICT AND HYDROPOWER

Hydroelectric dams already supply more than half of Myanmar's electricity, and the government has big expansion plans.²⁴⁴ The upper tracts of the Irrawaddy and Salween rivers have proven particularly attractive to investors, which include state-owned companies from China and Thailand.²⁴⁵ However, these regions are also home to many ethnic groups,²⁴⁶ which have been in conflict with the state of Myanmar for most of its seven-decade existence (it has been mostly ruled by a military dictatorship hostile to Indigenous groups). Unsurprisingly, building giant dams that flood villages and displace communities has exacerbated conflict and insecurity, and current projects promise more of the same.

One project arousing particular opposition is the Myitsone Dam, proposed as the largest in a cascade of seven planned for the Irrawaddy headwaters.²⁴⁷ At a capacity of 6 gigawatts, it would be the country's biggest dam. Ground was broken in 2007, coinciding with the beginning of a period when the ethnic Kachin population became progressively disillusioned with the government.²⁴⁸ The Kachin Independence Organization (KIO) publicly lobbied for the dam's cancellation, warning in 2011 that it could end the 17-year ceasefire and re-open civil war.²⁴⁹ The KIO did indeed return to armed struggle later that year, with clashes around dam sites reigniting the conflict.

A similar situation holds with the Hatgyi Dam on the Salween. Located in Karen State, the Karen population believes the government of Myanmar sees opening dams as a way to extend control over territory and people.²⁵⁰

Among the causes of dissent is the perception that a large proportion of the electricity generated from these dams may flow to neighbouring countries such as China and Thailand.²⁵¹ Dam developers indicate that customers in Myanmar will be given the first 10% free of charge and the remainder will be prioritized for domestic demand.²⁵² The absence of a comprehensive electricity grid further complicates the challenges, with at least one third of the population of Myanmar lacking access to power.²⁵³

The lived experience of the Karen, Kachin and other peoples is therefore negative—seeing the dams not as a source of low-carbon electricity, but as a tool for control that floods villages and displaces communities while benefiting the country's prosperous elite and foreign backers.

Construction on both the Hatgyi and Myitsone dams is currently suspended.



Powering the transition

The expansion of hydropower in scenarios that meet the 1.5°C global warming target is dwarfed by the likely growth in wind and solar power. The IEA envisages that wind turbines and solar panels will supply more than half our electricity by mid-century.²⁵⁴ This would entail a 15-fold increase in wind power and a 28-fold increase for solar generation. Nuclear generation would double. Battery storage will be an essential way to balance supply and demand, while batteries also sit at the heart of electric transportation.

Wind, solar and battery storage are already expanding quickly, driven by their rapidly falling costs as well as concern over climate change.²⁵⁵ Wind and solar power are already the cheapest ways of adding new generating capacity in most countries,²⁵⁶ and meet with impressive levels of public support in virtually every country studied.²⁵⁷

However, there are documented cases of windfarms generating opposition serious enough to pose a conflict risk. A decade ago, protests against the Bii Hioxo wind park in Mexico centred on two main factors: some protestors wanted the farm to provide benefits to the community, while others opposed it on principle, particularly Indigenous groups that claim customary

rights over the land. Protestors complained of a range of repressive responses including police harassment, death threats and attempted kidnappings.²⁵⁸ Ceará state in Brazil, the traditional ranges of the Sami people in northern Sweden and the pastoral lands of Lake Turkana in Kenya are other areas that have seen protests over wind power developments which threatened to hinder traditional livelihoods.²⁵⁹

Even with increasing efficiency in manufacturing, the vast acceleration needed in clean technologies to meet the Paris Agreement commitments implies a substantial rise in demand for raw materials such as copper, lithium and cobalt, as well as rare earth metals found only in a few locations on Earth.²⁶⁰ About half of the existing cobalt supply is mined in the Democratic Republic of the Congo.²⁶¹ There, the industry's documented history of human rights violations and abuse, including child labour, has even led to the term 'the blood diamond of batteries'.²⁶² The much larger volumes of critical minerals needed suggest that the scale of these violations might increase without substantial reforms to the largely artisanal mining operations.

The reliance on China for sourcing rare earth metals also opens up the potential for geopolitical tension, as occurred in 2010 when China stopped the flow of these metals to Japan for reasons that remain unclear.²⁶³ Governments and companies from countries including China, India, Russia, Saudi Arabia and the USA are showing keen interest in securing critical minerals from Africa, leading to warnings of a new 'Scramble for Africa' with colonialist overtones.²⁶⁴ Allowing the industry to develop along these lines would risk missing out on the development benefits that well-governed mining can bring, including contributing to delivering the SDGs.²⁶⁵

Disposal of decommissioned wind turbines, solar panels and batteries could become a contentious issue. However, the industry and its regulators are increasingly paying attention to end-of-life issues. For wind power, the EU has set a target of 80–85% supply chain recovery; some turbine blades are now fully recyclable,²⁶⁶ and the trade body WindEurope has committed to making that 100%.²⁶⁷ Electric car batteries are often not designed with disassembly and recycling in mind. But manufacturers are now moving towards that, with China's decision in 2018 to make electric vehicle manufacturers responsible for ensuring batteries are recycled a particular spur to innovation.²⁶⁸ Full recycling and recovery of all components would ease pressure on critical minerals by putting rare earths and other metals back into circulation,²⁶⁹ as would designs that avoid the need for these elements.²⁷⁰ Yet both of those options may be some years away from commercial reality.²⁷¹

Nuclear power is likely to remain limited to relatively few countries, where existing concerns over weapons proliferation, terrorist use of nuclear materials and long-term waste disposal will remain.²⁷² In recent years, another risk has crept into the nuclear power arena, namely cyberattack. The Russian Government has attacked reactors in Europe and the USA,²⁷³ while a North Korean-backed hack targeted an Indian reactor.²⁷⁴ Whether cyber penetration

The vast acceleration needed in clean technologies to meet the Paris Agreement commitments implies a substantial rise in demand for raw materials such as rare earth metals.

could be used to produce a meltdown or other serious incident is not clear; but the very lack of clarity could generate opposition to a proposed plant, and contribute to insecurity if it went ahead. The Russian takeover of nuclear power stations during its invasion of Ukraine, and use of artillery on site, has also drawn attention to the hazards that would be created by intentional or accidental strikes on operating reactors or nuclear waste stores—again, potentially generating opposition to expansion of the technology.²⁷⁵

Managing the sun

Various proposals have been made for cooling the Earth, or part of it, by reducing the amount of sunlight reaching its surface.²⁷⁶ These Solar Radiation Management (SRM) concepts include ideas such as placing a giant sunshield in space;²⁷⁷ but discussion tends to concentrate on two ideas that would block sunlight within the atmosphere.

Stratospheric Aerosol Injection would release particles of sulphate dust into the atmosphere from balloons or aeroplanes.²⁷⁸ This would mimic the effect of dust released by volcanic eruptions, which reflects sunlight back into space, cooling the Earth.

Marine Cloud Brightening would spray seawater into clouds over the ocean.²⁷⁹ The aim is to create more and finer water droplets in the clouds, which would reflect more solar energy back into space.

Both SRM methods carry a serious risk of impacts on security. In particular:

- they could change weather systems in ways deleterious to food production or freshwater availability²⁸⁰
- with no international mechanism in place for regulatory oversight, one country or group of countries could use them to advance its own aims irrespective of the needs of others
- once in place, they would have to be maintained in perpetuity as stopping them would lead to a sudden uptick in global temperatures.

Due to these and other issues, the IPCC does not consider SRM to be a pragmatic option for arresting climate change,²⁸¹ and there is as yet no agreed global governance framework.²⁸² Nevertheless, it is possible that one or more individual countries—or possibly a commercial entity—might decide to pursue one of these methods unilaterally.

Meeting adaptation needs

From the inception of the UN climate convention, states and stakeholders have been clear that adaptation to climate

Maladaptation is more likely if measures focus on sectors and risks in isolation and on short-term gains rather than addressing vulnerabilities with an inclusive and flexible approach.

change is necessary alongside action to reduce emissions (mitigation). In practice, projects often combine elements of both mitigation and adaptation, such as restoring mangrove forests or planting trees to protect against flooding.

Although adaptation is usually local in nature—for example, building higher sea defences, increasing freshwater reservoirs and establishing early warning systems for tropical cyclones—funding is both local and global, through UN mechanisms such as the Green Climate Fund. The 2021 UN climate summit urged donor governments to at least double funding for adaptation by 2025, and it is likely that higher sums will be pledged beyond that date.²⁸³

Poor design and implementation can lead to a range of negative outcomes—or ‘maladaptation’—including a greater risk of insecurity and conflict.²⁸⁴ A decade ago, a Swedish-funded project in Cambodia aimed to increase food security, boost livelihoods and promote biodiversity in areas already being affected by increasing drought. An evaluation several years later found that the project had exacerbated hierarchical and oppressive power relationships and land tenure arrangements, increasing communities’ dependence on government rather than making them more resilient and stimulating migration out of the area.²⁸⁵ In Ethiopia’s Gambella region, projects aiming to increase water security through development of new villages and new sources of livelihood have exacerbated insecurity by requiring people to leave their existing fields and food production. This has reduced communities’ capacity to adapt to extreme weather events.²⁸⁶ In Bangladesh, adaptation projects including coastal afforestation, water management and disaster preparedness have resulted in land-grabbing by the elite, community disempowerment and reinforcement of chronic poverty.²⁸⁷

Projects can fall short through a mixture of factors, including a shallow understanding of why communities are vulnerable and failure to engage equitably with affected populations.²⁸⁸ The IPCC concludes that maladaptation is more likely if measures ‘focus on sectors and risks in isolation and on short-term gains’, rather than addressing vulnerabilities with an inclusive and flexible approach.²⁸⁹ There are also examples where adaptation actions and funding have been captured by the elite, leading to outcomes in which they deliberately reinforce their power under the guise of climate adaptation.²⁹⁰ A particularly high potential for conflict risk lies in measures dealing with land use, infrastructure projects such as dams and irrigation, and those that force people to relocate. This is even more pertinent in situations of pre-existing tensions, inequality and conflict.²⁹¹

It is worth noting that adaptation is almost exclusively discussed in relation to climate change, but communities also have to adapt to other environmental threats. Loss of biodiversity, soil degradation, overfishing and pollution can decrease food security. Deforestation and pollution can compromise access to freshwater. Urban air pollution can affect health and livelihoods. Although the adjustments needed to live with these issues are hardly ever discussed with the label ‘adaptation’ attached, they are conceptually identical.²⁹² This means that while the challenge of adaptation is

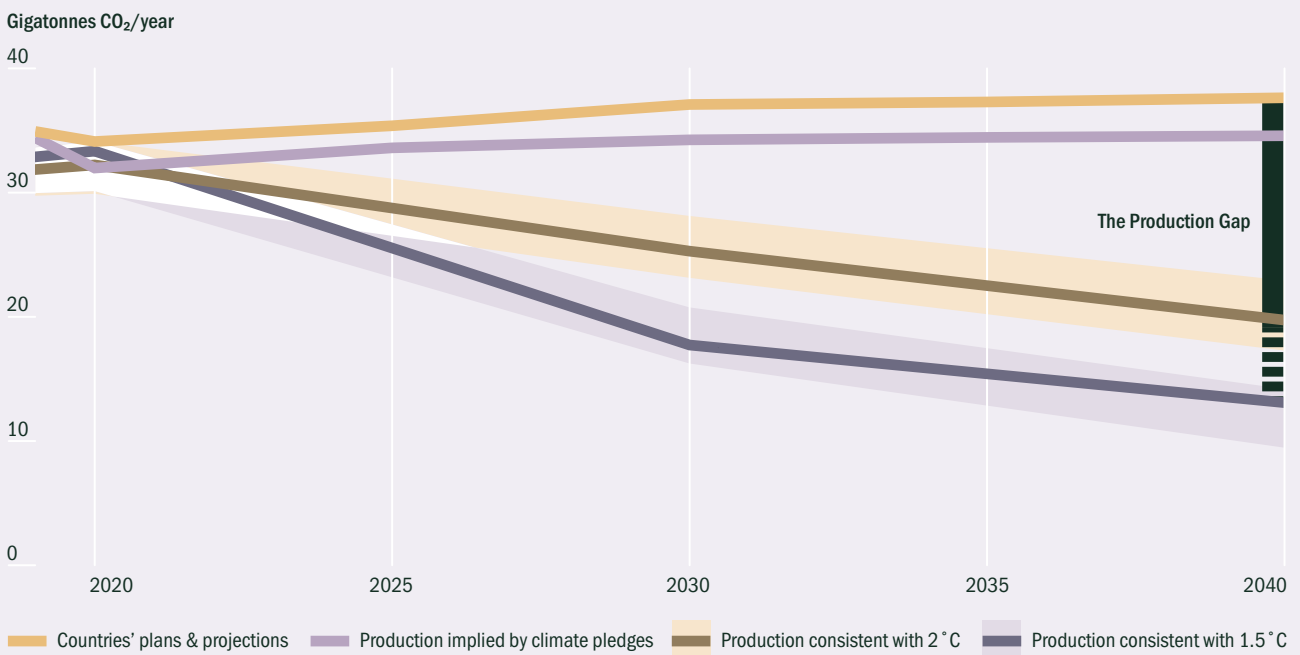
much greater, so is the opportunity: building community resilience can bring benefits that extend far beyond climate adaptation.

Leaving the fossil age

As use of zero-carbon energy ramps up, demand for fossil fuels is likely to fall, driven by economics as well as a desire to tackle climate change. How far and how fast it falls depend on many factors, including how seriously governments implement decarbonization policies. But coal use is certainly likely to be much lower in 2050 than currently, while oil and gas demand would also fall considerably under strong climate policy.²⁹³ This implies that extraction and processing industries will downsize considerably in many countries, potentially disappearing completely in some.

The launch of the Beyond Oil and Gas Alliance at the 2021 UN climate summit shows that some governments are already planning proactively for this.²⁹⁴ Yet many are not. Saudi Arabia, Russia and Australia are among those that have set mid-century net zero targets, while planning to extract fossil fuels at their current rate or even increase production.²⁹⁵ Other major producing countries have not set net zero targets. The abrupt bankruptcies registered by US coal-mining

Figure 7 Global fossil fuel production gap



The fossil fuel production gap represents the difference between the global carbon emissions (GtCO₂/year) resulting from countries' currently planned fossil fuel production and the emissions pathways consistent with limiting global climate change to 1.5°C and 2°C. Sources: SEI, IISD, ODI, E3G and UNEP (2021). The Production Gap Report 2021.

companies in 2015–16 illustrate how corporations can ignore warnings of inevitable decline, with unrest among the possible consequences.²⁹⁶

If countries or major fossil fuel corporations do not plan an orderly exit as demand falls, their exits will inevitably be disorderly, with potential for insecurity and conflict risk as people lose jobs and local economies contract.²⁹⁷ The demise of the British coal-mining industry in the early 1980s provides a striking lesson in how not to enact a transition out of an extractive industry, with social and cultural impacts that still reverberate 40 years later.²⁹⁸

Many of the most heavily oil-dependent countries are among the most affected, now and in the recent past, by conflict and instability. Angola, Azerbaijan, Equatorial Guinea, Iraq and Oman derive more than a quarter of their income from oil and gas rents; for the Republic of the Congo, Kuwait, Libya and Timor-Leste the figure is above 40%.

In the case of petrostates with a development deficit, the international community could offer assistance to enable them to transition away from fossil fuel dependence (see box 3.2, Timor-Leste: From war to oil ... to what?). But in the case of larger petrostates, this would be infeasible even were there a desire among Western governments. There is unlikely to be such a desire, because petrostate governments know the science as well as the rest and can start planning an economic transition compatible with the 1.5 °C global warming target, which they all agreed as a global aim, at any point.



BOX 3.2 TIMOR-LESTE: FROM WAR TO OIL ... TO WHAT?

Timor-Leste is among the world's newest states, becoming independent in 2002 following a quarter of a century of conflict against Indonesian occupiers. The new government and its supporters in the international community looked to fossil fuels as a source of income; and it is now the most oil- and gas-reliant country in the world, with oil and gas rents providing 45% of gross domestic product (GDP).²⁹⁹ However, as a tiny producer (less than 0.02% of global output)³⁰⁰ it can do virtually nothing to influence prices, putting continued development at the mercy of global trends, including the inevitable global fall in demand and price manipulation by major producers.

Despite supporting GDP, and despite early establishment of a sovereign wealth fund to finance public infrastructure and development, oil and gas income has not spread wealth equitably across Timor-Leste.³⁰¹ Significant sums have been paid out to foreign partners in the oil and gas business and to veterans of the armed struggle.³⁰² This has maintained peace, but at a cost to sustainable economic development.

The World Bank and other international agencies recognize that diversification—including into clean energy—would create sustainable employment and wealth across the country, reducing inequality and so the risk of conflict.³⁰³ However, given the history and the patronage attached to oil and gas income, the World Bank notes that the transition is challenging.

Perhaps more than any other petrostate, Timor-Leste illustrates the challenges of enacting a clean energy transition with ecological integrity in a small developing country. What once seemed a certain route to economic development has quickly become very risky, with price fluctuations over which the government has no control determining nearly half the national income.³⁰⁴ An added risk is that its oil and gas future generally lies in undeveloped fields with small reserves, rendering profitability uncertain.³⁰⁵

On the one hand, the longer Timor-Leste and international partners stay enmeshed with oil and gas, the greater the risk that global trends will crash the economy. On the other hand, deciding to leave unexploited oil and gas in the ground will reduce the national income, potentially creating pressure to re-open civil conflict.

