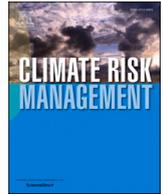




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Interactions between two existential threats: COVID-19 and climate change

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ABSTRACT

The COVID-19 pandemic and climate change are complex existential threats, unpredictable in many ways and unprecedented in modern times. There are parallels between the scale and scope of their impacts and responses. Understanding shared drivers, coupled vulnerabilities, and criteria for effective responses will help societies worldwide prepare for the simultaneous threats of climate change and future pandemics. We summarize some shared characteristics of COVID-19 and climate change impacts and interventions and discuss key policy implications and recommendations.

1. Introduction

In the closing days of 2019, reports began to emerge from China of a new and concerning coronavirus that was eventually named SARS-CoV2, and the associated disease COVID-19 (Loprete et al., 2021). Since then, the scales of the impacts of COVID-19 and associated responses have been unprecedented in recent history. As of mid-August 2021, the COVID-19 pandemic has killed more than 4.4 million people worldwide, with nearly 208 million cases (COVID mortality worldwide - Bing n.d. <https://www.bing.com/search?q=covid%20mortality%20worldwide&form=QBREsp=-1pq=covid%20mortality%20worldwidesc=1-25sk=cvid=D22C51A9E61A40B1A9FD1C763AEBF4D9> (accessed August 25, 2021)). At the peak of global lockdown measures on 28th April 2020, over 4.2 billion people – more than half of the global population were subject to complete or partial isolation (Review, 2020). Despite massive global efforts to vaccinate against and control the virus through various suppression measures, at the time of writing (August 2021) there are still over half a million confirmed cases of COVID-19, and over 10,000 confirmed deaths (Daily confirmed COVID-19 cases and deaths n.d. https://ourworldindata.org/grapher/daily-covid-cases-deaths?country=~OWID_WRL accessed 17 August, 2021) each day.

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The changes in our climate accelerated during the intense focus on the global pandemic over the last 18 months, as confirmed by the recently released Intergovernmental Panel on Climate Change Sixth Assessment Working Group 1 report (IPCC, 2021). Climate change is already affecting millions by altering food-, water-, and health-security, with projections that hundreds of millions could be affected over coming decades (IPCC, 2018). The projected scale and nature of the impacts of climate change share similarities with those of COVID-19. Studying the characteristics of these two existential risks and exploring the policy implications that emerge inform recommendations that can help to prepare for the new landscape of intertwined global threats.

2. Shared characteristics

2.1. Scales of impact

Both COVID-19 and climate change are transboundary threats that expand in space and time. Climate change manifests as short-term shocks and long-term trends. COVID-19 is expected to be a shorter-term shock that will be brought under control by widespread immunity through vaccination, improved treatment protocols, and measures such as mask wearing, social distancing, and widespread testing. However, in many cases, countries have been slow to share knowledge (Advice, 2021), equipment, and vaccines to address the pandemic. Examples of international cooperation – such as the Covax Facility - often have been too little, too late (Safi, 2021), with delays in vaccine export allowing for new variants to develop and spread. As with climate change, pandemics will be a constant threat requiring long-term policy action because other novel infectious diseases will continue to emerge (World Economic Forum, 2019). Similarly, the response to climate change requires strong international cooperation to achieve internationally-agreed reductions in greenhouse gas emissions (IPCC, 2021). The Paris Agreement may also prove to be a case of too little, too late.

2.2. Intensity of impact

The impacts of COVID-19 and climate change will be life-altering. Climate change is not on the same timescale as COVID-19 and is generally perceived as a less direct threat to people's lives. However, both threats are encouraging reassessments of 'normal ways of living' to achieve deep societal transformation to achieve multiple societal objectives. These windows to transform are fragile and uncertain, but are creating spaces for defining and planning for more desirable futures (Schipper et al., 2021).

2.3. Inequities of impact

Both climate change and COVID-19 disproportionately affect already vulnerable and marginalized communities (e.g., older adults, those with chronic diseases, and those in lower socio-economic conditions). The Fourth and the Fifth Assessment Reports of the IPCC noted with high confidence that these groups are at higher risk of the health impacts arising from climate change. With COVID-19, mortality was inversely correlated with institutional trust and effectiveness in countries and communities across the spectrum of poorer to wealthier nations (Devine et al., 2021).

