

Centre for the Study of Existential Risk



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A report prepared for CSER supporters

FEBRUARY 2023



The University of Cambridge extends its sincere thanks for your support of the activities of the Centre for the Study of Existential Risk (CSER).

Supported by your generosity, the work of CSER researchers is increasing our understanding of, and preparedness for, existential threats to our world.

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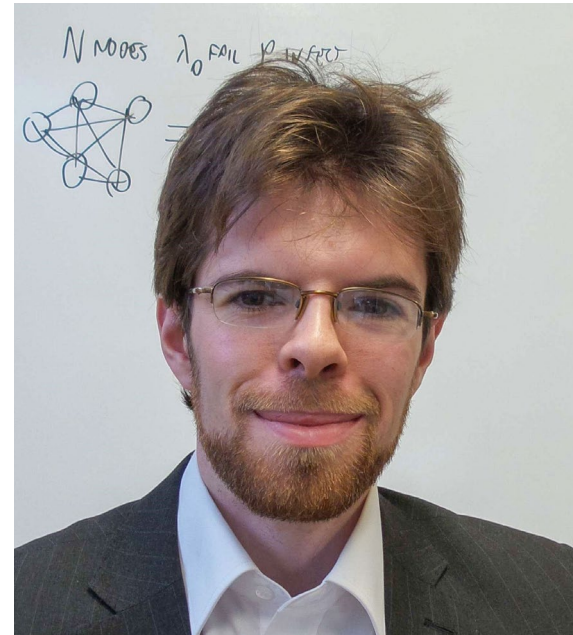
An introduction from **Seán Ó hÉigeartaigh** *Executive Director, CSER*

The Centre for the Study of Existential Risk (CSER) is an interdisciplinary research centre within the University of Cambridge dedicated to the study and mitigation of risks that could lead to civilizational collapse or human extinction. We work primarily on catastrophic biological risks, environmental risks, and on risks from artificial intelligence, as well as on cross-cutting methodologies for the analysis and governance of global risks. Our work is shaped around three main goals:

- **Understanding:** we study existential and global catastrophic risk.
- **Impact:** we develop collaborative strategies to reduce these risks.
- **Field-building:** we foster a global community of academics, technologists and policy-makers who share our goals.

This report covers the period September-December 2022 and outlines our activities and future plans. Highlights of the last three months include:

- We published **six papers** on global catastrophic climate change, digital twins for food security, societal collapse, and the effects of crossing Planetary Boundaries and Global Catastrophic Risk events on Disaster Risk Reduction.
- We hosted a public lecture, by Aarathi Krishnan, **Senior Advisor for Strategic Foresight at the UN Development Programme**, and three workshops: on volcanic risk, creative communications, and the Science Policy Interface.



- Our researchers have undertaken high level engagement with the **United Nations** and with international diplomacy around the war in Ukraine and the prevention of **nuclear catastrophes**.
- CSER researchers were featured by the **BBC World Service**, Times Radio, TalkTV, GBTV, Al Jazeera, *The Sun*, the **MIT Technology Review**, and the Inside View, Voices of War, and Challenging Climate podcasts among others. Particular media interest has focused on Lara Mani's work on volcanic risk, Luke Kemp's work on climate change, and Paul Ingram's work on the **war in Ukraine** and its nuclear potential.
- CSER researchers have engaged with world leading academic communities from a variety of disciplines. Our work has been presented to the University of Exeter, **Berlin Climate and Security Conference**, the iGEM Responsibility Conference, the International Institute for Applied Systems Analysis, **Understanding Risk 2022**, the National Academies of Science and Medicine, and the World Science Forum, among other prestigious venues. Our researchers have also delivered **postgraduate lectures** to students in the Engineering Department and the AI for Environmental Risk Doctoral Training Programme respectively.
- We welcomed two new members of staff supporting the work of our **sustainable finance** and **risk communications** projects, as well as three visitors working on futures literacy, socio-political collapse, and disarmament.



1. People

1.1 New Members of Staff

This term we have welcomed two new members to the CSER team

Ella Lipscombe (PA and Administrative Assistant – Sustainable Finance). Ella works as a personal assistant to Dr Ellen Quigley and as an administrative assistant within the Sustainable Finance team at CSER.