Delivering transitions successfully

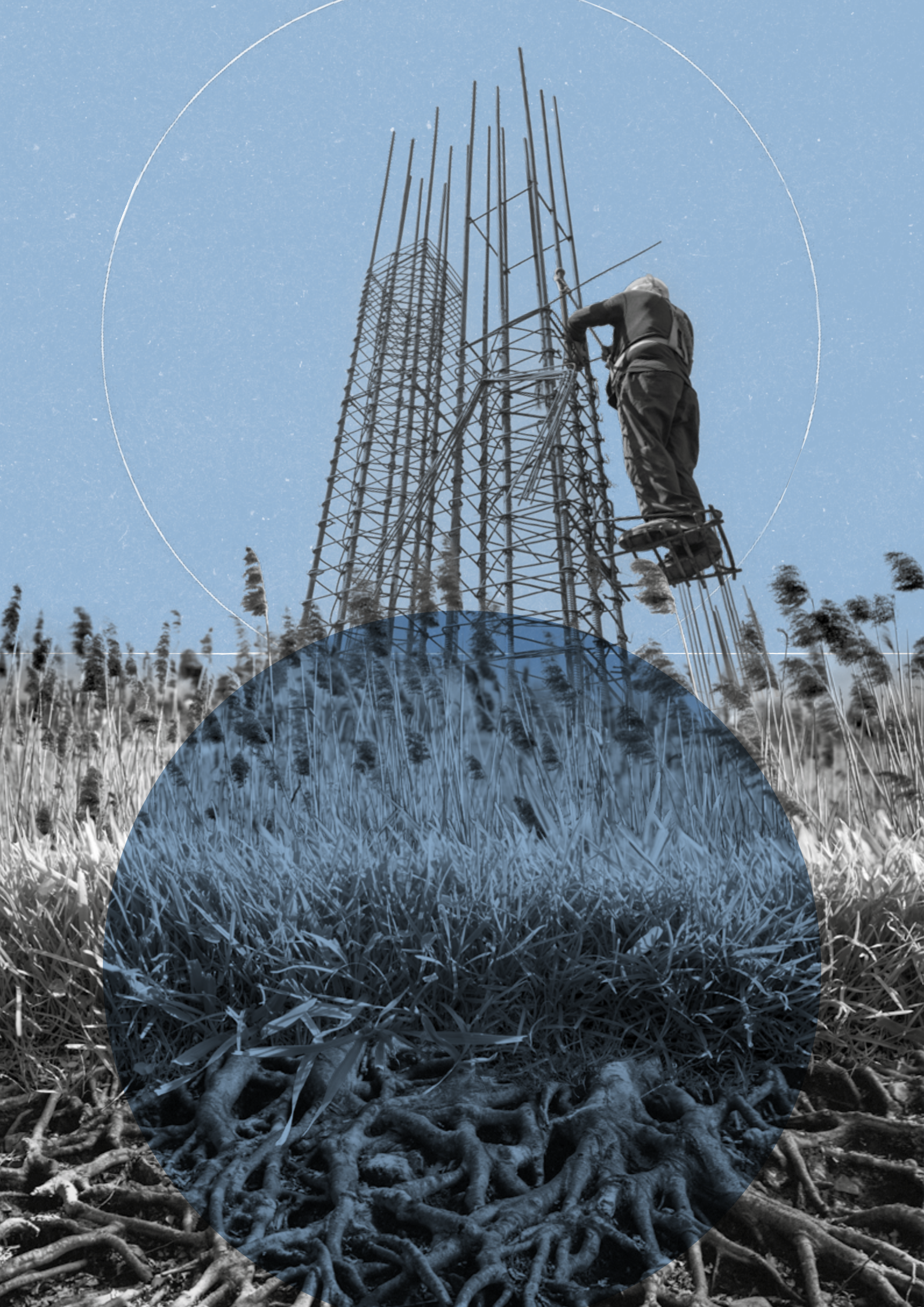
Among the measures proposed for tackling climate change and wider environmental decline, many carry major potential for generating opposition and so preventing a successful transition. Fortunately, the deployment of wind and solar power—the most important engines of decarbonization—appears relatively free of such concerns, as does the switch from fossil-fuelled to electric transportation. These measures can, of course, generate opposition centred on a lack of participation in decision making and benefits, disputes over land rights and lack of respect for cultural values. Overall, however, they promise many benefits in addition to being essential to delivering the Paris Agreement: higher and more diversified employment, cheaper energy, cleaner urban air, reduced potential for corruption and state capture, and a geopolitics in which energy supplies cannot be weaponized. In addition, the movement of wind power out to sea and the option of locating large solar arrays in the desert could reduce future disputes.

Some of the transitions needed to meaningfully tackle climate change and the wider environmental crisis are transitions not of technology but of rigour. To curb loss of nature, conservation is essential; rather than doing something new, governments, regulators, companies and sometimes non-governmental organizations (NGOs) have to do more of the same, but to much higher social and ecological standards. Hydropower and biofuels fit into the same category.

On a global scale, the combined demand for land implied by conservation set-aside, biofuels, nature-based solutions and BECCS is huge—perhaps beyond what is feasible given people's need for living space and food production. All these carry the potential for displacement, human rights abuses, land grabs, increasing inequality, and damage to food and water security. The imperative is clear for undertaking them sensitively, judiciously and, above all, with the needs and rights of people (especially marginalized communities) front of mind.

In reality, the details of each transition—exactly what is needed to make it just, peaceful and successful—will be both country- and sector-specific, and will also evolve over time. However, from the evidence assembled it is clear that certain principles should be observed:

- understanding of local realities
- genuinely participative decision making with the communities involved
- mechanisms and funding to protect livelihoods
- international support where appropriate.



4

FOUNDATIONS

Defusing the looming twin crises needs action at two levels: building resilience against the new risks that will inevitably emerge, and dealing with the underlying drivers of environmental decline. On both fronts, there are reasons for hope.

OF A NEW SECURITY

Many governments and international institutions acknowledge that the security and environmental crises are linked, and a few are acting to tackle them jointly. Non-governmental organizations are working in vulnerable communities to build peace and restore environmental integrity simultaneously. Some global environmental problems are effectively being tackled. Building an environment of peace will require a rapid and major expansion.

Defusing the dangers posed by the darkening security horizon and deepening environmental crisis, and the complex ways in which they interact, requires progress on many fronts. Root causes need to be addressed, resources mobilized, resilience enhanced and experiences shared. There are fixes, but none of them quick. The need for action, though, is urgent.

From supranational institutions to local communities, there have been successful developments on all of these fronts, both in agreements and in practice, which can be used as models for further, more widespread action.

Agreements, rights and linkages

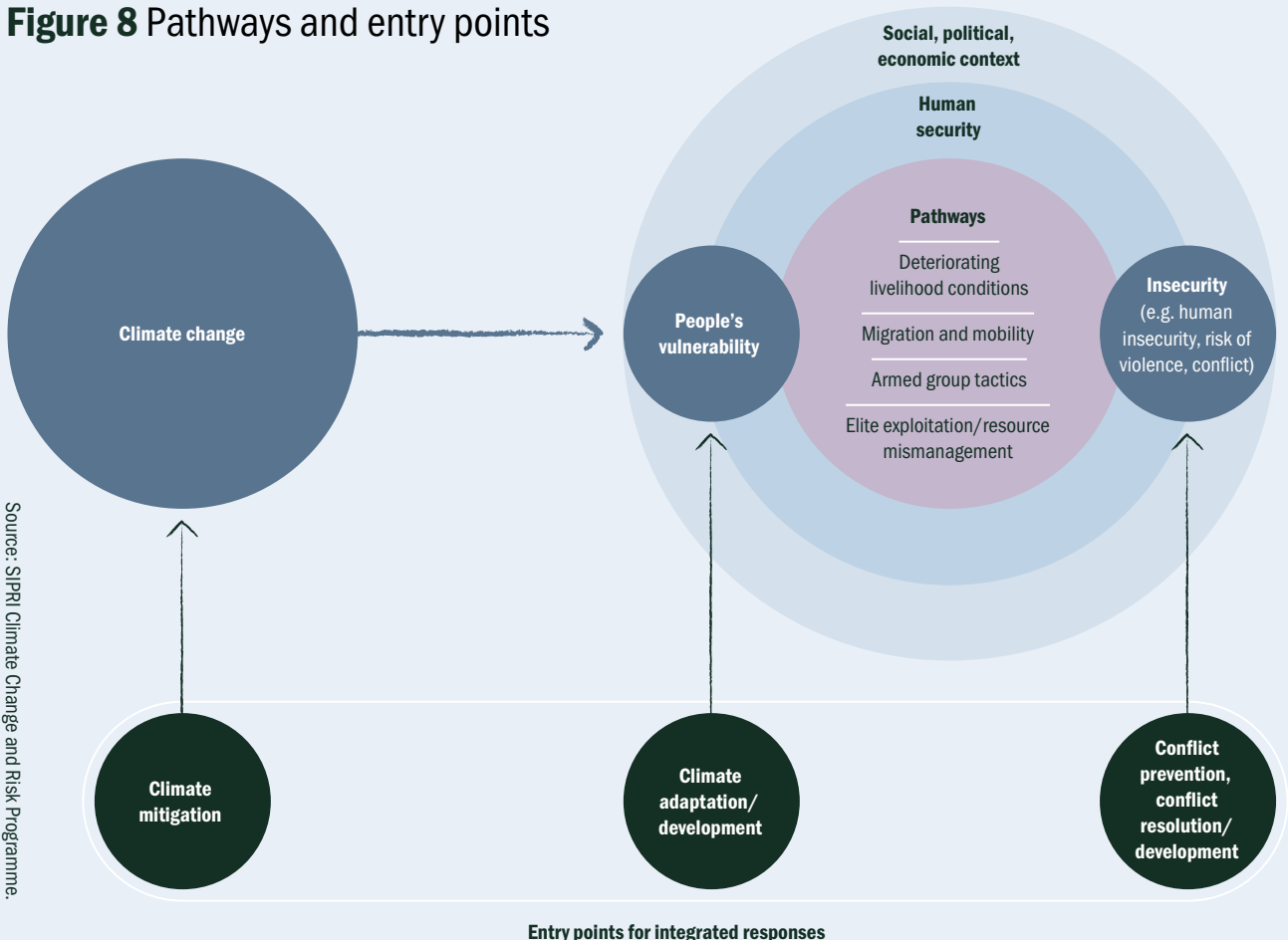
In the 50 years since the Stockholm conference, governments have adopted some international agreements that stopped environmental threats in their tracks. The Montreal Protocol of 1987 and its companion conventions have halted the depletion of the ozone layer, which is now expected progressively to heal.³⁰⁶ Regional fisheries management organizations have halted the decline of some fish stocks, in the process preventing disputes from turning into something more serious.³⁰⁷ International engagement

has significantly reduced the blight of acid rain, which once menaced forests in Europe and North America.³⁰⁸ Transboundary water agreements have helped to sustain peace despite tensions and disputes.³⁰⁹ Many countries are downscaling their use of fossil fuels (see box 4.1, Chile: A consensual exit from coal), and the majority have now adopted targets for reaching net zero emissions by mid-century.³¹⁰ Some investors, corporations and civil society are also playing important roles in addressing climate change, deforestation and other aspects of the environment crisis.

Furthermore, there have been various moves to integrate approaches to the security and environmental crises—within the UN system, in other multilateral organizations such as the African Union (AU) and the EU, and at non-governmental level.

Inside the UN, acknowledgement of a relationship between environmental degradation and security dates back at least to January 1992, when the Security Council declared that ‘non-military sources of instability in the economic, social, humanitarian and ecological fields have become threats to peace and security’.³¹¹ Shortly after, in his report ‘An Agenda for Peace’, UN Secretary-General Boutros Boutros-Ghali noted that ‘progress also brings new risks for stability’, including ‘ecological damage’.³¹² This came as world leaders were negotiating the UN climate change and biodiversity conventions at the 1992 Rio de Janeiro Earth Summit.

Figure 8 Pathways and entry points



Source: SIPRI Climate Change and Risk Programme.

BOX 4.1 CHILE: A CONSENSUAL EXIT FROM COAL

Faced with the imperative to move away from fossil fuels, governments have chosen a range of responses, from enthusiasm to denial. One country that is embracing the journey away from coal, the most polluting fossil fuel, is Chile.³¹³

Coal currently accounts for over one third of electricity generation, in a large fleet of power stations of widely varying ages.³¹⁴ In 2017, the Chilean Government decided to explore options for phasing out coal and established a commission to examine the evidence. The commission was designed to be inclusive and incorporate a range of stakeholders, such as government departments, local authorities, mayors, electricity companies, trade unions, environmental non-governmental organizations (e.g. World Wide Fund for Nature) and the German development agency GIZ (as an international partner).³¹⁵

The initial outcome was a decision to progressively close a small number of power stations. However, by the time of the 2019 UN climate summit, which Chile chaired, the government was able to announce that half of the coal fleet will close by 2025. The remainder will follow by 2040 at the latest. The commission, government and businesses are currently deciding how best

to replace both power and jobs, with options on the table including renewable energy sources, gas and hydrogen generation, and molten salt energy storage.³¹⁶

In this transition, two factors in Chile's favour are the absence of a coal-mining industry (even though the country is a major miner of other minerals) and some of the best conditions in the world for solar and wind power.³¹⁷ The government has also called in external expertise and support, notably from Germany, which also established a coal phase-out commission around the same time.³¹⁸

The German Government recently indicated its intention to advance its scheduled final closure date of 2038 to 2030, to bring it in line with science,³¹⁹ and the Chilean Government will face the same challenge. Several analyses conclude that Organisation for Economic Co-operation and Development (OECD) countries should stop using coal by 2030 at the latest.³²⁰ Continuing cost reductions in clean technology³²¹ suggest that Chile, like other countries, will find ending the coal era considerably easier and more profitable than it expected when deciding on the phase out.



More recently, the Millennium Report of the UN Secretary-General acknowledged that 'resource depletion, especially freshwater scarcities, as well as severe forms of environmental degradation, may increase social and political tensions in unpredictable but potentially dangerous ways'.³²² The preamble to the SDGs states: 'There can be no sustainable development without peace and no peace without sustainable development.'³²³ The Sustaining Peace initiative proposes a 'new approach' that would address environmental degradation and resource depletion as a route to reducing the risks of insecurity and conflict.³²⁴

Environmental rights are included in political statements such as the 1972 Stockholm Declaration³²⁵ and the 1992 Rio Declaration.³²⁶ The 2016 UN Declaration on the Rights to Peace enshrine 'the right to enjoy peace such that all human rights are promoted and protected and development is fully realized'. And just last year, in 2021, the UN Human Rights Council took the historic step of recognizing 'the right to a safe, clean, healthy and sustainable environment as a human right'.³²⁷

Several regional groupings recognize the relevance of the environment in their approaches to security and development, and recognize people's fundamental right to a healthy environment:

- The AU Master Road Map of Practical Steps to Silencing the Guns in Africa notes that addressing environmental degradation, including ‘loss of arable land, desertification, pollution in various forms, coastal erosion, loss of vegetation [and] impact of climate change’, will reduce the risk of conflict.³²⁸
- Agenda 2063, the AU’s development strategy, seeks to tackle resource depletion, biodiversity degradation and climate change impacts as a route to securing development.³²⁹
- The Association of Southeast Asian Nations (ASEAN) acknowledges environmental decline as a driver of insecurity.³³⁰
- The EU has identified climate change and wider environmental degradation as risks to international peace and security, and plans to address this in all relevant EU activities in this field, including by deploying environmental advisers to civilian Common Security and Defence Policy (CSDP) missions where appropriate.³³¹
- The Organization for Security and Co-operation in Europe (OSCE) passed a resolution in December 2021 on ‘strengthening co-operation to address the challenges caused by climate change’. It acknowledges that climate change may have negative effects on prosperity, stability and security, and notes the potential for cooperation on addressing climate change to contribute to stability, resilience and prosperity in the region.³³²
- The African Charter on Human and Peoples’ Rights, the American Convention on Human Rights and the Escazú Agreement* all recognize the fundamental right to a healthy environment.³³³
- NATO foreign ministers endorsed the NATO Climate Change and Security Agenda in May 2021, acknowledging climate change as a threat multiplier. The Action Plan that followed sets out a framework for climate change adaptation and mitigation, as well as for outreach on the topic.³³⁴

Taken together, these agreements show that in principle states are persuaded that environmental integrity is essential for security and development, and that societies are entitled to a clean and safe environment to safeguard their security and human rights. Governments have also agreed that every individual on Earth should see benefits from sustainable development, through the vow enshrined in the 2030 Agenda that ‘no one will be left behind’.³³⁵ Although some governments regularly oppose resolutions on climate and environmental security at the UN Security Council, this can reflect long-standing concerns about issues such as the securitization of climate change, non-provision of climate finance and fair participation.³³⁶ Nevertheless, the list of agreements to date and the overwhelming support from governments for the 2021 Human Rights Council resolution³³⁷ constitute a solid starting point for discussions on turning principle into reality and so beginning to build an environment of peace.