2.4. System vulnerabilities

Both crises underscore the increasing, complex, and close interconnections among food, water, health, energy, and infrastructure systems. Responses to climate change and COVID-19 must address the upstream drivers of exposure, vulnerability, and capacity, not just their proximate manifestations. For both, surprises are likely to become the new norm. Cascading and compounding risks and impacts due to climate change and other threats (such as pandemics) will increase the pressure on individuals, communities, and countries to rapidly recover and regenerate. COVID-19 may prove to be the beginning of a new reality of more frequently emerging infectious diseases, with potential long-term consequences for socioeconomic development, a fundamental determinant of health.

2.5. Uncertainty

Both crises are characterized by large uncertainties (Phillips et al., 2020). Adaptation to climate change focuses on managing the knowns (e.g., the fate of warm-water corals at higher temperatures) and increasing preparedness for the known unknowns (e.g., crossing of tipping points, abrupt non-linear change, irreversibility). Climate change uncertainties extend from our understanding of the fundamental behaviour of the Earth-atmosphere system through to the effectiveness of different adaptation and mitigation strategies. Heatwaves, floods, and droughts will increase in frequency and severity (IPCC, 2021), often with limited capacity to forecast floods and droughts at the time scales necessary for comprehensive preparation to limit disruption (IPCC, 2021). The COVID-19 pandemic also contains knowns and unknowns. Decades of research have highlighted the probability of a global pandemic from coronaviruses or other zoonotic diseases. However, there are many unknowns about the shape of progress over the coming years, including the long-term downstream social-economic, political, and environmental effects.

The uncertainties that surround the evolution of the pandemic and climate change reinforce the need for flexibility: some countries that appeared to be fairly successful a year ago in dealing with the pandemic are now seeing surges (e.g., Japan, Israel). The precautionary principle (e.g. being better safe than sorry when there is uncertainty about whether an agent or activity could harm humans or the environment) should be applied in decision- and policy-making for both crises (Milani, 2020; Devine et al., 2021)

2.6. Misinformation

Misinformation about the scale of the impact and the effectiveness of different strategies plague both COVID-19 and climate change. Due to their complexity and emergent nature, both threats are examples of real-time, in-progress scientific discovery that can result in disproportionate attention given to provisional, premature, or irregular findings. For COVID-19, misinformation or poorly communicated campaigns emerged in many countries that resulted in vaccination hesitancy and further preventable mortality. For climate change, misinformation, including whether climate change is a real phenomenon, has long dominated public discourse, contributing to delayed behaviour change and compromising the political will to act.

3. Policy implications and recommendations

We explore six interrelated COVID-19 and climate policy implications and provide recommendations.

First, in response to COVID-19, **governments demonstrated they can respond profoundly, substantially, and immediately to an existential threat**. Taiwan, for example, adopted 124 measures to block disease spread when implemented simultaneously ([Crushing coronavirus uncertainty, 2020](#)). In many countries, free childcare was instituted, unemployment benefits increased, and the homeless rehoused, to contain viral transmission and to address the knock-on consequences of lockdowns on economic and social stability, such as high rates of unemployment. In Australia, COVID-19 business packages and Job Seeker schemes have provided income for those adversely impacted by lengthy lockdowns and stay-at-home rules, although these measures have not all been maintained through the pandemic. Early successes in many countries were challenged by multiple waves of infection and new variants with higher transmissibility. The Delta variant and its variation, Delta+ /Delta plus have demanded a constant adaptation of health and economic systems to deal with faster-spreading variants. How the longer-term effects of these government interventions play out remains to be seen in terms of sovereign debt and strength of national economies. It is also unclear how the severe economic impacts due to COVID-19 will affect the long-term reforms required to address the global systemic risks associated with climate change. Carefully and intentionally planned, short-term responses and longer-term **sustainable and resilient development** could and should be an outcome of stimulus funding to restart economies suffering under COVID-19, for example the WHO's Manifesto for a Healthy Recovery from COVID-19 ([Change and Health, 2020](#)). Climate change mitigation and adaptation need to be embedded into all recovery plans so that threat reduction can be jump-started everywhere ([Adaptation and Report, 2020](#)).

Second, both COVID-19 and climate change require **effective governance at the scale of the impact**. This means the creation and support of robust coordination systems across multiple spatial and temporal scales. Additional data and complex, dynamic models are needed to increase effective management of both crises; the question is whether sustained systems will be created to ensure the availability and accessibility of data and models for managing the next global crisis. New institutional arrangements, such as networks of international centers of excellence, could foster faster responses for an array of interlinked global crises. Increasing the flow and speed of information and data sharing could enable faster responses in real-time, with careful mapping of existing and needed response capacity within communities and within countries to tackle emerging crises. For example, in both cases the importance of local actors can be highlighted – i.e., to effectively facilitate contact tracing for COVID-19 and to be able to develop appropriate adaptation measures for climate change both require an intimate knowledge of the local community and its characteristics. Early learning and detecting emergent trends are key to understanding the systemic interdependencies and potential tipping points. The private sector has already harnessed these tools for supply chain resilience. For example, the global brewing company Anheuser-Busch InBev, based on the early evolution of COVID-19 in China, pivoted operations in other markets to enable business continuity and increased its capacity to assist communities when COVID started spreading in the US ([Brito, 2020](#)).