Anastasia Chau (Research Assistant). Anastasia researches risk communication for Global Catastrophic Risks and has previously worked in sustainability consulting and for a research project linking gender and policymaking. Anastasia holds a BSc in Economics from King's College London and has recently graduated with an MSc in Risk, Disasters and Resilience from University College London.



1.2 Visiting Scholars

We have welcomed two new visitors and one returning visitor to CSER during this period:

Yee Kuang Heng (September–December 2022). Yee Kuang works on national risk assessment exercises and capacity-building for futures literacy in governments such as the UK and Singapore, particularly on climate change and AI risks. He is Professor at the University of Tokyo's Graduate School of Public Policy, and previously taught at Trinity College Dublin, the University of St Andrews, and the National University of Singapore. He has a background in International Relations with a BSc and PhD from the London School of Economics and Political Science.



Nathaniel Cooke (October 2022–January 2023 returning). Nathaniel is a researcher and postgraduate student working on theoretical, systemic, and sociopolitical approaches to existential risk, as well as societal collapse and resilience. He currently focuses on societal resilience to global catastrophes and methods for rigorously modelling extinction risk, in



addition to producing an introductory x-risk curriculum. Nathaniel has previously held research roles at CSER and the Stanford Existential Risks Initiative and is an occasional co-host of 21st Talks, an existential risk podcast. Alongside this, Nathaniel is studying theoretical archaeology at University College London, his dissertation considers how macrohistory can be used to imagine and improve humanity's future.

Taniel Yusef (November 2022–August 2023). Taniel is a researcher and advocate working on issues at the UN, EU and UK parliaments on various portfolios, with an emphasis on disarmament. She specifically focusses on weapons technology regulation, AI, nuclear and outer space threats, as well as supply chain, trade, development, economics and gender. She also has a number of roles including WILPF International representative (UK) and advisory board member, technology developers coordinator of the UK Campaign to Stop Killer Robots, visiting lecturer at the University of East London and she researches conflict and resilience on the ground. She had a previous career in the arts before her LLM in Economic Law, Justice and Development and associate study LLM in IHL and LOAC. She is currently studying Artificial Intelligence and Machine Learning at the University of York.



1.2 Research Affiliates

We have welcomed five new research affiliates:

Elizabeth Seger is a researcher at the Centre for the Governance of AI (GovAI) in Oxford where she investigates the real and potential impacts of AI on the production, dissemination, and internalization of information in technologically advanced societies. The aim of

Elizabeth's research is to identify specific "epistemic threats" posed by AI technologies, to determine whether those threats yield or exacerbate pathways to existential risks, and to appraise how those pathways might most effectively be intervened upon. Elizabeth's work is an extension of the Epistemic Security project she led with CSER in 2020 and with whom she continues to collaborate.

Di Cooke is a Visiting Fellow in the International Security Program at the Center for Strategic and International Studies, as well as a Research Affiliate at CSER and at the Centre for the Governance of AI. Di's work focuses on AI risks and governance in a defence context, along with the impact of AI on intelligence activities within and outside of the conventional Intelligence Community.

Sam Clarke is the Strategy Manager at Centre for the Governance of AI in Oxford. He is responsible for answering high-level questions regarding the Centre's programmes and the overall direction of the organisation. He has a background in computer science and philosophy, and previously worked as a researcher at the Leverhulme Centre for the Future of Intelligence on understanding the main sources of risk from advanced AI.

Mike Cassidy is a NERC research fellow specialising in volcano science at the University of Oxford. He has a background in Earth and Environmental Sciences, with degrees from Bristol, Lancaster and Southampton. His work has taken him to volcanoes and research institutions around the world. At CSER he aims to investigate the global catastrophic impacts from large magnitude explosive eruptions with Lara Mani and others.

Fazl Barez is a researcher at Edinburgh Centre for Robotics and leads the technical development content at AI Safety Hub. He is working on safety applications of machine learning as well as AI x-risk field building. He has a background in Economics and AI and has previously worked at Amazon, Huawei and the DataLab.