* The Escazú Agreement is the first comprehensive international treaty in Latin America and the Caribbean devoted to the environment. In force from April 2021, it includes provisions recognizing the right of current and future generations to a healthy environment and sustainable development.

Environmental security in the field

In recent years, UN institutions and others have made moves to bridge the gap between their peacebuilding and environment wings. The UN Environment Programme has conducted various projects on the security implications of climate change for well over a decade.³³⁸ In 2018, in response to member states' calls for greater focus on issues such as climate-related security risks, the UN formally established the Climate Security Mechanism (CSM).³³⁹ It provides integrated climate risk assessments to the Security Council and other UN bodies, through synthesizing first-hand insights from different UN agencies and external experts. The CSM has now established itself and intensified its work within UN headquarters, as well as increasingly in the field. Given the rapid expansion of the climate–security agenda, there is a case for expanding both the scale and scope of its work.³⁴⁰

Incorporating environmental aims and expertise into peacebuilding and peacekeeping missions is an obvious operational step for many institutions to take. But implementation has been slow.

However, the UN Assistance Mission in Somalia (UNSOM) represents an important step forward. It is the first mission to



The UN Assistance Mission in Somalia is the first mission to include a dedicated environmental security adviser, focusing on how climate change and wider environmental degradation affect security and conflict, and vice versa.

include a dedicated environmental security adviser, focusing on how climate change and wider environmental degradation affect security and conflict, and vice versa.³⁴¹ As a focal point between UNSOM, other UN agencies and the Somali Government, this work includes evaluating the impact of environmental degradation on issues such as displacement, training officials in climate security, and supporting the National Environmental Action Plan and specific plans for charcoal, forestry and rangeland management.³⁴² Its activities include developing nature-based flood management, bolstering the approach to environmental crime and reforestation using drone delivery of seed. In operation for less than two years, UNSOM promises to be an important proof point that building environmental integrity is a valuable component of peacebuilding. The UN is now in the process of deploying similar advisers to South Sudan and elsewhere.

There are also examples of programmes enacted by regional coalitions that combine environmental, social and peacebuilding principles on the ground to positive effect. For example, despite the confluence of factors exacerbating conflict in the Sahel (see chapter 2) and the many remaining fragilities, regional initiatives established over the last decade are bringing change.

The Regional Sahel Pastoralism Support Project³⁴³ and the Regional Pastoral Livelihoods Resilience Project³⁴⁴ aim to improve resource management and animal health, facilitate access to markets, help pastoralists diversify sources of income, and manage conflict. Supported by the World Bank, they also aim to enhance preparedness and resilience in the face of drought and improve governments' emergency response. Between 2015 and 2020, these projects improved the management of more than 5 million hectares of pastureland, secured water points, established cattle markets and delineated nearly 1500 kilometres of transhumance corridors for nomadic passage of livestock. More recently, they have been joined by the Pastoralism and Stability in the Horn and in the Sahel project,³⁴⁵ which aims to embed peacebuilding into a sustainable development strategy that is sensitive to local and regional realities. Activities include establishing processes to provide early warning of conflict and cross-border conflict resolution mechanisms.

NGOs are complementing these initiatives. In Mali, for example, the Program to Support Food Security and Resilience to Climate and Social Crises aims to build resilience to environmental degradation and other stressors using sustainable and collaborative management of natural resources and income diversification.³⁴⁶ Consultations and other communication tools, such as radio broadcasts, raise awareness of conflict potential. Cooperation on environmental restoration and sustainable livelihoods is a route to building relationships between communities, aiming to reduce conflict risk.

The success of such programmes has influenced the approach of governments in the region, with Chad, Mali and Niger all setting out national strategies for pastoral waterworks that recognize the conflictual dynamics between pastoralists and farmers and aim to defuse the potential for conflict.³⁴⁷

On a larger scale, the Great Green Wall of the Sahara and Sahel shows governments, international supporters and local organizations working collaboratively in an attempt to improve environmental integrity.³⁴⁸ Initially envisaged purely as a tree-planting project, it now incorporates elements of social and economic development. Local women's organizations are involved, aiming to empower women and bolster household incomes. Restoring biodiversity and soil quality should improve food and water security, boosting livelihoods for subsistence farmers. Despite challenges,³⁴⁹ the Great Green Wall remains a compelling example of cooperation across borders and sectors that can improve multiple aspects of human security and reduce the risk of conflict over resources, particularly as climate impacts accumulate.

NGOs can play a central role in situations of environmental and security stress. One with a near 30-year record in a challenging region is EcoPeace, a collaboration of Israeli, Jordanian and Palestinian environmentalists aiming to build cooperation in tackling the water and energy problems that their countries jointly face.³⁵⁰ The shared River Jordan runs almost dry due to overuse and drought, and is heavily polluted. Conflict over access is a possible outcome in such a situation. EcoPeace has built a mutual understanding among communities in Israel, Jordan and Palestine, and advocates for common solutions, in doing so reducing the chances of conflict.

A related intervention in the same region has seen educators in Israel and Palestine run educational programmes on water management and conservation, particularly for farmers and schoolchildren. Similar programmes exist in South Asia and the Mekong region. All of these initiatives aim to increase understanding and reduce prejudice by bringing together people from diverse communities, jointly developing solutions to a common problem.

In Uganda, the Strengthening Resilience and Inclusive Governance project is tackling unsustainable resource use in a refugee setting. In Arua District, both refugees and host communities fell trees for charcoal and bricks. This contributes to deforestation, raises the risk of conflict between the two communities over a dwindling resource and reduces resilience to environmental shocks. The project promotes discussion between the communities to break the damaging circular dynamic, and in doing so both reduces conflict risk and helps rebuild natural resilience to climate impacts.³⁵¹

Some NGOs and other organizations are also consciously building adaptive management and 'learning while doing' into their projects³⁵² (see box 4.2, Defusing conflict in the Niger Delta). In a future of complex, evolving risks, this approach is likely to be more appropriate than statically conceived interventions.

BOX 4.2 DEFUSING CONFLICT IN THE NIGER DELTA

The 1990s and 2000s were a bloody period in the coastal Niger Delta. Intense community unrest against oil and gas exploitation centred on contamination of crucial land and water, and exclusion of communities from the benefits of development. This came to international attention through the execution of Ken Saro-Wiwa and eight other activists in 1995.³⁵³ A decade later, there were an estimated 120–150 conflicts in the delta, with more than 50 armed groups counting 20 000–25 000 adherents active against the industry.³⁵⁴

The Norwegian state oil company Statoil wanted to avoid provoking new unrest as it moved into hitherto unexploited oil and gas fields in the Niger Delta. An environmental impact assessment conducted in 1997 identified the Akassa clan as the most likely to be impacted—a widely dispersed clan of around 30 000 people in a region without electricity or clean drinking water and with few roads. Statoil therefore funded Pro-Natura, an environmental non-governmental organization, to formulate and implement a ‘bottom-up’ development programme.³⁵⁵ Representatives went to live in each of the 19 villages, holding extensive conversations on needs, concerns and objectives. Training in skills such as leadership and governance complemented the consultations.³⁵⁶

Now under the stewardship of the Akassa Development Foundation (ADF), with funding from a range of sources including the United Nations Development Programme, the programme has led to health facilities, microcredit schemes, biodiversity conservation projects, and support for women and youth, among other things.³⁵⁷ Clan-wide planning and regular reviews by a representative general assembly ensure consultation and transparency across the community. A significant majority of the Akassa say they are satisfied with the foundation’s operations and distribution of benefits.³⁵⁸ The original aim of avoiding conflict generation has been realized.

Three factors appear central to the programme’s success: the inclusive and participatory bottom-up approach; the creation of accountable institutions that generate trust; and incorporating adaptive peacebuilding from the start, in other words accepting that new challenges will emerge and committing to learning through doing.³⁵⁹ The Akassa model has now been adopted and adapted by numerous communities in neighbouring Niger Delta states and throughout the country.³⁶⁰ As Nigeria undertakes its transition strategy to achieve net zero emissions by 2060,³⁶¹ the ADF example provides one template for successful community-driven development practice.



Gaps in the landscape

The absence of consensus within the UN Security Council on the case for addressing climate–security links is one gap in the foundations that would ideally be in place to address these risks at the scale they merit. At the level of policies, measures and operations, there are others. For example, not all early warning protocols for disaster and conflict incorporate indicators of impending environmental or climate impacts.

Another potential gap lies in the governance of shared resources, such as river basins or high seas fisheries. Here, environmental change can diminish the resource, which in some cases may already be diminishing due to over-exploitation, and hence create a conflict risk. Not all shared resources are covered by resource-sharing agreements, a deficit that the SDGs note should be addressed.³⁶² Where such agreements do exist, they may not be equipped to anticipate and respond to abrupt change or tipping points, they may lack the dispute resolution mechanisms necessary to prevent conflict, or they may not include all resource users (see chapter 2).

In several agreements, including the UN Declaration on the Rights of Indigenous Peoples, states recognize their obligation to ‘cooperate in good faith’ with Indigenous Peoples and obtain their

free, prior and informed consent before adopting measures that may affect them; to respect their integrity and allow no force or coercion to violate their rights and freedoms.³⁶³ Nevertheless, Indigenous Peoples are especially vulnerable to land grabs, as outlined previously (see chapter 3), with only about 10% having legal title to their land. This creates conflict risk over issues such as hydropower dams and land set-aside; it also creates a critical conservation problem because, as the UN Convention on Biological Diversity recognizes, Indigenous Peoples play a crucial role in conservation.³⁶⁴ Traditional Indigenous territories take up nearly a quarter of the Earth's land surface but contain 80% of global biodiversity;³⁶⁵ and biodiversity management as performed by Indigenous Peoples can be at least as effective, and possibly more effective, than just protecting areas of land.³⁶⁶

Simply giving Indigenous groups legal title to their land is a way to potentially safeguard their security and the environment. In Peru, more than 1200 communities have received land title since the 1970s. Satellite imaging shows that titling reduces forest clearance by more than 75% within a few years.³⁶⁷ This has local and global benefits, given the importance of tropical forests for moderating climate change.

It is not only Indigenous Peoples who are often denied fair involvement in decision-making forums that materially



To meet the size of the global threat, a transformation in both the scale and pace of change is needed.

affect them; so are women, young people and other marginalized groups. Last year, UN Secretary-General António Guterres specifically called attention to the fact that women made up only 23% of delegates in peace processes led or co-led by the UN,³⁶⁸ but the under-representation goes wider. This is not just a question of fairness; programmes that aim to build peace and sustainable livelihoods have to be relevant to women as well as men, especially given that women may be taking up work opportunities as they are established. Full participation in decision making is more likely to result in benefits flowing to both women and men, and better outcomes for the communities concerned.

The security and environmental crises interact in ways that are already complex and are expected to become more so. A static or short-term approach to resource sharing that lacks adaptive capacity is likely to prove less effective over time. Nevertheless, the examples above show that even in the most challenging environments—such as Somalia, where the impacts of local environmental degradation and climate change mix with pre-existing poverty and insecurity—progress is possible. Governments, international organizations and civil society, and sometimes businesses too, are developing interventions that go to the heart of the wicked environment–security combination.

To meet the size of the global threat, a transformation in both the scale and pace of change is needed.



5

TOWARDS AN ENVIRONMENT

How can we usher in an Environment of Peace? Based on the evidence featured here, we present six recommendations for action, and five principles to guide them.

OF PEACE

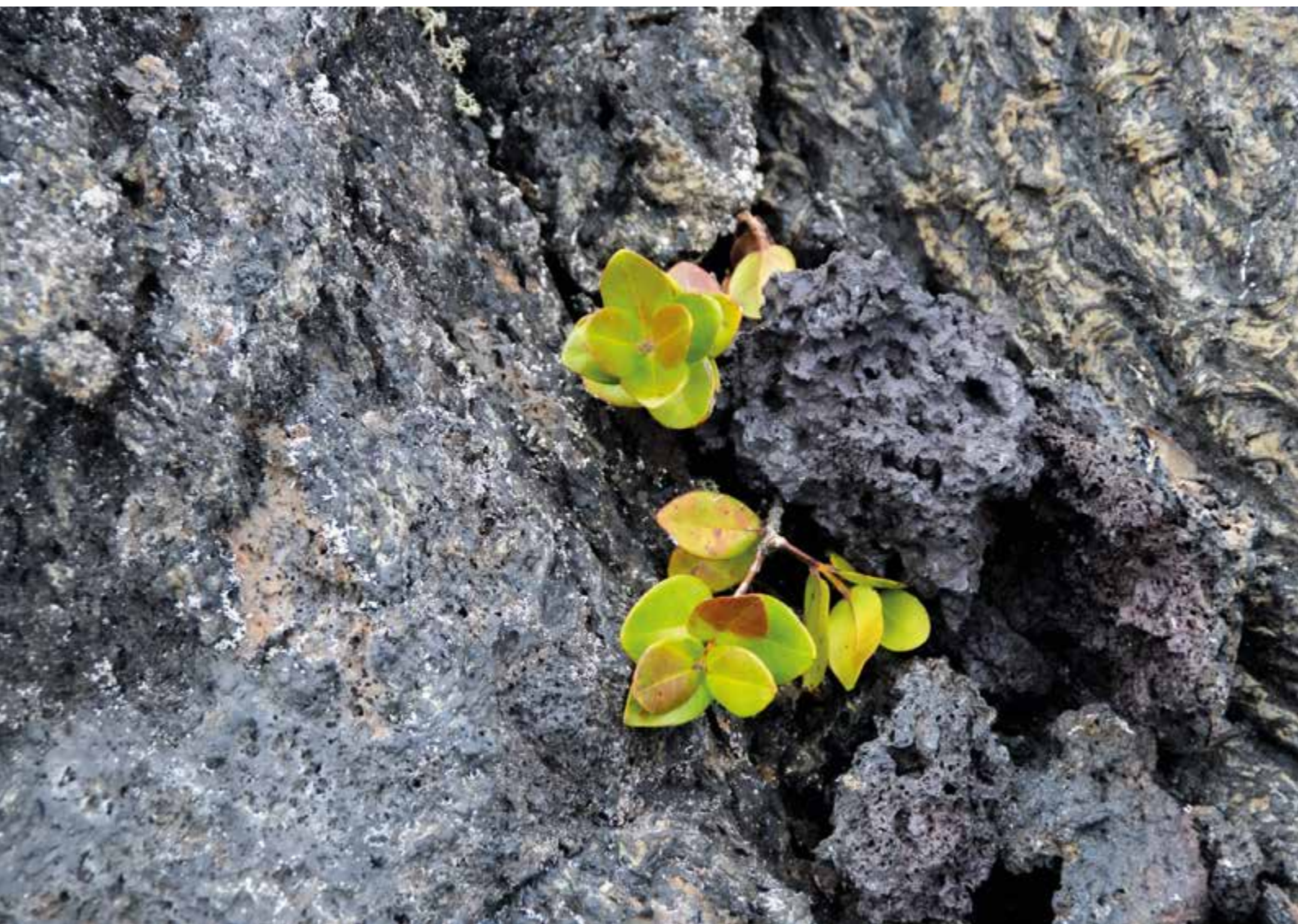
Building peace, restoring the natural environment, halting climate change. Dealing with crisis situations as they develop without losing sight of the long-term goal. Investing in peace and cooperation rather than conflict. All of the recommendations presented here can be implemented within a few years—and, if there is a genuine desire for a just and peaceful world, all of them should be.

Humanity has entered a new era of risk. Individuals, communities, governments and international organizations are only just starting to respond. Global agreements, regional mechanisms and non-governmental initiatives all show that it is feasible to understand the wicked mix of risks created by the security and environmental crises, and to act in ways commensurate with it.

In addition, recent events have provided stark learning opportunities that point to the value of risk-informed planning and investment in resilience. The Covid-19 pandemic has highlighted the gains countries make by preparing for an event whose potential for devastation is clear even if its timing and nature may not be. Some countries, such as South Korea, which had experienced the 2002 SARS outbreak realized there was a significant risk of similar epidemics in the future and invested in preparatory measures.³⁶⁹ As a result, over the first two years of the pandemic, South Korea recorded less than 10% of the cumulative Covid-19 deaths per million inhabitants seen in countries with a similar population size (e.g. Argentina, Colombia, Italy, South Africa and Spain).³⁷⁰ A decade earlier, after the financial crisis of 2008–2009, governments, regulators and central banks established new systems to reduce the chances of further ‘too-big-to-fail’ businesses crashing into bankruptcy and taking billions in public money with them.³⁷¹

The dynamics of climate change and ecological decline mean that waiting until it happens and then realizing you were unprepared is a catastrophic choice. In contrast to the financial and Covid-19 crises, there is no equivalent of quantitative easing or mask mandates that can compensate for the collapse of an ecosystem or a life-sustaining weather system. The choice before policymakers is whether they take that chance and accept the profound risks that will emerge as the security and environmental crises escalate, or whether they prepare for the entire range of futures humanity may face by assessing risks, establishing contingencies and preparing responses.