Third, COVID-19 has demonstrated the crucial role that **political leadership** plays in national resilience and preparedness. The Global Health Security Index, published in 2019 just prior to the pandemic ([Cameron et al., 2019](#)), was a comprehensive assessment over two years of health security and related capabilities across 195 countries determined through responses to 140 questions organized into six categories, 34 indicators, and 85 sub-indicators. The categories are highly relevant for managing the health risks of climate change, including prevention, detection and reporting, rapid response, health system, compliance with international health and security norms, and risks environment. The 33 recommendations also are highly relevant for climate change adaptation, including that national health security was fundamentally weak worldwide, with countries unprepared for a global pandemic; that few countries had tested their health security capacities; and that more than half of the countries faced major political and security risks that could undermine national capability to counter a pandemic or other biological threat. The COVID-19 pandemic underscored the accuracy of these assessments. However, the pandemic also highlighted that the assessment of political leadership was off the mark, with the United States and the United Kingdom the top two scoring countries. Similar lessons can be seen in climate change action where lack of political leadership has meant some progress in limited areas, but an overall lack of robust resilience building.

Fourth, the impacts of climate change and COVID-19 highlight the critical need to address the **inequities** that are driving high rates of vulnerability within and between countries, regions, and communities. Both crises increased attention to inequities that have long been present but are now visible in new ways. Climate change and COVID-19 generate multiple vulnerabilities and reveal longstanding lack of adequate political will, capacity, or both. However, cycles of learning in conjunction with greater preparedness can reduce the burden of impact. Further, promoting social safety nets and considering such measures as a universal basic income can support those at most disadvantage.

Fifth, the governance of risk requires **intersectoral solutions informed by highly collaborative and interdisciplinary research**. In the early days, responding to COVID-19 was centered in the medical and epidemiological sciences, but now includes a wide spectrum of expertise, including economists, behavioural scientists, and others engaged in understanding the possible societal impacts of COVID-19

surveillance and response measures. Agile collaborations emerged amongst major pharmaceutical companies in the race to identify, test, and manufacture vaccines for COVID-19 where competition and holding of intellectual property were mostly set aside (noting the governance challenges mentioned above). Similarly, with climate change, many collaborations and research activities have pivoted to online formats that have allowed more accessibility and inclusive forms of global participation across research communities and communities of practice. For example, the Adaptation Futures 2020 conference (Futures, 2020) organized public webinars on key issues to enhance global discussion and collaboration, as have many other organizations and businesses. Research communities have also had to pivot and develop new methods for research given that international travel and even inter-state travel has often been highly challenging.

Sixth, COVID-19 and climate change are ‘all of society problems’, with responses and innovation coming not just from governments but from all actors including industry and non-governmental organizations – and at all scales. Globally, societies must **capitalize on innovative activities from individuals to businesses to civil society organizations** to address the immediate and longer-term challenges. For COVID-19, examples include students using 3D printers to produce headbands for doctors, nightclubs switching to offer home delivery services for cleaning items; breweries and distilleries switching to producing hand sanitizer for the health sector and using their transport network capacity to deliver food to vulnerable remote communities. Communities have been innovative in sharing information and coming together to share their experiences online: for example, the Kindness Pandemic Facebook group connects individuals and communities globally where people share stories about how they have helped or have been helped by strangers during the pandemic. Similarly, hundreds of non-governmental organizations are working to address climate change at community to international scales; each of the actions undertaken matter (Masson-Delmotte et al., 2018).

An example of addressing COVID-19 and climate jointly is when super-cyclone Amphan struck Bangladesh and the Indian states of Odisha and West Bengal in May 2020, causing devastation compounded by having to maintain physical distancing in crowded cyclone shelters and by the large number of migrants returning from major cities under COVID-19 lockdown. Careful and deliberate preparation and learning from previous extreme events over the last fifty years have resulted in effective early warning and response systems, meaning there was limited loss of life.

Governments need to provide enabling environments for an all-of-society response.