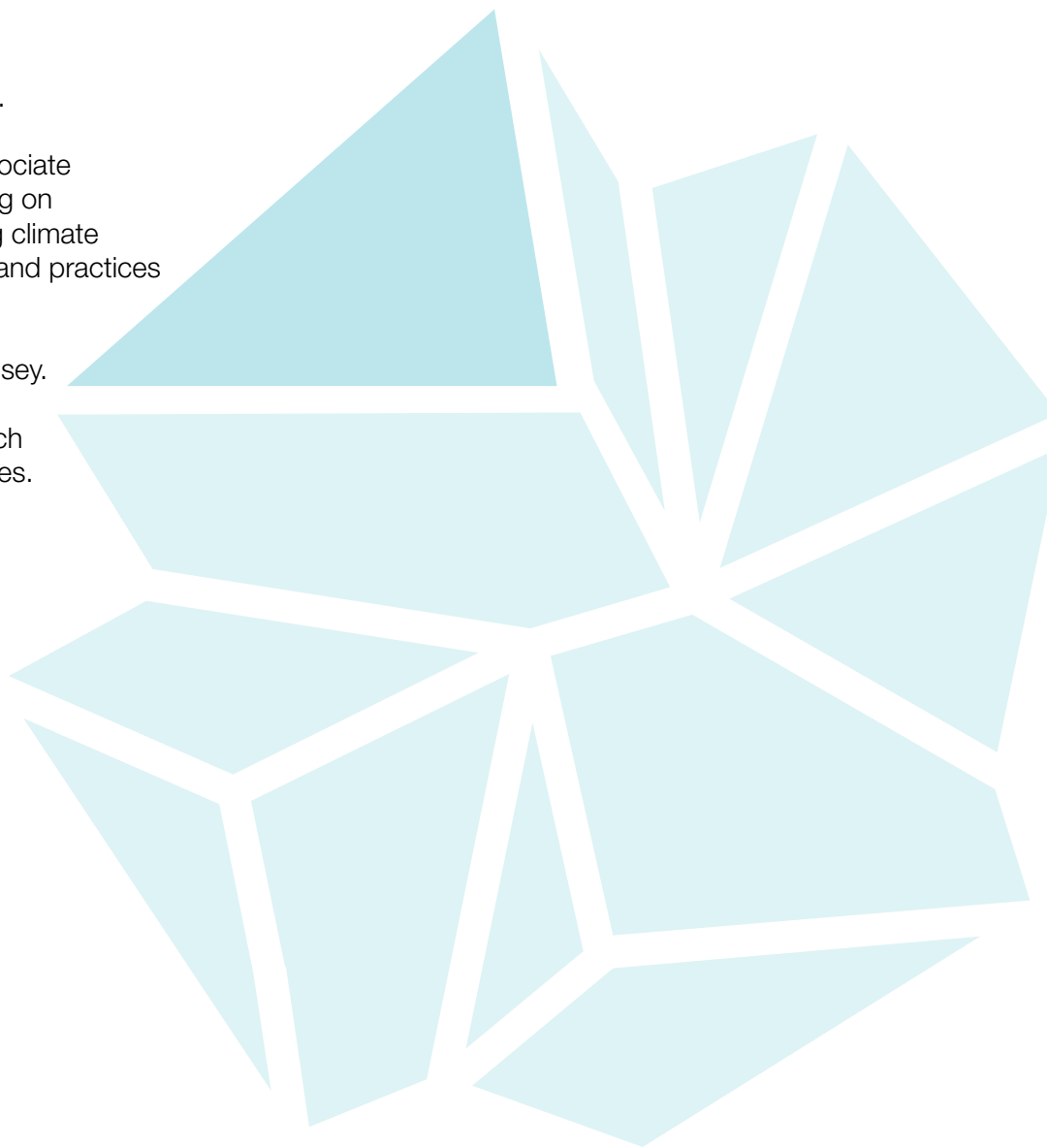
1.3 Leavers

We have sadly said goodbye to two of our researchers.

Mia Sannapureddy has left to become a Research Associate at Jesus College Intellectual Forum, Cambridge working on sustainable finance. Her work is focussed on mitigating climate change and inequality through the investment policies and practices of institutional investors.