Drawing on evidence outlined earlier in the report, in particular the ideas set out in the previous chapter, we present a set of principles around which policymakers and others should rapidly reorganize; a lens through which to see optimal approaches. We then present a series of recommendations which, if implemented, will take humanity towards an environment of peace. Some steps can be taken by individuals, communities and civil society organizations, but the principal focus here is on governments and other institutions of power because their legislative, agenda-setting and resource-allocating roles are central to finding solutions. They set the 'rules of the game', creating a framework that all other entities have to work within. Generally speaking, they are also the entities that can bring change most rapidly—and, given the urgency of the twin crises, rapid change is essential.



Principles for an Environment of Peace

1

Think fast, think ahead, act now

Establishing an environment of peace requires a far-sighted vision and proactive, evidence-based policymaking that recognizes the synergies between environment, development, human rights and peace. It also calls for swift, short-term action, including to halt and reverse environmental degradation.

2

Cooperate to survive and thrive

No government can secure the well-being of its citizens against the escalating global crises without international cooperation. The new era of evolving risk demands a new mode of cooperation that reaches beyond like-minded alliances in the interests of addressing common threats.

3

Expect the unexpected—be prepared to adapt

The escalating crises are constantly bringing new risks and challenges, and static assessments and policies are already proving inadequate. Continuous horizon scanning, far-sighted analysis and adaptive implementation will be needed if societies are to keep ahead of growing and unpredictably changing risks.

4

Only a just and peaceful transition will succeed

To be successful, transitions to environmentally sustainable societies must be both just and peaceful. Potential risks to security need to be assessed, managed and mitigated in all measures taken to address climate change and wider environmental degradation.

5

By everyone, for everyone

Decision-making processes at every level, from intergovernmental organizations to individual and community projects, are likely to produce fairer and more effective decisions if they are inclusive. People most involved in and impacted by actions should be fully consulted and have their interests reflected in the outcomes.

Recommendations for an Environment of Peace

Address the linked crises with joint solutions

Governments and other decision-making organizations in all sectors of society should ensure that measures addressing environmental problems also promote peace, and that measures addressing security issues also promote environmental integrity.

- The UN has a central role in joining up approaches to the security and environmental crises. Peace and security bodies such as the Security Council and the Peacebuilding Commission should routinely integrate environmental understanding into their work; entities focused on the environment, such as the Rio conventions, should be mindful of the security consequences of their decisions. Entities that already straddle the security and environment fields, such as the Climate Security Mechanism, should be strengthened.
- There are real-world examples of successful initiatives enhancing both security and environmental outcomes on which to draw, and real-world examples of failures from which to learn. Governments should invest in open and transparent platforms to share best practice as well as lessons from projects that have had unintended negative consequences.
- Governments should increase support for international and regional cooperation, particularly South–South cooperation, which is increasingly being used to enhance development, environmental sustainability and human security.

Invest in preparedness and resilience

Countries, subnational bodies and communities should reduce vulnerability to environmental and conflict shocks by investing in preparedness, resilience and adaptive capacity. These must be adequate for the new era in which the entire range of risks and shocks is not fully foreseeable. Preparedness includes investing in capacity to identify both progressive changes and the warning signs of rapid-onset events.

- Every government should undertake a strategic review of how impacts of climate change and wider environmental decline will affect risks to security, and assess their resilience. The international community should provide financial and technical support where necessary.
- Transboundary agreements on managing shared resources such as water, fisheries and forests should be expanded and enhanced, in order to cover all instances of resource sharing with potential to generate insecurity and conflict risk. Both existing and

The provision and allocation of finance are critical to increasing resilience, reversing environmental decline and building peace.

new transboundary agreements should be made fit for purpose against the evolving risk landscape.

- Early warning systems for conflict and for environmental shocks can provide useful information in advance of potentially damaging events. Where environmental stressors are not routinely incorporated in conflict early warning systems, they should be.

Finance peace, not risk

The provision and allocation of finance are critical to increasing resilience, reversing environmental decline and building peace. Governments, development banks and other financial institutions should ensure that both the public money they provide and the private money they regulate are spent in ways that promote peace and environmental integrity.

Fully meet funding commitments:

- Organisation for Economic Co-operation and Development (OECD) member states and other prosperous countries should quickly and fully meet their international funding obligations on climate change, biodiversity and other environmental issues.

Switch spending to support peace and environmental integrity:

- Military and humanitarian spending in response to near-term threats must be complemented by long-term funding strategies to establish and sustain security. This funding must address the causes and manifestations of the escalating twin crises with the aim of building peace and restoring environmental integrity, including through international cooperation.
- Subsidies that exacerbate insecurity and conflict by damaging the environment amount to trillions of dollars per year. Governments should re-examine the subsidies they give for activities such as fossil fuel extraction and consumption, destructive fishing and deforestation in this light, and deliver on their commitments to end them.

Ensure funding is just and conflict-sensitive:

- International funding mechanisms that address environmental decline should disburse funds in ways that do not damage security and peace, and ideally in ways that enhance them. Oversight mechanisms should be designed and implemented inclusively, and with human rights and the promotion of peace front of mind.
- International environmental finance should flow as a priority to the most fragile states and communities. Access to funding should be as inclusive as possible. Donor countries and

multilateral funding institutions should reduce barriers that restrict access for marginalized groups and the poorest countries.

- In order to minimize risks to peace and security, private sector funding for offsetting emissions via nature-based solutions must operate to the highest internationally agreed social and ecological standards. Governments should ensure rigorous regulatory oversight.

Deliver a just and peaceful transition

In the move to more sustainable societies, governments, multilateral organizations and corporations should ensure that the pro-environment measures they undertake do not create environmental or security risks. Entities in the Global North should be particularly attentive to the risk of creating unwanted consequences for communities in the Global South.

- Public and private entities embarking on measures to address environmental degradation should assess the potential for negative social impacts, such as increasing risks of conflict or community tension, before a decision is taken to commence. Where risks exist, assessment should continue throughout the lifetime of an initiative.
- Climate change adaptation should identify and address root causes of vulnerabilities, rather than focusing narrowly on climate change impacts.
- The rapidly increasing demand for critical minerals and other components of zero-carbon technologies raises risks for conflict and insecurity. Governments and the private sector should cooperatively identify and implement ways of reducing these risks at every stage in the product cycle, from extraction of raw materials through manufacture and deployment to decommissioning and waste disposal.

Be deliberately inclusive

Governments, other institutions of authority and corporate entities should ensure that all communities and sectors of society are fully and meaningfully involved in decision-making processes that affect them. In addition to increasing security, this inclusive governance is likely to result in more effective interventions.

- Indigenous Peoples are often especially vulnerable to environmental and security threats; at the same time, they possess traditional and local knowledge and practices that are valuable for environmental conservation. Policymakers should recognize their rights in full, award legal land title where none exists, and ensure their full and effective participation in decision making.

Young people must be given opportunities to participate meaningfully in decision-making processes concerning security and the environment.

- Diverse groups of women and men should be represented, and their interests and rights given due weight, in all processes intended to address elements of the interlinked security and environmental crises. These include peacebuilding, livelihood diversification, environmental enhancement, low-carbon transitions and climate adaptation.
- Young people have an especially high stake in the security and environmental crises. Governments at all levels, and multilateral institutions, should ensure that young people are given opportunities to participate meaningfully in decision-making processes concerning security and the environment, and give their voices due weight.

Research, educate, inform

Education and information about the links between the security and environmental crises are central to establishing an environment of peace. In classrooms, boardrooms, government offices, informal learning environments and peace operations there is a need for better understanding of the complexities and interconnections of the twin crises. This entails access to data and analysis adequate for understanding evolving risks, and for development and dissemination of skills and knowledge that can lead to more effective interventions. Decision makers should analyse needs and opportunities for research, education and information sharing, and develop interventions wherever possible.

- Governments and research institutions should establish multi-disciplinary programmes that document and analyse risks emerging from the interlinked security and environmental crises. Analyses must then be effectively communicated to communities, practitioners and educators, enabling them to better understand, anticipate and respond to the changing risk landscape.
- Formal and informal educators should identify and create opportunities to educate young people on the complex risk landscape and challenges ahead, while also promoting awareness and discussion on managing risks and addressing underlying causes.
- Authorities and NGOs should look to create educational interventions across divided communities that face similar environmental and security stressors, using these interventions to build resilience and peace.

CONCLUSION

Without restoring a healthy and fully functional natural environment, the risks of insecurity, instability and conflict will keep rising. For climate change and biodiversity, this is a critical decade, which makes it a critical decade for security as well.

In order to build an environment of peace, humanity first needs to make peace with the environment. Indeed, it is impossible to conceive of the world becoming more peaceful as long as climate change impacts continue to multiply, plastic chokes the global ocean, mountain glaciers melt away and ecosystems on which communities depend cease to exist.

Yet environmental degradation continues apace; and as it does so, security risks mount. With the Russian invasion of Ukraine illustrating vividly the turmoil that conflicts cause, it is surely time to ask whether this is the future that humanity really wants.

Coming together for the Stockholm conference 50 years ago, governments agreed that environmental integrity was essential for human well-being. (It was, after all, a conference on the human environment.)

Governments also noted both the positives and negatives of the unique power *Homo sapiens* wields over the natural world. 'If used wisely,' the conference declaration noted, '[this power] can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the environment.'³⁷²

Today, 'incalculable harm' is much closer than 50 years ago. Without restoring a healthy and fully functional natural environment, the risks of insecurity, instability and conflict will keep rising. For climate change and biodiversity, this is a critical decade, which makes it a critical decade for security as well. But with full deployment of the twin strategies outlined in this report—addressing the causes with the urgency they merit, while managing the consequences—the current bleak trends can be turned around.

Action to halt and reverse climate change and wider environmental degradation is manifestly in the interest of every country. So is attending to the security risks that are already here and preparing for the larger ones that will inevitably emerge. It is still humanity's choice which path to take. But there is a real danger of events overtaking the time left to choose, especially in the most fragile states.

It is time to use the powers that we have wisely.

REFERENCES

- 1 World Bank, GDP, PPP (current international \$), <<https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD>>, accessed 25 Feb. 2022.
- 2 Montanarella, L., Scholes, R. and Brainich, A., *The Assessment Report on Land Degradation and Restoration* (IPBES: Bonn, 2018).
- 3 UN Educational, Scientific and Cultural Organization World Water Assessment Programme, UN Water, *The United Nations World Water Development Report 2020: Water and Climate Change* (UNESCO: Paris, Mar. 2020).
- 4 UN Food and Agriculture Organization, *The State of World Fisheries and Aquaculture 2020: Sustainability in Action* (FAO: Rome, 2020).
- 5 Crutzen, P. J. and Stoermer, E. F., 'The "Anthropocene"', *IGBP Global Change Newsletter*, vol. 41 (May 2000); International Commission on Stratigraphy, International Union of Geological Sciences, 'Working Group on the "Anthropocene": What is the Anthropocene?—Current definition and status', Subcommission on quaternary stratigraphy, 21 May 2019.
- 6 Pettersson, T. et al., 'Organized violence 1989–2020, with a special emphasis on Syria', *Journal of Peace Research* (July 2021); Gleditsch, N. P. et al., 'Armed conflict 1946–2001: A new dataset', *Journal of Peace Research*, vol. 39, no. 5 (Sep. 2002).
- 7 UN High Commissioner for Refugees, *Global Trends: Forced Displacement in 2020* (UNHCR: Copenhagen, June 2021).
- 8 Pettersson et al. (note 6).
- 9 Smith, D., 'Introduction: International stability and human security in 2019', ed. I. Davis, *SIPRI Yearbook 2020: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2020).
- 10 Gokhale, V., *The Road from Galwan: The Future of India–China Relations*, Working Paper (Carnegie Endowment for International Peace: Washington, DC, Mar. 2021).
- 11 Davis, I., 'The interstate armed conflict between Armenia and Azerbaijan', ed. I. Davis, *SIPRI Yearbook 2021: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2021); Davis, I., 'Armed conflict and peace processes in East Africa', ed. I. Davis, *SIPRI Yearbook 2021: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2021).
- 12 Schoonover, R., Cavallo, C. and Caltabiano, I., *The Security Threat That Binds Us* (Council on Strategic Risks: The Converging Risks Lab, 2021).
- 13 Spijkers, J. et al., 'Global patterns of fisheries conflict: Forty years of data', *Global Environmental Change*, vol. 57 (July 2019).
- 14 China Briefing Team, 'US–China Relations in the Biden-Era: A Timeline—China Briefing News', China Briefing, 21 Mar. 2022.
- 15 Brattberg, E. and Maurer, T., *Russian Election Interference: Europe's Counter to Fake News and Cyber Attacks* (Carnegie Endowment for International Peace: Washington, DC, May 2018).
- 16 Owen, R., *The Litvinenko Inquiry: Report into the Death of Alexander Litvinenko*, no. HC695 (British Government: London, 2016); 'Murder at the airport: The brazen attack on Kim Jong Nam', Reuters, 1 Apr. 2019; Koven, S. G. and Perez, A. F., 'Ethics of targeted killings and assassinations', *Public Integrity* (7 July 2021).
- 17 Chaney, E., 'Russia, gas and the European Union: An explosive mix', Institut Montaigne, 10 Feb. 2022; Umbach, F., 'What if Russia cuts off gas to Europe? Three scenarios', GIS Reports, 14 Feb. 2022.
- 18 UN News, 'End 'appalling' Belarus–Poland border crisis, UN rights office urges', 21 Dec. 2021.
- 19 UN Food and Agriculture Organization, 'FAO Food Price Index', World food situation, 8 Apr. 2022.
- 20 International Fund for Agricultural Development, 'Impacts of Ukraine conflict on food security already being felt in the Near East North Africa region and will quickly spread, warns IFAD', 17 Mar. 2022; Weersink, A. and Massow, M. von, 'How the war in Ukraine will affect food prices', *The Conversation*, 14 Mar. 2022; Saleh, H. and Terazono, E., 'Ukraine war sparks food shortages in Arab nations as wheat prices soar', *Financial Times*, 21 Mar. 2022; Elkin, E., 'Russia jolts global fertilizer market by seeking end to exports', Bloomberg, 4 Mar. 2022.
- 21 UN News, 'Russia blocks Security Council action on Ukraine', 25 Feb. 2022; Magid, S. and Shalomov, Y., 'Russia's veto makes a mockery of the United Nations Security Council', Atlantic Council, 15 Mar. 2022; Hovell, D., 'Council at War: Russia, Ukraine and the UN Security Council', EJIL: Talk!, 25 Feb. 2022; Ocampo, K. D. and J. A., 'Will Ukraine's tragedy spur UN Security Council reform?', Brookings Institution, 3 Mar. 2022.
- 22 Roth, A. et al., 'Putin signals escalation as he puts Russia's nuclear force on high alert', *The Guardian*, 28 Feb. 2022; Kroenig, M., Massa, M. J. and Marine, A., 'To decipher Putin's nuclear threats, watch what he does—not what he says', Atlantic Council, 4 Mar. 2022.
- 23 Lopes da Silva, D. et al., *Trends in World Military Expenditure, 2021*, SIPRI Fact Sheet (SIPRI: Stockholm, Apr. 2022).
- 24 Wezeman, P. D., Kuimova, A. and Wezeman, S. T., *Trends in International Arms Transfers, 2020*, SIPRI Fact Sheet (SIPRI: Stockholm, Mar. 2021).
- 25 E.g., Sheahan, M. and Marsh, S., 'Germany to increase defence spending in response to 'Putin's war'—Scholz', Reuters, 27 Feb. 2022; Skydsgaard, N. and Jacobsen, S., 'Denmark to boost defence spending and phase out Russian gas', Reuters, 6 Mar. 2022.
- 26 Kristensen, H. M. and Korda, M., 'World nuclear forces', ed. I. Davis, *SIPRI Yearbook 2021: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2021).