4. Some final thoughts

The discussion above shows clearly the capacity of humanity to respond with strength and agility to existential threats, but also demonstrates that this capacity is not always realised, and that where governance is weak, short-termist, and narrow in ambition, the outcomes may be disastrous.

The impact of the COVID-19 pandemic, and how we are responding to it, interacts with, and has potential implications for global development pathways and how we manage the risks from climate change (Fig. 1). The inability of some countries to effectively handle the pandemic has broader geopolitical ramifications where post-COVID interactions may cause re-thinking of diplomatic and trade relations and shift perceptions of power. In consequence, there is a real concern that the response to climate change will suffer as

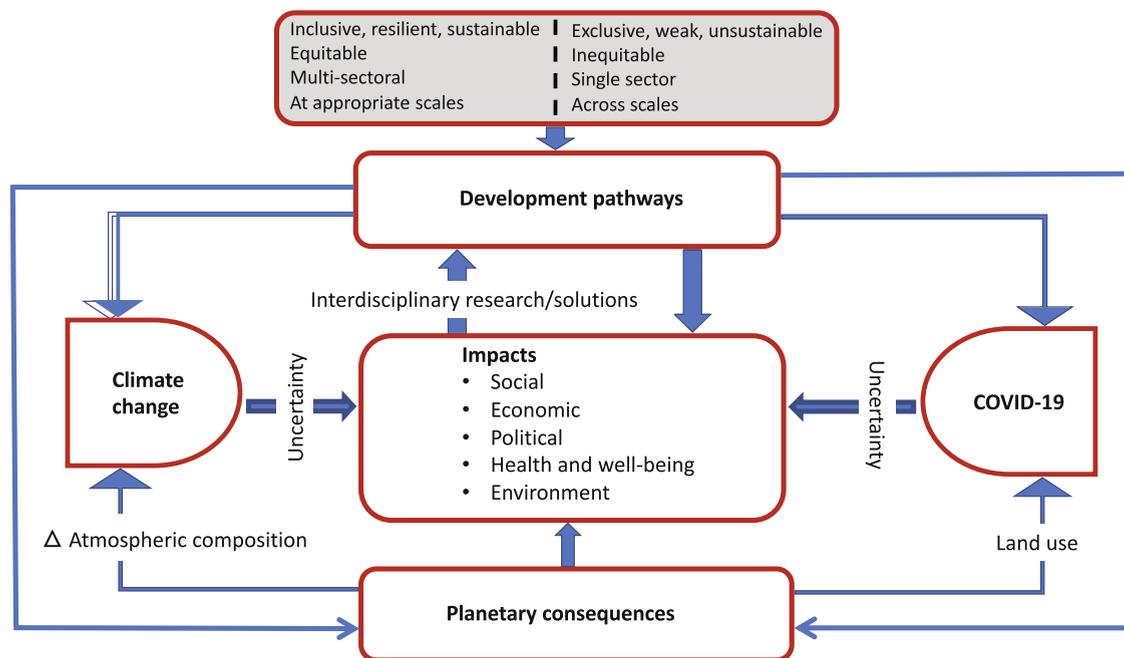


Fig. 1. Illustrating how the choices we make about our development pathways (outlined in the grey box) have planetary consequences, including climate change and pandemics, that in turn have impacts with implications for the development pathways we follow.

COVID-19 monopolizes policy attention, with climate change being seen as too distant, too costly, and without immediate returns on investment. Yet, COVID-19 also provides the opportunity to ensure investments for a greener economic recovery and a more resilient future.

The far-reaching impacts of the pandemic and climate change are planetary emergencies that will propagate through interconnected economic and social systems across the world. More interdisciplinary research on and assessments of risks and responses are required, to cross knowledge boundaries and enhance the accelerated and effective delivery of scientific information to the public and policymakers. For example, initiatives and organisations such as Future Earth and the World Adaptation Science Program address global scale, multidisciplinary research and practice. The challenge is to increase knowledge production that directly feeds decision- and policy-making and also builds capacity across key skills and sectors throughout the world, especially in low- and middle-income countries.

We are at the beginning of what will likely be a long journey to respond to the COVID-19 pandemic and its cascading effects, whilst we have yet to progress very far on the urgently needed journey to address the global systemic risks presented by climate change. It is essential that the COVID-19 responses avoid the mistakes made in managing climate change, especially the slow pace of international negotiation, collaboration, and coordination. There are many opportunities for joint learning from the processes of iterative and flexible risk management of these dual global crises, ensuring progress towards a safe, just, and resilient future. Perhaps the biggest risk is that the financial costs and efforts to contain COVID-19 will distract from preparing for the existential threats of climate change.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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