- 27 Kristensen and Korda (note 26).
- 28 Reagan, R., 'Joint Soviet–United States Statement on the Summit Meeting in Geneva', The American Presidency Project, 21 Nov. 1985.
- 29 US Department of Defense, Defense Atomic Support Agency, *Accidents and Incidents Involving Nuclear Weapons (U)* (US Department of Defense: Washington, DC, 15 Oct. 1967); 'Loose nukes', Council on Foreign Relations, 1 Jan. 2006; Morris, I., *War! What Is It Good for? Conflict and the Progress of Civilization from Primates to Robots* (Farrar, Straus and Giroux: New York, 2015).
- 30 UN Human Rights Council, 'Press statement on the alleged use of chemical weapons in eastern Ghouta', Press Release, 13 Apr. 2018; Human Rights Watch, 'Syria: A year on, chemical weapons attacks persist', 4 Apr. 2018.
- 31 Hart, J., 'Allegations of use of chemical weapons in Iraq', ed. Ian Davis, *SIPRI Yearbook 2017: Armaments. Disarmament and International Security* (Oxford University Press: Oxford, 2017).
- 32 Boulanin, V. and Verbruggen, M., *Mapping the Development of Autonomy in Weapon Systems* (SIPRI: Stockholm, Nov. 2017); Boulanin, V. et al., *Artificial Intelligence, Strategic Stability and Nuclear Risk* (SIPRI: Stockholm, June 2020).
- 33 United Nations, *The Sustainable Development Goals Report 2020* (UN: New York, 7 July 2020).
- 34 United Nations (note 33).
- 35 International Fund for Agricultural Development (note 20).
- 36 Mitchell, I., Hughes, S. and Huckstep, S., 'Price spike caused by Ukraine war will push over 40 million into poverty: How should we respond?', Center for Global Development, 18 Mar. 2022.
- 37 World Bank, 'Fragility, conflict & violence', Understanding poverty, 1 July 2021.
- 38 Mace, G. M., Norris, K. and Fitter, A. H., 'Biodiversity and ecosystem services: A multilayered relationship', *Trends in Ecology & Evolution*, vol. 27, no. 1 (Jan. 2012).
- 39 Brondizio, E. S. et al., *The Global Assessment Report on Biodiversity and Ecosystem Services* (IPBES Secretariat: Bonn, 2019).
- 40 Bar-On, Y. M., Phillips, R. and Milo, R., 'The biomass distribution on Earth', *Proceedings of the National Academy of Sciences*, vol. 115, no. 25 (19 June 2018).
- 41 Grooten, M. and Almond, R. E. A. (eds), *Living Planet Report 2018: Aiming Higher* (WWF: Gland, 2018).
- 42 Lister, B. C. and Garcia, A., 'Climate-driven declines in arthropod abundance restructure a rainforest food web', *Proceedings of the National Academy of Sciences*, vol. 115, no. 44 (15 Oct. 2018); Hallmann, C. A. et al., 'More than 75 percent decline over 27 years in total flying insect biomass in protected areas', *PLOS ONE*, vol. 12, no. 10 (18 Oct. 2017).
- 43 Sodhi, N. S., Brook, B. W. and Bradshaw, C. J. A., 'Causes and consequences of species extinctions', eds S. A. Levin et al., *The Princeton Guide to Ecology* (Princeton University Press: Princeton, 2009).
- 44 UN Food and Agriculture Organization, *Global Forest Resources Assessment 2015: How Are the World's Forests Changing? Second Edition* (FAO: Rome, 2016).
- 45 Harris, B., 'Brazilian Amazon endures fastest rate of deforestation in 15 years', *Financial Times*, 19 Nov. 2021.
- 46 McMahon, B. J., Morand, S. and Gray, J. S., 'Ecosystem change and zoonoses in the Anthropocene', *Zoonoses and Public Health*, vol. 65, no. 7 (Nov. 2018); Judson, S. D. and Rabinowitz, P. M., 'Zoonoses and global epidemics', *Current Opinion in Infectious Diseases*, vol. 34, no. 5 (Oct. 2021).
- 47 UN Food and Agriculture Organization, *Status of the World's Soil Resources: Main Report* (FAO: Rome, 2015).
- 48 Mekonnen, M. M. and Hoekstra, A. Y., 'Four billion people facing severe water scarcity', *Science Advances*, vol. 2, no. 2 (12 Feb. 2016); UN Water, *Summary Progress Update 2021: SDG 6—Water and Sanitation for All* (UN Water: Geneva, Feb. 2021), p. 7.
- 49 Díaz, S. et al., *The Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Summary for Policymakers* (IPBES: Bonn, 2019).
- 50 Sodhi, Brook and Bradshaw (note 43).
- 51 Kolbert, E., *The Sixth Extinction: An Unnatural History* (Henry Holt & Co: New York, Feb. 2014).
- 52 Kaza, S. et al., *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050* (International Bank for Reconstruction and Development/The World Bank: Washington, DC, 2018).
- 53 UN Food and Agriculture Organization, *Assessment of Agricultural Plastics and Their Sustainability: A Call for Action* (FAO: Rome, 2021).
- 54 Baker, E. et al., 'Oceans and coasts', eds P. Ekins, J. Gupta and P. Boileau, *Global Environment Outlook—GEO-6: Healthy Planet, Healthy People* (Cambridge University Press: Cambridge, 2019); World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, *The New Plastics Economy: Rethinking the Future of Plastics* (World Economic Forum: Geneva, Jan. 2016).
- 55 Leslie, H. A. et al., 'Discovery and quantification of plastic particle pollution in human blood', *Environment International* (Mar. 2022).
- 56 Carrington, D., 'Microplastic pollution found near summit of Mount Everest', *The Guardian*, 20 Nov. 2020; Peng, X. et al., 'Microplastics contaminate the deepest part of the world's ocean', *Geochemical Perspectives Letters*, vol. 9 (27 Nov. 2018).
- 57 Brown, T. M. et al., 'The distribution and trends of persistent organic pollutants and mercury in marine mammals from Canada's Eastern Arctic', *Science of The Total Environment*, vol. 618 (Mar. 2018).
- 58 Swan, S. H. and Colino, S., *Count down: How Our Modern World Is Threatening Sperm Counts, Altering Male and Female Reproductive Development, and Imperiling the Future of the Human Race* (Scribner: New York, 2021).
- 59 UN Environment Programme, *Towards a Pollution-Free Planet: Background Report* (UNEP: Nairobi, 2017).
- 60 Ritchie, H. and Roser, M., 'Air pollution', Our World in Data, 2021.
- 61 Institute for Health Metrics and Evaluation, University of Washington, GBD Compare. Data as of 2019, <<https://vizhub.healthdata.org/gbd-compare>>, accessed 23 Aug. 2021.
- 62 Health Effects Institute, *State of Global Air 2020. A Special Report on Global Exposure to Air Pollution and Its Health Impacts* (Health Effects Institute: Boston, 2020).

- 63 Masson-Delmotte, V. et al. (eds), 'IPCC, 2021: Summary for policymakers', *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge, 2021).
- 64 IPCC, 2021: Summary for policymakers (note 63).
- 65 IPCC, 2021: Summary for policymakers (note 63).
- 66 United Nations Paris Agreement, adopted 12 Dec. 2015, entered into force 4 Nov. 2016, Treaties-XXVII.7.d.
- 67 Climate Action Tracker, *Glasgow's 2030 Credibility Gap* (9 Nov. 2021).
- 68 IPCC, 'Summary for policymakers', eds V. Masson-Delmotte et al., *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change*, (World Meteorological Organization: Geneva, 2018).
- 69 Cheng, L. et al., 'How fast are the oceans warming?', *Science*, vol. 363, no. 6423 (11 Jan. 2019); Doney, S. C. et al., 'The impacts of ocean acidification on marine ecosystems and reliant human communities', *Annual Review of Environment and Resources*, vol. 45, no. 1 (17 Oct. 2020); Global Ocean Oxygen Network et al., *The Ocean Is Losing Its Breath: Declining Oxygen in the World's Ocean and Coastal Waters*, Summary for Policymakers IOC/2018/TS/137 (IOC-UNESCO: Paris, 2018).
- 70 IPCC, 2021: Summary for policymakers (note 63).
- 71 Pörtner, H.-O. et al., *Climate Change 2022: Impacts, Adaptation and Vulnerability. Summary for Policymakers. Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC; WMO; UNEP: Geneva, 28 Feb. 2022); Dosio, A. et al., 'Extreme heat waves under 1.5 °C and 2 °C global warming', *Environmental Research Letters*, vol. 13, no. 5 (1 May 2018).
- 72 Xu, C. et al., 'Future of the human climate niche', *Proceedings of the National Academy of Sciences*, vol. 117, no. 21 (4 May 2020).
- 73 Wunderling, N. et al., 'Interacting tipping elements increase risk of climate domino effects under global warming', *Earth System Dynamics*, vol. 12, no. 2 (3 June 2021).
- 74 UN News, 'IPCC report: 'Code red' for human driven global heating, warns UN chief', 9 Aug. 2021.
- 75 Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook 5: Summary for Policymakers* (UN CBD: 18 Aug. 2020), p. 2.
- 76 IPBES, *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (IPBES: Bonn, 4 May 2019).
- 77 Simeonova, K., 'Assessing the overall aggregated effect of steps taken by Parties on mitigation', First meeting of the Structured Expert Dialogues of the Second Periodic Review, UNFCCC, 27 Nov. 2020.
- 78 Saudi Arabia, *Updated First Nationally Determined Contribution: 2021 Submission to the UNFCCC* (Riyadh, Oct. 2021); Australian Government Department of Industry, Science, Energy and Resources, *Australia's Nationally Determined Contribution: Communication 2021* (Commonwealth of Australia: Canberra, Oct. 2021).
- 79 Gerretsen, I., 'US to double climate finance again, but gap remains to \$100bn', *Climate Home News*, 21 Sep. 2021; Colenbrander, S. et al., *A Fair Share of Climate Finance: Apportioning Responsibility for the \$100 Billion Climate Finance Goal*, Working Paper (Overseas Development Institute: London, Sep. 2021), p. 15.
- 80 Organisation for Economic Co-operation and Development (OECD), UN Environment Programme and World Bank, *Financing Climate Futures: Rethinking Infrastructure*, Policy Highlights (OECD; UNEP; World Bank: Paris, 2018); Sustainable Energy for All, *Energizing Finance: Understanding the Landscape 2021* (Sustainable Energy for All: Vienna, 2021).
- 81 Rumney, E. and Jessop, S., 'That sinking feeling: Poor nations struggle with U.N. climate fund', Reuters, 11 Nov. 2021; Caldwell, M. and Larsen, G., 'Improving Access to the Green Climate Fund: How the Fund Can Better Support Developing Country Institutions', World Resources Institute (2021).
- 82 Clancy, J. et al. (eds), *Engendering the Energy Transition* (Palgrave Macmillan: Cham, 2020).
- 83 UN Development Programme, *Climate Finance for Sustaining Peace: Making Climate Finance Work for Conflict-Affected and Fragile Contexts* (UNDP: New York, 2021), p. 3.
- 84 Eaton, L., 'Covid-19: WHO warns against "vaccine nationalism" or face further virus mutations', *BMJ*, vol. 372, no. 292 (1 Feb. 2021); UN Secretary-General, 'Vaccine nationalism, hoarding putting us all at risk, Secretary-General tells World Health Summit, warning COVID-19 will not be last global pandemic', Press Release SG/SM/20986, 24 Oct. 2021.
- 85 The Independent Panel for Pandemic Preparedness & Response, *COVID-19: Make It the Last Pandemic* (The Independent Panel for Pandemic Preparedness & Response: Geneva, May 2021).
- 86 The Lancet, 'Access to COVID-19 vaccines: Looking beyond COVAX', *The Lancet*, vol. 397, no. 10278 (13 Mar. 2021).
- 87 von Bogdandy, A. and Villarreal, P., 'The EU's and UK's self-defeating vaccine nationalism', *Verfassungsblog*, 30 Jan. 2021.
- 88 Hafner, M. et al., *COVID-19 and the Cost of Vaccine Nationalism* (RAND Corporation: Santa Monica; Cambridge, 2020).
- 89 United Nations, 'Climate change and COVID-19: UN urges nations to 'recover better'', Covid-19 Response, 22 Apr. 2020.
- 90 Nahm, J. M., Miller, S. M. and Urpelainen, J., 'G20's US\$14-trillion economic stimulus reneges on emissions pledges', *Nature*, vol. 603, no. 7899 (3 Mar. 2022).
- 91 Lasco, G., 'Medical populism and the COVID-19 pandemic', *Global Public Health*, vol. 15, no. 10 (11 Aug. 2020); The Lancet Infectious Diseases, 'The COVID-19 infodemic', *The Lancet Infectious Diseases*, vol. 20, no. 8 (Aug. 2020).
- 92 de Boer, J. and Bosetti, L., *The Crime–Conflict Nexus: Assessing the Threat and Developing Solutions*, Crime–Conflict Nexus Series 1 (United Nations University, Centre for Policy Research: New York, May 2017).
- 93 Beittel, J. S., *Mexico: Organized Crime and Drug Trafficking Organizations*, R41576 (Congressional Research Service (CRS), US Congress: Washington, DC, 28 July 2020).
- 94 Global Witness, *Last Line of Defence: The Industries Causing the Climate Crisis and Attacks against Land and Environmental Defenders* (Global Witness: Sep. 2021).

- 95 International Institute for Democracy and Electoral Assistance, *The Global State of Democracy Report 2021: Building Resilience in a Pandemic Era* (International IDEA: Stockholm, 2021).
- 96 Hegre, H., 'Democracy and armed conflict', *Journal of Peace Research*, vol. 51, no. 2 (10 Jan. 2014).
- 97 Kim, Y. et al., 'The linkages between democracy and the environment: Evidence from developed and developing countries', *Energy & Environment*, vol. 30, no. 5, SAGE Publications Ltd STM (1 Aug. 2019).
- 98 Maxmen, A., 'Has COVID taught us anything about pandemic preparedness?', *Nature*, vol. 596, no. 7872 (13 Aug. 2021).
- 99 Mueller, R. S. III., *Report on the Investigation into Russian Interference in the 2016 Presidential Election. Volume II of II* (US Department of Justice: Washington, DC, Mar. 2019).
- 100 Alvarado, F. et al., *World Inequality Report 2018* (World Inequality Lab: Paris, 2018).
- 101 Puma, M. J. et al., 'Assessing the evolving fragility of the global food system', *Environmental Research Letters*, vol. 10, no. 2 (4 Feb. 2015).
- 102 UN Food and Agriculture Organization, *Food Outlook: Biannual Report on Global Food Markets* (FAO: Rome, 9 June 2021).
- 103 Pauly, D. and Zeller, D., 'Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining', *Nature Communications*, vol. 7, no. 1 (19 Jan. 2016).
- 104 de Coning, E., 'Why are some flag states unable or unwilling to address IUU fishing?', *International Community Law Review*, vol. 22, no. 3-4 (20 Aug. 2020).
- 105 Liddick, D., 'The dimensions of a transnational crime problem: The case of IUU fishing', *Trends in Organized Crime*, vol. 17, no. 4 (Dec. 2014).
- 106 Weldemichael, A. T., *Piracy in Somalia: Violence and Development in the Horn of Africa* (Cambridge University Press: Cambridge, 2019); Glaser, S. M., Roberts, P. M. and Hurlburt, K. J., 'Foreign illegal, unreported, and unregulated fishing in Somali waters perpetuates conflict', *Frontiers in Marine Science*, vol. 6 (6 Dec. 2019); Okafor-Yarwood, I., 'The cyclical nature of maritime security threats: Illegal, unreported, and unregulated fishing as a threat to human and national security in the Gulf of Guinea', *African Security*, vol. 13, no. 2 (27 Feb. 2020).
- 107 Climate Scrutiny and Mokoro, *Africa's Public Expenditure on Climate Adaptation* (Climate Scrutiny/Mokoro: Oxford, 28 Oct. 2017), p. iv.
- 108 Brown, O., Farhan, A. and Hodder, C., 'On the front line of climate change, Somalia needs help', Chatham House Expert Comment, 21 Dec. 2021.
- 109 Government of the Commonwealth of Dominica, *Post-Disaster Needs Assessment: Hurricane Maria September 18, 2017 Report* (Roseau, 15 Nov. 2017), p. xiii.
- 110 Pretis, F. et al., 'Uncertain impacts on economic growth when stabilizing global temperatures at 1.5°C or 2°C warming', *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, vol. 376, no. 2119 (2 Apr. 2018).
- 111 Burek, P. et al., *Water Futures and Solution: Fast Track Initiative (Final Report)*, WP-16-006 (International Institute for Applied Systems Analysis: Laxenburg, 2016), pp. 55, 68.
- 112 Institute for Economics and Peace, *Ecological Threat Report 2021: Understanding Ecological Threats, Resilience and Peace* (IEP: Sydney, Oct. 2021), p. 4.
- 113 Krampe, F., *Why United Nations Peace Operations Cannot Ignore Climate Change* (22 Feb. 2021).
- 114 Independent Evaluation Office of the GEF, *Evaluation of GEF Support in Fragile and Conflict-Affected Situations*, Evaluation report (11 Nov. 2020).
- 115 UN Development Programme, *Human Development Report 2020. the next Frontier: Human Development and the Anthropocene* (UNDP: New York, 2020).
- 116 Organisation for Economic Co-operation and Development (OECD) and International Institute for Sustainable Development (IISD), 'Fossil fuel subsidy tracker', Fossil fuel subsidy tracker, 2022.
- 117 Parry, I., Black, S. and Vernon, N., *Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies*, Working Paper no. 236 (International Monetary Fund: Washington, DC, Sep. 2021).
- 118 Dasgupta, P., *The Economics of Biodiversity: The Dasgupta Review* (HM Treasury: London, 2021), p. 220
- 119 Skea, J. et al., *Climate Change 2022: Mitigation of Climate Change. Summary for Policymakers. Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC: Geneva, 2022).
- 120 Dasgupta, P., *Economics of Biodiversity: The Dasgupta Review—Headline Messages* (HM Treasury: London, 2021).
- 121 E.g., United Nations, General Assembly, *The Future We Want: Outcome Document of the United Nations Conference on Sustainable Development, Rio de Janeiro, Brazil, 20-22 June 2012, A/RES/66/288*, 2012.
- 122 von Grebmer, K. et al., *2021 Global Hunger Index: Hunger and Food Systems in Conflict Settings* (Welthungerhilfe; Concern Worldwide: Bonn; Dublin, Oct. 2021).
- 123 World Food Programme, Hunger map live, <<https://hungermap.wfp.org>>, accessed 19 Mar. 2021; World Food Program USA, 'Nearly 60% of the world's hungriest people live in just a few countries. Why?', World Food Program USA, 11 Mar. 2022.
- 124 Shidore, S., *Climate Change and the India-Pakistan Rivalry*, Briefer 4 (Council on Strategic Risks: Washington, DC, 23 Jan. 2020).
- 125 Haines, D., *Rivers Divided: Indus Basin Waters in the Making of India and Pakistan* (Oxford University Press: New York, 2017).
- 126 Zawahri, N. and Michel, D., 'Assessing the Indus Waters Treaty from a comparative perspective', *Water International*, vol. 43, no. 5 (13 Aug. 2018).
- 127 Bibi, S. et al., 'Climatic and associated cryospheric, biospheric, and hydrological changes on the Tibetan Plateau: A review', *International Journal of Climatology*, vol. 38, no. S1 (15 Jan. 2018); Hock, R. and Rasul, G., 'High mountain areas', eds H. O. Pörtner et al., *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (IPCC: Geneva, 24 Sep. 2019).
- 128 Hock and Rasul (note 127).
- 129 Pörtner et al. (note 71).
- 130 Mobjörk, M., Krampe, F. and Tarif, K., *Pathways of Climate Insecurity: Guidance for Policymakers* (SIPRI: Stockholm, Nov. 2020).

- 131 van Baalen, S. and Mobjörk, M., *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (Stockholm University; Stockholm International Peace Research Institute; The Swedish Institute of International Affairs: Stockholm, 2016).
- 132 Nordqvist, P. and Krampe, F., *Climate Change and Violent Conflict: Sparse Evidence from South Asia and South East Asia*, 4 (SIPRI: Stockholm, Sep. 2018); Reuveny, R., 'Ecomigration and Violent Conflict: Case Studies and Public Policy Implications', *Human Ecology*, vol. 36, no. 1 (1 Feb. 2008).
- 133 Tarif, K., *Climate Change and Violent Conflict in West Africa: Assessing the Evidence* (SIPRI: Feb. 2022).
- 134 Nordqvist and Krampe (note 132).
- 135 Adger, W. N. et al., 'Human security', eds C. B. Field et al., *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge, 2014).
- 136 Watkins, A. and Wilber, K., *Wicked & Wise: How to Solve the World's Toughest Problems* (Urbane Publications: Chatham, 2015).
- 137 Lutheran World Relief, *Chennai Floods*, Situation Report no. 1 (Lutheran World Relief: June 2015).
- 138 HT Correspondent, 'Lesson from Chennai floods: India needs old cities to be less dumb', *Hindustan Times*, 4 Dec. 2015.
- 139 Avelino, J. et al., 'The coffee rust crises in Colombia and Central America (2008–2013): Impacts, plausible causes and proposed solutions', *Food Security*, vol. 7 (11 Mar. 2015).
- 140 Avelino et al. (note 139).
- 141 Pham, Y. et al., 'The impact of climate change and variability on coffee production: A systematic review', *Climatic Change*, vol. 156 (4 Sep. 2019); Ziska, L. H. et al., 'Climate Change, Carbon Dioxide, and Pest Biology. Managing the Future: Coffee as a Case Study', *Agronomy*, vol. 8, no. 8, Multidisciplinary Digital Publishing Institute (17 Aug. 2018).
- 142 Milan, A. and Ruano, S., 'Rainfall variability, food insecurity and migration in Cabricán, Guatemala', *Climate and Development*, vol. 6, no. 1 (2 Jan. 2014); Warner, K. et al., *Where the Rain Falls: Climate Change, Food and Livelihood Security, and Migration. An 8-Country Study to Understand Rainfall, Food Security and Human Mobility* (United Nations University Institute for Environment and Human Security: Bonn, Nov. 2012), p. 83.
- 143 InSight Crime, 'Guatemala Profile', InSight Crime, 28 Feb. 2021.
- 144 Sigelman, L., *The Hidden Driver: Climate Change and Migration in Central America's Northern Triangle* (American Security Project: Washington, DC, Sep. 2019).
- 145 Comisión Internacional contra la Impunidad en Guatemala, *Financiamiento de la política en Guatemala* [Political financing in Guatemala] (CICIG: Guatemala de la Asunción, July 2015).
- 146 US Customs and Border Patrol, *US Border Patrol Nationwide Apprehensions by Citizenship and Sector (FY2007-2019)* (US Department of Homeland Security: Washington, DC, 2020).
- 147 Sigelman (note 144).
- 148 Barriopedro, D. et al., 'The hot summer of 2010: Redrawing the temperature record map of Europe', *Science*, vol. 332, no. 6026 (17 Mar. 2011).
- 149 Lan, L. et al., 'Increased Mortality During the 2010 Heat Wave in Harbin, China', *EcoHealth*, vol. 9, no. 3 (1 Sep. 2012); Azhar, G. S. et al., 'Heat-Related Mortality in India: Excess All-Cause Mortality Associated with the 2010 Ahmedabad Heat Wave', *PLoS ONE*, vol. 9, no. 3, Public Library of Science (14 Mar. 2014).
- 150 Otto, F. E. L. et al., 'Reconciling two approaches to attribution of the 2010 Russian heat wave', *Geophysical Research Letters*, vol. 39, no. 4 (22 Feb. 2012).
- 151 Svanidze, M., Götz, L. and Serebrennikov, D., 'The influence of Russia's 2010/2011 wheat export ban on spatial market integration and transaction costs of grain markets', *Applied Economic Perspectives and Policy* (16 May 2021).
- 152 Veninga, W. and Ihle, R., 'Import vulnerability in the Middle East: Effects of the Arab spring on Egyptian wheat trade', *Food Security*, vol. 10, no. 1 (5 Feb. 2018).
- 153 Lott, M. C., 'The US now uses more corn for fuel than for feed', *Scientific American*, 7 Oct. 2011; Bullis, K., 'Ethanol blamed for record food prices', *MIT Technology Review*, 23 Mar. 2011.
- 154 Lagi, M. et al., 'Accurate market price formation model with both supply-demand and trend-following for global food prices providing policy recommendations', *Proceedings of the National Academy of Sciences* (26 Oct. 2015).
- 155 Bush, R., 'The Arab Spring in North Africa: Egypt and Tunisia', eds Rami Zurayk, Eckhart Woertz and Rachel Bahn, *Crisis and Conflict in Agriculture* (CABI: Boston, 18 Sep. 2018); Veninga and Ihle (note 152).
- 156 Çakmak, C. and Ustaoglu, M., 'The Arab Spring and the Emergence of the Syrian Crisis', eds C. Çakmak and M. Ustaoglu, *Post-Conflict Syrian State and Nation Building: Economic and Political Development* (Palgrave Macmillan: New York, 2015).
- 157 Kim, N., *How Long Will It Take for LDCs and SIDS to Recover from the Impacts of COVID-19?* ST/ESA/2020/DWP/170, DESA Working Paper no. 170 (UNDESA: 20 Oct. 2020).
- 158 Santomauro, D. F. et al., 'Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic', *The Lancet*, vol. 398, no. 10312 (6 Nov. 2021).
- 159 Storlazzi, C. D. et al., 'Most atolls will be uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding', *Science Advances*, vol. 4, no. 4 (25 Apr. 2018).
- 160 UN Development Programme (note 115); USAID, *Climate Risks to Resilience Food Security in Bureau for Humanitarian Assistance Geographies: Haiti* (USAID: Washington, DC, Sep. 2020).
- 161 Freedom House, *Freedom in the World 2021: Haiti* (Freedom House: Washington, DC, 2021).
- 162 Diaz-Bonilla, E. et al., *Haiti: The Impact of COVID-19 and Preliminary Policy Implications*, Interim Report no. 18 (International Food Policy Research Institute: Washington, DC, Feb. 2021).
- 163 USAID (note 160).
- 164 Fujita, Y. and Sabogal, A., *Perspective of Localization of Aid during COVID-19: Reflecting on the Tensions between the Top-down and Bottom-up Responses to the Health Emergency in Haiti*, Working Paper no. 673 (International Institute of Social Studies, Erasmus University Rotterdam: The Hague, 29 Mar. 2021).

- 165 Diaz-Bonilla et al. (note 162).
- 166 UN Office for the Coordination of Humanitarian Affairs, *Haiti: Tropical Storm Laura*, Situation Report no. 4 (UN OCHA: Port-au-Prince, 28 Aug. 2020).
- 167 Famine Early Warning Systems Network (FEWS NET), *Haiti. Food Security Outlook: February to September 2021* (USAID: Washington, DC, Feb. 2021).
- 168 Famine Early Warning Systems Network (FEWS NET), *Haiti. Food Security Outlook: June 2021–January 2022* (USAID: Washington, DC, June 2021).
- 169 UN Food and Agriculture Organization, *Haiti: Response Overview* (FAO Office of Emergencies and Resilience: Rome, July 2021).
- 170 BBC News, 'Haiti president's assassination: What we know so far', 20 Jan. 2021.
- 171 UN Food and Agriculture Organization (note 169).
- 172 Sinpeng, A. and Kuhonta, E. M., 'From the street to the ballot box: The July 2011 elections and the rise of social movements in Thailand', *Contemporary Southeast Asia*, vol. 34, no. 3 (Dec. 2012).
- 173 I-soon, R., 'An investigation of the circumstances of flood response in Thailand: Case study of the flooding situation in 2011', *Policy Science*, vol. 21, no. 2 (2014); Maier-Knapp, N., 'Betwixt droughts and floods: Flood management politics in Thailand', *Journal of Current Southeast Asian Affairs*, vol. 34, no. 1 (Apr. 2015); Marks, D., 'Assembling the 2011 Thailand floods: Protecting farmers and inundating high-value industrial estates in a fragmented hydro-social territory', *Political Geography*, vol. 68 (Jan. 2019).
- 174 Eberle, U. J., Rohner, D. and Thoenig, M., *Heat and Hate: Climate Security and Farmer–Herder Conflicts in Africa*, Working Paper no. 22 (Empirical Studies of Conflict: Dec. 2020).
- 175 Owonikoko, S. B. and Momodu, J. A., 'Environmental degradation, livelihood, and the stability of Chad Basin Region', *Small Wars & Insurgencies*, vol. 31, no. 6 (7 Aug. 2020).
- 176 Owonikoko and Momodu (note 175); Onuoha, F. C., 'Environmental degradation, livelihood and conflicts: A focus on the implications of the diminishing water resources of Lake Chad for North-Eastern Nigeria', *African Journal on Conflict Resolution*, vol. 8, no. 2 (20 Jan. 2009).
- 177 Biasutti, M., 'Rainfall trends in the African Sahel: Characteristics, processes, and causes', *WIREs Climate Change*, vol. 10, no. 4 (July 2019); Ndehedehe, C. E. et al., 'Evolutionary drought patterns over the Sahel and their teleconnections with low frequency climate oscillations', *Atmospheric Research*, vol. 233 (Mar. 2020).
- 178 Owonikoko and Momodu (note 175).
- 179 Rupesinghe, N. and Bøås, M., *Local Drivers of Violent Extremism in Central Mali*, UNDP Policy Brief (Norwegian Institute of International Affairs; UNDP: Oslo, 2019).
- 180 Khan, A. M. and Rodella, A.-S., *A Hard Rain's a-Gonna Fall? New Insights on Water Security and Fragility in the Sahel*, Policy Research Working Paper no. 9805 (World Bank Group: Washington, DC, Oct. 2021).
- 181 Deb, M. and Ferreira, C. M., 'Potential impacts of the Sunderban mangrove degradation on future coastal flooding in Bangladesh', *Journal of Hydro-Environment Research*, vol. 17 (Dec. 2017).
- 182 Hossain, M. Z. et al., 'Impact of Tropical Cyclones on Rural Infrastructures in Bangladesh', *Agricultural Engineering International: CIGR Journal*, vol. 10, no. 2 (1 Jan. 2008).
- 183 Paul, B. K., 'Why relatively fewer people died? The case of Bangladesh's Cyclone Sidr', *Natural Hazards*, vol. 50, no. 2 (13 Jan. 2009).
- 184 Gibbens, S., 'Hurricane Katrina, explained', *National Geographic* (16 Jan. 2019).
- 185 Laska, S. and Morrow, B. H., 'Social vulnerabilities and Hurricane Katrina: An unnatural disaster in New Orleans', *Marine Technology Society Journal*, vol. 40, no. 4 (1 Dec. 2006).
- 186 Laska and Morrow (note 185); Allen, T. D., 'Katrina: Race, class, and poverty—Reflections and analysis', *Journal of Black Studies*, vol. 37, no. 4 (1 Mar. 2007).
- 187 Trenberth, K. E., Davis, C. A. and Fasullo, J., 'Water and energy budgets of hurricanes: Case studies of Ivan and Katrina', *Journal of Geophysical Research: Atmospheres*, vol. 112, no. D23 (16 Dec. 2007).
- 188 Irish, J. L. et al., 'Simulations of Hurricane Katrina (2005) under sea level and climate conditions for 1900', *Climatic Change*, vol. 122 (5 Dec. 2013).
- 189 IPCC (note 68).
- 190 Lebling, K. et al., *State of Climate Action: Assessing Progress toward 2030 and 2050* (World Resources Institute: Washington, DC, Dec. 2021), p. 8.
- 191 Dinerstein, E., Vynne, C., et al., 'A global deal for nature: Guiding principles, milestones, and targets', *Science Advances*, vol. 5, no. 4 (19 Apr. 2019).
- 192 Dabelko, G. D. and Parker, M., 'Afterword: From backdraft to boomerang', *Water, Climate Change and the Boomerang Effect* (Routledge: London, 2018).
- 193 Dabelko, G. D. et al., *Backdraft: The Conflict Potential of Climate Change Adaptation and Mitigation*, vol. 14, no. 2 (Wilson Center: Washington, DC, 2013); Swatuk, L. A. et al., 'The "boomerang effect": Insights for improved climate action', *Climate and Development*, vol. 13, no. 1 (13 Feb. 2020).
- 194 O'Brien, K. L., St. Clair, A. L. and Kristoffersen, B. (eds), *Climate Change, Ethics and Human Security* (Cambridge University Press: New York, 2010).
- 195 E.g., Smith, S., *Just Transition: A Report for the OECD* (Just Transition Centre: Brussels, May 2017).
- 196 E.g., Fink, P., *The Road Towards a Carbon Free Society: A Nordic-German Trade Union Cooperation on Just Transition* (Nordic Trade Unions (NFS); German Trade Union Confederation (DGB): Stockholm, 2021).
- 197 Climate Justice Alliance, *Just Transition Principles* (Climate Justice Alliance: Aug. 2016).
- 198 Scottish Government, 'Making Just Transition a defining mission', Environment and climate change, 15 Sep. 2021.
- 199 Lofts, K., Sarmiento-Barletti, J. P. and Larson, A. M., *Lessons towards Rights-Responsive REDD+ Safeguards from a Literature Review*, Working Paper no. 280 (CIFOR: Bogor, 2012).
- 200 European Parliament and Council of the European Union, Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport, *Official Journal of the European Union*, L123/42, 8 May 2003.
- 201 Matondi, P. B., Havnevik, K. J. and Beyene, A. (eds), *Biofuels, Land Grabbing and Food Security in Africa* (Zed Books: London; New York, 2011).
- 202 Mutopo, P. and Chiweshe, M. K., 'Water resources and biofuel production after the fast-track land reform in Zimbabwe', *African Identities*, vol. 12, no. 1 (22 Jan. 2014).

- 203 Ide, T. and Selbmann, K., 'Climate Change, Biofuels, and Conflict', *Biofuels* (CRC Press: Boca Raton, 2016); Neville, K. J., *Fueling Resistance: The Contentious Political Economy of Biofuels and Fracking* (Oxford University Press: Oxford, New York, 1 Feb. 2021).
- 204 Zoellick, R., 'World Bank chief: Biofuels boosting food prices', NPR Radio Broadcast, 11 Apr. 2008; Headey, D. and Fan, S., *Reflections on the Global Food Crisis: How Did It Happen? How Has It Hurt? And How Can We Prevent the Next One?* (International Food Policy Research Institute: Washington, DC, 2010).
- 205 Laborde, D., *Assessing the Land Use Change Consequences of European Biofuel Policies* (IFPRI: Washington, DC, Oct. 2011).
- 206 Lark, T. J. et al., 'Environmental outcomes of the US Renewable Fuel Standard', *Proceedings of the National Academy of Sciences*, vol. 119, no. 9 (Mar. 2022).
- 207 International Energy Agency, 'Bioenergy', *Fuels & Technologies*, 9 Nov. 2020.
- 208 Intelligent Partnership, 'Aviation biofuels: Which airlines are doing what, with whom?', 6 June 2021.
- 209 European Commission, Proposal for a Regulation of the European Parliament and of the Council on ensuring a level playing field for sustainable air transport, 2021/0205(COD), 14 July 2021.
- 210 International Council on Civil Aviation, *Corsia Eligible Fuels* (ICAO: Montreal, Mar. 2019).
- 211 Dinerstein, E., Olson, D., et al., 'An ecoregion-based approach to protecting half the terrestrial realm', *Bioscience*, vol. 67, no. 6 (1 June 2017); Dinerstein, Vynne, et al. (note 191).
- 212 High Ambition Coalition (HAC) for Nature and People, <www.hacfornatureandpeople.org/home>, accessed 18 Apr. 2022.
- 213 United Nations, Environment Programme, First draft of the post-2020 Global Biodiversity Framework, CBD/WG2020/3/3, 5 July 2021; Open-ended Working Group on the Post-2020 Global Biodiversity Framework, *Preparation of the Post-2020 Global Biodiversity Framework: Draft Recommendation Submitted by the Co-Chairs*, CBD/WG2020/3/L.2 (UNEP: Geneva, 29 Mar. 2022).
- 214 Rights and Resources Initiative, *Rights-Based Conservation: The Path to Preserving Earth's Biological and Cultural Diversity?*, Technical Report (Rights and Resources Initiative: Washington, DC, 24 Nov. 2020).
- 215 Schleicher, J. et al., 'Protecting half of the planet could directly affect over one billion people', *Nature Sustainability*, vol. 2, no. 12 (Dec. 2019).
- 216 Tauli-Corpuz, V., Alcorn, J. and Molnar, A., *Cornered by Protected Areas: Replacing 'fortress' Conservation with Rights-Based Approaches Helps Bring Justice for Indigenous Peoples and Local Communities, Reduces Conflict, and Enables Cost-Effective Conservation and Climate Action*, Brief (Rights and Resources Initiative: Washington, DC, June 2018); Boyd, D. and Keene, S., *Human Rights-Based Approaches to Conserving Biodiversity: Equitable, Effective and Imperative*, Policy Brief no. 1 (UN OHCHR: Geneva, Aug. 2021).
- 217 Survival International et al., *Our Land, Our Nature: A People's Manifesto for the Survival of Conservation* (Survival International: Berlin, Oct. 2021).
- 218 Tribal Leaders & Tribal organization leaders, 'Tribal Leader Statement on 30x30 Proposed Policy', Press Release (2021), 6 May 2021.
- 219 Peluso, N. L., 'Coercing conservation? The politics of state resource control', *Global Environmental Change*, vol. 3, no. 2 (1993).
- 220 Ali, S. H. (ed.), *Peace Parks: Conservation and Conflict Resolution, Global Environmental Accord: Strategies for Sustainability and Institutional Innovation* (MIT Press: Cambridge, MA, 17 Aug. 2007).
- 221 Swatuk, L. A., 'Peace parks in theory and practice: Confronting the elephant in the room', *Routledge Handbook of Environmental Security* (Routledge: London, 2021).
- 222 Duffy, R., 'Waging a war to save biodiversity: The rise of militarized conservation', *International Affairs*, vol. 90, no. 4 (July 2014).
- 223 E.g., Dutta, A., 'Forest becomes frontline: Conservation and counter-insurgency in a space of violent conflict in Assam, Northeast India', *Political Geography*, vol. 77 (Mar. 2020).
- 224 Black, R. et al., *Taking Stock: A Global Assessment of Net Zero Targets* (ECIU and Oxford Net Zero: Mar. 2021).
- 225 E.g., Stabinsky, D., *Chasing Carbon Unicorns: The Deception of Carbon Markets and 'Net Zero'* (Friends of the Earth International and partners: Amsterdam, Feb. 2021).
- 226 Black et al. (note 224).
- 227 Gabbatiss, J., 'Analysis: Shell says new 'Brazil-sized' forest would be needed to meet 1.5C climate goal', *Carbon Brief*, 12 Feb. 2021.
- 228 UN Framework Convention on Climate Change, 'Warsaw Framework for REDD+', UNFCCC REDD+, 2013.
- 229 Alusiola, R. A., Schilling, J. and Klär, P., 'REDD+ conflict: Understanding the pathways between forest projects and social conflict', *Forests*, vol. 12, no. 6 (June 2021).
- 230 Howson, P., 'Slippery violence in the REDD+ forests of Central Kalimantan, Indonesia', *Conservation and Society*, vol. 16, no. 2 (2018).
- 231 Riahi, K. et al., 'Chapter 3. Mitigation pathways compatible with long-term goals', eds P. R. Shukla et al., *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge; New York, 2022), p. 6; UN Food and Agriculture Organization, *Land Use Statistics and Indicators Statistics. Global, Regional and Country Trends 1990-2019*, FAOSTAT Analytical Brief no. 28 (FAO: Rome, 2021), p. 1.
- 232 United Nations, Framework Convention on Climate Change, *Guidance on cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement*, UNFCCC/Decision-/CMA.3, 14 Nov. 2021; United Nations, Framework Convention on Climate Change, *Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement*, UNFCCC/Decision-/CMA.3, 14 Nov. 2021; United Nations, Framework Convention on Climate Change, *Work programme under the framework for non-market approaches referred to in Article 6, paragraph 8, of the Paris Agreement*, UNFCCC/Decision-/CMA.3, 14 Nov. 2021.
- 233 Griscom, B. W. et al., 'Natural climate solutions', *Proceedings of the National Academy of Sciences*, vol. 114, no. 44 (31 Oct. 2017).
- 234 International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (IEA: Paris, 18 May 2021).
- 235 Swain, A., 'Water Wars', ed. J. D. Wright, *International Encyclopedia of the Social & Behavioral Sciences*, 2nd edn (Elsevier: 31 Dec. 2015).
- 236 Walicki, N., Ioannides, M. J. and Tilt, B., *Case Study Series: Dam Displacement* (IDMC: Geneva, 11 Apr. 2017).

- 237 Moran, E. F. et al., 'Sustainable hydropower in the 21st century', *Proceedings of the National Academy of Sciences*, vol. 115, no. 47 (20 Nov. 2018).
- 238 Kayawe, B., 'Electricity for all but those the Kariba dam displaced', Inter Press Service.
- 239 World Commission on Dams, *Dams and Development*, 1st edn (Routledge: London, Nov. 2000).
- 240 Villeda, S. P., 'Glimmer of hope in Honduras: Ex-dam ceo & West Point grad convicted in murder of Berta Cáceres', *Democracy Now!*, 6 July 2021.
- 241 Cole, M. A., Elliott, R. J. R. and Strobl, E., 'Climate change, hydro-dependency, and the African dam boom', *World Development*, vol. 60 (1 Aug. 2014); International Energy Agency (note 234).
- 242 International Energy Agency (note 234).
- 243 International Hydropower Association, *2021 Hydropower Status Report: Sector Trends and Insights* (IHA: London, June 2021).
- 244 du Pont, P., *Decentralizing Power: The Role of State and Region Governments in Myanmar's Energy Sector* (The Asia Foundation: Apr. 2019); U Aung Ko Ko, 'Hydropower development plans', Hydropower Developers' Working Group, Yangon, 18 Aug. 2016.
- 245 Zerrouk, E., 'Water grabbing/land grabbing in shared water basins the case of Salween River Hatgyi Dam', *Journal of Water Resources and Ocean Science*, vol. 2, no. 5 (30 Oct. 2013).
- 246 Lamb, V. et al., 'A State of Knowledge of the Salween River: An Overview of Civil Society Research', eds C. Middleton and V. Lamb, *Knowing the Salween River: Resource Politics of a Contested Transboundary River*, vol. 27 (Springer International Publishing: Cham, 2019).
- 247 International Rivers Network, 'The Myitsone Dam on the Irrawaddy River: A briefing', *International Rivers*, 28 Sep. 2011.
- 248 Appendix, 'Chronology of the Myitsone Dam at the Confluence of Rivers above Myitkyina', *Journal of Current Southeast Asian Affairs*, vol. 31, no. 1 (1 Mar. 2012).
- 249 International Crisis Group, *A Tentative Peace in Myanmar's Kachin Conflict*, Briefing no. 140 (International Crisis Group: Yangon/Jakarta/Brussels, 2013).
- 250 Karen Rivers Watch and Karen Human Rights Group, *Joint Statement from KHRG and KRW: The Construction of the Hatgyi Hydropower Plant Along the Salween River Must be Stopped*, 11 June 2021; Kim, K., 'Civil Resistance in the Shadow of War: Explaining popular mobilization against dams in Myanmar', PhD Dissertation, Department of Peace and Conflict Research, Uppsala University, Uppsala, 2021.
- 251 Kirchherr, J., Charles, K. J. and Walton, M. J., 'The interplay of activists and dam developers: The case of Myanmar's mega-dams', *International Journal of Water Resources Development*, vol. 33, no. 1 (12 May 2016); Dapice, D., *Hydropower in Myanmar: Moving Electricity Contracts from Colonial to Commercial* (Harvard Kennedy School: Dec. 2015).
- 252 Mon, Y. and Hammond, C., 'CPI pushes for restart of Myitsone Dam', *The Myanmar Times*, 5 June 2015.
- 253 World Bank, Access to electricity (% of population), Data, The World Bank, <<https://data.worldbank.org/indicator/EG.ELC.ACCTS.ZS>>, accessed 5 Nov. 2021.
- 254 International Energy Agency (note 234).
- 255 Bond, K. et al., *Reach for the Sun: The Emerging Market Electricity Leapfrog* (Carbon Tracker; CEEW: London, July 2021).
- 256 International Renewable Energy Agency, *Renewable Power Generation Costs in 2020* (IRENA: Abu Dhabi, June 2021).
- 257 Flynn, C. et al., *The Peoples' Climate Vote: Results* (UNDP; University of Oxford: Oxford, 26 Jan. 2021).
- 258 Dunlap, A., 'Counterinsurgency for wind energy: The Bii Hioxo wind park in Juchitán, Mexico', *The Journal of Peasant Studies*, vol. 45, no. 3 (19 Mar. 2018).
- 259 Brannstrom, C. et al., 'Is Brazilian wind power development sustainable? Insights from a review of conflicts in Ceará state', *Renewable and Sustainable Energy Reviews*, vol. 67 (Jan. 2017); EJOLT, Large-scale wind farm in Sami reindeer land, Sweden, Environmental Justice Atlas, <<https://ejatlas.org/conflict/large-scale-wind-farm-in-sami-reindeer-pastures>>, accessed 21 July 2021; Finnish Fund for Industrial Cooperation Limited, *Socio-Economic Impact of Lake Turkana Wind Power in Marsabit: Final Report* (Finnfund: Helsinki, 3 Apr. 2020).
- 260 Hund, K. et al., *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* (World Bank: Washington, DC, 2020).
- 261 Kalantzakos, S., 'The race for critical minerals in an era of geopolitical realignments', *The International Spectator*, vol. 55, no. 3 (2 July 2020); Amnesty International, 'This Is What We Die for': Human Rights Abuses in the Democratic Republic of the Congo Power the Global Trade in Cobalt, AFR 62/3183/2016 (Amnesty International: London, 2016); Pattison, P., 'Like slave and master': DRC miners toil for 30p an hour to fuel electric cars', *The Guardian*, 8 Nov. 2021.
- 262 Searcey, D., Lipton, E. and Gilbertson, A., 'Hunt for the 'Blood Diamond of Batteries' impedes green energy push', *New York Times*, 29 Nov. 2021.
- 263 Klinger, J. M., *Rare Earth Frontiers: From Terrestrial Subsoils to Lunar Landscapes* (Cornell University Press: Ithaca, 2018); Zhang, Y., Han, G. and Jürisoo, M., *The Geopolitics of China's Rare Earths: A Glimpse of Things to Come in a Resource-Scarce World?*, Discussion Brief (Stockholm Environment Institute: Stockholm, 21 Oct. 2014).
- 264 Maseko, R., 'Shifting centers of coloniality of power: The scramble for African mines and minerals', eds S. O. Oloruntoba and T. Falola, *The Palgrave Handbook of Africa and the Changing Global Order* (Palgrave Macmillan: Cham, 2022); Ewalefoh, J., 'The new scramble for Africa', eds S. O. Oloruntoba and T. Falola, *The Palgrave Handbook of Africa and the Changing Global Order* (Palgrave Macmillan: Cham, 2022).
- 265 Ghebremusse, S., *New Directions in Mining Governance and the Sustainable Development Goals in Africa*, Policy Brief no. 9 (Centre for International Governance Innovation: Waterloo, Ontario, 2020).
- 266 Patel, S., 'Siemens Gamesa launches world's first fully recyclable wind turbine blade', *POWER Magazine* (9 Sep. 2021).
- 267 WindEurope, 'Wind industry calls for Europe-wide ban on landfilling turbine blades', *WindEurope*, 16 June 2021.
- 268 Harper, G. et al., 'Recycling lithium-ion batteries from electric vehicles', *Nature*, vol. 575, no. 7781 (7 Nov. 2019); Morse, I., 'A dead battery dilemma', *Science*, 20 May 2021.
- 269 Dominish, E., Florin, N. and Teske, S., *Responsible Minerals Sourcing for Renewable Energy* (Institute for Sustainable Futures, University of Technology Sydney: Sydney, Australia, 2019).

- 270 Pavel, C. C. et al., 'Substitution strategies for reducing the use of rare earths in wind turbines', *Resources Policy*, vol. 52 (1 June 2017); Månberger, A. and Stenqvist, B., 'Global metal flows in the renewable energy transition: Exploring the effects of substitutes, technological mix and development', *Energy Policy*, vol. 119 (1 Aug. 2018).
- 271 Church, C. and Crawford, A., *Green Conflict Minerals: The Fuels of Conflict in the Transition to a Low-Carbon Economy* (International Institute for Sustainable Development: Winnipeg, Aug. 2018), p. 20.
- 272 Rogner, H.-H., 'World outlook for nuclear power', *Energy Strategy Reviews*, vol. 1, no. 4 (1 May 2013); Morone, J. G. and Woodhouse, E. J., *The Demise of Nuclear Energy? Lessons for Democratic Control of Technology* (Yale University Press: New Haven, 1989); Ho, S. S. and Kristiansen, S., 'Environmental debates over nuclear energy: Media, communication, and the public', *Environmental Communication*, vol. 13, no. 4, Routledge (19 May 2019).
- 273 Perloth, N. and Sanger, D. E., 'Cyberattacks put Russian fingers on the switch at power plants, US says', *New York Times*, 15 Mar. 2018; US Cybersecurity and Infrastructure Security Agency, 'Alert (TA18-074A): Russian government cyber activity targeting energy and other critical infrastructure sectors', National Cyber Awareness System, 16 Mar. 2018.
- 274 Findlay, S. and White, E., 'India confirms cyber attack on nuclear power plant', *Financial Times*, 31 Oct. 2019.
- 275 Heintz, J., Karmanau, Y. and Chernov, M., 'Russia attacks Ukraine nuclear plant as invasion advances', AP News, 3 Mar. 2022; Braun, S., 'Ukraine: The risks of war in a nuclear state', *Deutsche Welle*, 4 Mar. 2022; Hibbs, M., 'What comes after Russia's attack on a Ukrainian nuclear power station?', Carnegie Endowment for International Peace, 17 Mar. 2022.
- 276 Irvine, P. et al., 'Expert judgements on solar geoengineering research priorities and challenges', *EarthArxiv (Preprint)* (29 Apr. 2021).
- 277 National Academies of Sciences, Engineering, and Medicine, *Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance* (National Academies Press: Washington, DC, 28 May 2021).
- 278 Irvine et al. (note 276).
- 279 National Academies of Sciences, Engineering, and Medicine (note 277).
- 280 Latham, J. et al., 'Marine cloud brightening', *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, vol. 370, no. 1974 (13 Sep. 2012).
- 281 'Geoengineering is conspicuously absent from the IPCC's report', *The Economist* (14 Aug. 2021).
- 282 Nicholson, S., 'Solar radiation management', Wilson Center, 30 Sep. 2020.
- 283 Glasgow Climate Pact—Decision -/CMA.3, Advance unedited version, 14 Nov. 2021.
- 284 Schipper, E. L. F., 'Maladaptation: When adaptation to climate change goes very wrong', *One Earth*, vol. 3, no. 4 (Oct. 2020).
- 285 Habib, M. A., *Evaluation of Swedish Climate Change Initiative 2009–2012: Adaptation Fund Cambodia Case Study*, EBA Substudy no. 6 (EBA: Stockholm, 2020).
- 286 Milman, A. and Arsano, Y., 'Climate adaptation and development: Contradictions for human security in Gambella, Ethiopia', *Global Environmental Change*, vol. 29 (Nov. 2014).
- 287 Sovacool, B. K., 'Bamboo beating bandits: Conflict, inequality, and vulnerability in the political ecology of climate change adaptation in Bangladesh', *World Development*, vol. 102 (Feb. 2018).
- 288 Eriksen, S. et al., 'Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance?', *World Development*, vol. 141 (1 May 2021).
- 289 Pörtner et al. (note 71).
- 290 Eriksen et al. (note 288), p. 3.
- 291 Gilmore, E. A. and Buhaug, H., 'Climate mitigation policies and the potential pathways to conflict: Outlining a research agenda', *WIREs Climate Change*, vol. 12, no. 5 (Sep. 2021); Mohamed-Katerere, J. C., 'Human rights: An opportunity for making adaptation conflict-sensitive', eds U. Bob and S. Bronkhorst, *Conflict-Sensitive Adaptation to Climate Change in Africa* (Berliner Wissenschafts-Verlag: Berlin, 2014).
- 292 Roe, D., 'Is adaptation the missing ingredient from the new UN biodiversity action plan?', International Institute for Environment and Development, 24 Feb. 2020.
- 293 International Energy Agency, *World Energy Outlook 2021* (IEA: Paris, Oct. 2021).
- 294 Beyond Oil & Gas Alliance, 'Beyond Oil & Gas Alliance', <<https://beyondoilandgasalliance.com>>, accessed 3 Dec. 2021.
- 295 Kingdom of Saudi Arabia (note 78); Australian Government Department of Industry, Science, Energy and Resources (note 78); Climate Action Tracker, Russian Federation: Analysis, <<https://climateactiontracker.org/countries/russian-federation>>, accessed 3 Dec. 2021.
- 296 Nair, A., 'Peabody Chapter 11 tops string of US coal bankruptcies', Reuters, 15 Apr. 2016.
- 297 Rothkopf, D. J., 'Is a green world a safer world? Not necessarily', *Foreign Policy* no. 174 (22 Aug. 2009).
- 298 Fothergill, S., *Coal Transition in the United Kingdom* (Institute for Sustainable Development and International Relations: Paris, 2017).
- 299 World Bank, WDI Data, World development indicators, <<https://datatopics.worldbank.org/world-development-indicators>>, accessed 23 June 2021.
- 300 Total output includes oil and gas, as calculated by: US Energy Information Administration, Petroleum and other liquids, <www.eia.gov/international/data/world/petroleum-and-other-liquids/annual-petroleum-and-other-liquids-production>, accessed 11 Oct. 2021.
- 301 UN Development Programme, 'Timor-Leste', Human Development Reports, 2021.
- 302 Doraisami, A., 'The Timor Leste Petroleum Fund, veterans and white elephants: Fostering intergenerational equity?', *Resources Policy*, vol. 58 (Oct. 2018); Scheiner, C., *Timor-Leste: 2021 Economic Survey: The End of Petroleum Income* (La'o Hamutuk: Dili, 30 June 2021).
- 303 Peszko, G. et al., *Diversification and Cooperation in a Decarbonizing World: Climate Strategies for Fossil Fuel-Dependent Countries* (World Bank: Washington, DC, 2 July 2020).
- 304 US Energy Information Administration, *Annual Energy Outlook 2021 with Projections to 2050* (US Department of Energy: Washington, DC, Feb. 2021); International Energy Agency (note 234).

- 305 Armstrong, C., 'Decarbonisation and world poverty: A just transition for fossil fuel exporting countries?', *Political Studies*, vol. 68, no. 3 (1 Aug. 2020).
- 306 Albrecht, F. and Parker, C. F., 'Healing the Ozone Layer: The Montreal Protocol and the Lessons and Limits of a Global Governance Success Story', eds P. 't Hart and M. Compton, *Great Policy Successes* (Oxford University Press: 5 Sep. 2019).
- 307 Haas, B. et al., 'Factors influencing the performance of regional fisheries management organizations', *Marine Policy*, vol. 113 (Mar. 2020); Rayfuse, R., 'Settling disputes in Regional Fisheries Management Organizations: Dealing with Objections', eds H. Ruiz Fabri et al., *A Bridge over Troubled Waters: Dispute Resolution in the Law of International Watercourses and the Law of the Sea* (Brill Nijhoff: Leiden Boston, 2020).
- 308 Grennfelt, P. et al., 'Acid rain and air pollution: 50 years of progress in environmental science and policy', *Ambio*, vol. 49 (1 Apr. 2020).
- 309 Global High-Level Panel on Water and Peace, *A Matter of Survival: Report of the Global High-Level Panel on Water and Peace* (Geneva Water Hub: Geneva, 2018).
- 310 Black et al. (note 224).
- 311 UN Security Council, *The Responsibility of the Security Council in the Maintenance of International Peace and Security* (UNSC: New York, 31 Jan. 1992), p. 821.
- 312 Boutros-Ghali, B., *An Agenda for Peace: Report of the Secretary-General Pursuant to the Statement Adopted by the Summit Meeting of the Security Council on 31 Jan 1992* (UN Secretary-General: New York, 17 June 1992).
- 313 Hauser, P. et al., *Phasing out Coal in Chile and Germany: A Comparative Analysis* (GIZ; Ecologic Institute: Berlin; Santiago, June 2021).
- 314 International Energy Agency, IEA, Chile—Countries & regions, <www.iea.org/countries/chile>, accessed 23 Nov. 2021.
- 315 Hauser et al. (note 313).
- 316 Hauser et al. (note 313); en:former, 'Coal-fired power plant to be converted into heat storage facility', en:former, 29 Mar. 2019; Wagman, D., 'Nuclear to coal to hydrogen: Sheldon Station blazes a trail', *IEEE Spectrum*, 11 July 2017.
- 317 Simsek, Y. et al., 'Comparison of energy scenario alternatives for Chile: Towards low-carbon energy transition by 2030', *Energy*, vol. 206 (1 Sep. 2020).
- 318 Wettengel, J., 'Spelling out the coal exit: Germany's phase-out plan', *Clean Energy Wire*, 3 July 2019.
- 319 Wacket, M., 'EXCLUSIVE German parties agree on 2030 coal phase-out in coalition talks—sources', *Reuters*, 23 Nov. 2021.
- 320 Yanguas Parra, P. et al., *Global and Regional Coal Phase-out Requirements of the Paris Agreement: Insights from the IPCC Special Report on 1.5°C* (Climate Analytics: Sep. 2019).
- 321 International Renewable Energy Agency (note 256).
- 322 Annan, K. et al., *We the Peoples: The Role of the United Nations in the 21st Century* (UN Secretary-General: New York, 2000), p. 44.
- 323 United Nations, General Assembly, *Transforming Our World: The 2030 Agenda for Sustainable Development*, A/RES/70/1, 21 Oct. 2015.
- 324 United Nations, General Assembly, *Peacebuilding and Sustaining Peace: Report of the Secretary General A/74/976-S/2020/773* (United Nations: New York, 30 July 2020).
- 325 United Nations, Report of the United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972, A/CONF.48/14/Rev.1 (United Nations: New York, 1973).
- 326 United Nations, General Assembly, Report of the United Nations Conference on Environment and Development Rev.1 (Vol. 1), A/CONF.151/26, 1992.
- 327 UN Human Rights Council, *Resolution 48/13*, 18 Oct. 2021, p. 13.
- 328 African Union, *Master Roadmap of Practical Steps to Silence the Guns in Africa by Year 2020* (Lusaka Master Roadmap 2016) Assembly/AU/6 (XXVIII) Annex (African Union: Addis Ababa, 2016).
- 329 African Union, *Agenda 2063: The Africa We Want* (African Union Commission: Addis Ababa, Sep. 2015).
- 330 Association of South East Asian Nations, *ASEAN State of Climate Change Report (ASCCR)* (ASEAN Secretariat: Jakarta, Oct. 2021).
- 331 European Union, *Report on the Implementation of the European Security Strategy: Providing Security in a Changing World* (European Union: Brussels, 11 Dec. 2008); European Union, *Shared Vision, Common Action: A Stronger Europe: A Global Strategy for the European Union's Foreign and Security Policy* (European Union: Brussels, June 2016); European External Action Service, *Climate Change and Defence Roadmap* (Council of the European Union: Brussels, 9 Nov. 2020); European External Action Service, *Concept for an Integrated Approach on Climate Change and Security* (Council of the European Union: Brussels, 5 Oct. 2021).
- 332 Sweden, *Decision No.3/21 Strengthening Co-Operation to Address the Challenges Caused by Climate Change* (Organization for Security and Co-operation in Europe (OSCE): Stockholm, 6 Dec. 2021).
- 333 Organization of African Unity, *African Charter on Human and Peoples' Rights* (Organization of African Unity: Nairobi, June 1981); Organization of American States, *American Convention on Human Rights: 'Pact of San José, Costa Rica'* (Organization of American States: San José, 11 Nov. 1969); UN Economic Commission for Latin America and the Caribbean, *Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement)* (UN ECLAC: Santiago, 2018).
- 334 North Atlantic Treaty Organization, 'NATO Climate Change and Security Action Plan', 14 June 2021.
- 335 United Nations (note 323), p. 1.
- 336 Shidore, S., 'Climate Change Resolution Fails to Pass UN Security Council', *The National Interest*, The Center for the National Interest, Text, 6 Jan. 2022.
- 337 UN Human Rights Council (note 327).
- 338 UN Environment Programme, *Environmental Cooperation for Peacebuilding Programme: Final Report 2016* (UNEP: Nairobi, 2016); Maertens, L. and Hardt, J. N., 'Climate change and security within the United Nations: Insights from the UN Environment Programme and the UN Security Council', eds E. Lövbrand and M. Möbjörk, *Anthropocene (In)Securities: Reflections on Collective Survival 50 Years after the Stockholm Conference* (Oxford University Press: Oxford, 2021).
- 339 United Nations, *Climate Security Mechanism: Progress Report* (UNEP; UNDP; DPPA: New York, May 2021).
- 340 Smith, D. et al., *Climate Security: Making It #Doable* (Clingendael and SIPRI: Feb. 2019).

- 341 Hodder, C., *Climate Change and Security in the United Nations Assistance Mission to Somalia*, Climate–Fragility Policy Brief (adelphi: Berlin, 26 Aug. 2021).
- 342 UN Assistance Mission in Somalia, 'Interview with the UN Environmental Advisor to Somalia, Christophe Hodder', UNSOM, 10 Sep. 2020; Christophe Hodder, personal communication
- 343 World Bank, 'Regional Sahel Pastoralism Support Project: P147674', World Bank, 24 Feb. 2022.
- 344 World Bank, 'Regional Pastoral Livelihoods Resilience Project: P129408', World Bank, 24 Feb. 2022.
- 345 World Bank, 'Pastoralism & Stability in the Sahel and Horn of Africa (PASSHA): P153713', World Bank, 19 Dec. 2017.
- 346 Réseau de prévention des crises alimentaires, Appui à la sécurité alimentaire et à la résilience des populations aux crises climatiques et sociales dans la région de Mopti phase II (PASARC-II) [Food Crisis Prevention Network, Support for food security and population resilience to climatic and social crises in the Mopti region phase II (PASARC-II)], <www.food-security.net/projet/appui-a-la-securite-alimentaire-et-a-la-resilience-des-populations-aux-crisis-climatiques-et-sociales-dans-la-region-de-mopti-phase-ii-pasarc-ii>, accessed 27 Feb. 2022; Stockholm Resilience Centre, Communication with Richard Black, 2022.
- 347 Bonzanigo, L. et al., *Strengthening Regional Water Security for Greater Resilience in the G5 Sahel* (World Bank Group: Washington, DC, June 2021).
- 348 Goffner, D., Sinare, H. and Gordon, L. J., 'The Great Green Wall for the Sahara and the Sahel Initiative as an opportunity to enhance resilience in Sahelian landscapes and livelihoods', *Regional Environmental Change*, vol. 19, no. 5 (1 June 2019); Sacande, M., Parfondry, M. and Cicatiello, C., *Restoration in Action against Desertification: A Manual for Large-Scale Restoration to Support Rural Communities' Resilience in Africa's Great Green Wall* (FAO: Rome, 2020).
- 349 Turner, M. D. et al., 'Environmental rehabilitation and the vulnerability of the poor: The case of the Great Green Wall', *Land Use Policy* (Sep. 2021).
- 350 Bromberg, G., Majdalani, N. and Abu Taleb, Y., *A Green Blue Deal for the Middle East* (EcoPeace Middle East: Tel Aviv, Dec. 2020).
- 351 Sten Andresen Consulting, *Strengthening Resilience and Inclusive Governance (STRENPO): Mid-Term Review* (CARE International: 20 Dec. 2019).
- 352 Swanson, D. and Bhadwal, S. (eds), *Creating Adaptive Policies: A Guide for Policy-Making in an Uncertain World* (Sage Publications: London, 2009); Mercy Corps and International Rescue Committee, *ADAPting Aid: Lessons from Six Case Studies* (Mercy Corps / International Rescue Committee: June 2016).
- 353 Saale, L. B. and David, P., 'The Death of Ken Saro-Wiwa: Its Moral Implications on Nigeria', *International Journal of Arts and Humanities*, vol. 3/4, no. 12 (Sep. 2014).
- 354 Francis, P., Lapin, D. and Rossiasco, P., *Securing Development and Peace in the Niger Delta: A Social and Conflict Analysis for Change* (Wilson Center: Washington, DC, 2011).
- 355 Jim-Dorgu, G., 'Pro-Natura International: The Akassa Development Foundation and Development Plan', *Building Sustainable Communities through Multi-Party Collaboration* (Interfaith Center on Corporate Responsibility: New York, 2011).
- 356 Frynas, J. G., 'The false developmental promise of Corporate Social Responsibility: Evidence from multinational oil companies', *International Affairs*, vol. 81, no. 3 (May 2005).
- 357 Jim-Dorgu (note 355); Frynas (note 356); Ako, R. and Ekhaton, E. O., 'The civil society and the regulation of the extractive industry in Nigeria', *Journal of Sustainable Development Law and Policy*, vol. 7, no. 1 (26 July 2016).
- 358 Kimenyi, M. S. et al., *Analysis of Community-Driven Development in Nigeria's Niger Delta Region: Use of the Institutional Analysis and Development (IAD) Framework*, Working Paper no. 14 (Brookings Institution: Washington, DC, May 2014).
- 359 Troell, J. J. and Weinthal, E., 'Harnessing water management for more effective peacebuilding: Lessons learned', eds E. Weinthal, J. Troell and M. Nakayama, *Water and Post-Conflict Peacebuilding* (Routledge: London, 2014); Africa Growth Initiative, *Analysis of the Development Models in the Niger Delta—Case Study One: The Akassa Development Foundation* (Brookings Institution: Washington, DC, May 2014); Babatunde, A. O., 'Oil pollution and water conflicts in the riverine communities in Nigeria's Niger Delta region: Challenges for and elements of problem-solving strategies', *Journal of Contemporary African Studies*, vol. 38, no. 2 (2 Apr. 2020); Udoh, I., 'Oil production, environmental pressures and other sources of violent conflict in Nigeria', *Review of African Political Economy*, vol. 47, no. 164 (2 Apr. 2020); de Coning, C., 'Adaptive peacebuilding', *International Affairs*, vol. 94, no. 2 (1 Mar. 2018).
- 360 Pro-Natura International, *The Akassa Model: A Proven Process for Improving Life in the Niger Delta and Beyond*, Newsletter (Pro-Natura International UK: London, May 2021).
- 361 Department of Climate Change, Federal Ministry of Environment, *2050 Long-Term Vision for Nigeria (LTV-2050): Towards the Development of Nigeria's Long-Term Low Emissions Development Strategy (LT-LEDS)* (Government of Nigeria: Abuja, Nov. 2021).
- 362 UN Water, *Progress on Transboundary Water Cooperation: Global Status of SDG Indicator 6.5.2 and Acceleration Needs* (UN/UNESCO: Paris, 2021).
- 363 UN Declaration on the Rights of Indigenous Peoples, 2007; Indigenous and Tribal Peoples Convention, 1989, p. 16.
- 364 Convention on Biological Diversity (CBD), opened for signature 4 June 1992, entered into force 29 Dec. 1993.
- 365 Sobrevila, C., *The Role of Indigenous Peoples in Biodiversity Conservation* (World Bank: Washington, DC, May 2008), p. xii.
- 366 Schuster, R. et al., 'Vertebrate biodiversity on indigenous-managed lands in Australia, Brazil, and Canada equals that in protected areas', *Environmental Science & Policy*, vol. 101 (1 Nov. 2019).
- 367 Blackman, A. et al., 'Titling indigenous communities protects forests in the Peruvian Amazon', *Proceedings of the National Academy of Sciences*, vol. 114, no. 16 (3 Apr. 2017).
- 368 Guterres, A., Remarks by Secretary-General António Guterres at the UN Security Council Open Debate on Women, Peace and Security, UN Women, 21 Oct. 2021.
- 369 Maxmen (note 98).
- 370 Ritchie, H. et al., 'Coronavirus (COVID-19) deaths', Our World in Data, 2020.
- 371 International Monetary Fund, *Global Financial Stability Report, October 2018: A Decade after the Global Financial Crisis: Are We Safer?*, Global Financial Stability Report (IMF: Washington, DC, 2018); Financial Stability Board, *Implementation and Effects of the G20 Financial Regulatory Reforms*, Fourth Annual Report (FSB: Basel, 28 Nov. 2018).
- 372 United Nations (note 325).

Figures

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International Geosphere-Biosphere Programme, 'Great acceleration', Global Change, 2015; UN Department of Economic and Social Affairs, World population prospects 2019, <<https://population.un.org/wpp/Download/Standard/Population>>, accessed 26 Apr. 2022; Bolt, J. and van Zanden, J. L., 'Maddison style estimates of the evolution of the world economy: A new 2020 update', Oct 2020; Ritchie, H., Roser, M. and Rosado, P., 'Energy', Our World in Data, 2020; NOAA US Department of Commerce, Global Monitoring Laboratory, Trends in atmospheric carbon dioxide, <<https://gml.noaa.gov/ccgg/trends>>, accessed 26 Apr. 2022; Ritchie, H. and Roser, M., 'Water use and stress', Our World in Data, 2017.

Figure 2

Pettersson, T. et al., 'Organized violence 1989–2020, with a special emphasis on Syria', *Journal of Peace Research* (July 2021); Gleditsch, N. P. et al., 'Armed conflict 1946–2001: A new dataset', *Journal of Peace Research*, vol. 39, no. 5 (Sep. 2002).

Figure 3

Lee, J.-Y. et al., 'Chapter 4. Future global climate: Scenario-based projections and near-term information', eds V. Masson-Delmotte et al., *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge, 2021); Lenton, T. M. et al., 'Climate tipping points—too risky to bet against', *Nature*, vol. 575, no. 7784 (27 Nov. 2019).

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