Catherine Richards has taken up a position with McKinsey.

They will continue to collaborate with CSER as Research Affiliates, and we wish them all the best in their new roles.



2. Events, Engagement and Outreach

2.1 Academic engagement

This period saw a large number of academic engagements. Following the publication of his high-profile paper [Climate Endgame: Exploring catastrophic climate change scenarios](#), Luke Kemp gave talks at the University of Exeter, Cambridge Union Society, Berlin Climate and Security Conference, Climate Repair Society, the National Academies of Science and Medicine, and the Climate Law and Governance Day, co-hosted by the prestigious Egyptian Ain Shams University in Cairo and the University of Cambridge.

Other CSER researchers gave presentations at EA Global, the iGEM Responsibility Conference, the International Institute for Applied Systems Analysis, Understanding Risk 2022, and the World Science Forum, among other prestigious venues. Lalitha Sundaram, Haydn Belfield and SJ Beard also engaged in lecturing to postgraduate students in the Engineering Department, MSt in AI Ethics and the AI for Environmental Risk Doctoral Training Programme respectively.

- 24 August: Haydn Belfield gave a talk arguing that [competition law is one of the most important levers for AI governance](#) at EA Global San Francisco
- 12 September: Luke Kemp gave a talk on [Climate Endgame: Exploring Catastrophic Climate Change Scenarios](#) as part of a climate tipping points plenary session at the University of Exeter
- 17 September: Luke Kemp gave the opening keynote at the [Civilization](#) exhibition in the San Domenico Museums, Forlì
- 28 September: Luke Kemp gave a talk on [Can National Governments tackle the climate emergency?](#) at the Cambridge Union
- 11 October: SJ Beard gave a lecture as part of the AI for Environmental Risk Doctoral Training Programme on the subject of risk
- 15 October: Lalitha Sundaram gave a [talk about her work](#) to the ILINA (Initiative for Longtermism in Africa) Fellowship programme
- 20 October: Luke Kemp gave a talk on [Ways forward to weather compounding and cascading climate-security risks](#) at the Berlin Climate and Security Conference 2022
- 13–23 October: Sabin Roman attended the Conference on Complex Systems in Mallorca
- 25 October: SJ Beard took part in a panel on [Calamitous Futures](#) for the University of Cambridge Futures in Question Research Network
- 26 October: Lalitha Sundaram spoke at the [iGEM Responsibility Conference](#) – Navigating the Future of Synthetic Biology

- 28 October: Lalitha Sundaram gave a lecture for the Engineering Department module 3G1 Molecular Bioengineering
- 1 November: Luke Kemp took part in a panel discussion on [Climate Repair](#) for the Cambridge Climate Society
- 1–7 November: Sabin Roman attended EAGxRotterdam
- 11 November: Luke Kemp took part in an Experts Panel on [Governing Resilience & Climate Repair](#) as part of Climate Law & Governance Day 2022, co-hosted by the prestigious Egyptian Ain Shams University in Cairo and the University of Cambridge
- 14 November: SJ Beard took part in a Fireside Chat on [Existential Risk](#) with Effective Altruism Cambridge
- 14 November: Jess Bland spoke in an opening session of the 4th International Conference on Anticipation in November 2022 at Arizona State University
- 15 November: Ellen Quigley delivered a webinar on [Universal Ownership Theory](#) organized by The Children's Investment Fund Foundation.
- 11–21 November: Sabin Roman visited the National Institute for Research in Digital Science and Technology in Grenoble France and gave a presentation to their Sustainability Transition, Environment, Economy and local Policy project team.
- 24 November: Paul Ingram gave a talk on Taking a Systems Approach to improving chances of survival when powerful actors pursue their own interests and threaten annihilation to the International Institute for Applied Systems Analysis
- 28 November: Tom Hobson and Alex Klein attended the Biological Weapons Convention Ninth Review Conference
- 28 November: Haydn Belfield attended the Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS), the largest machine learning conference.
- 29 November: SJ Beard and Shahar Avin took part in the [Understanding Risk 2022 London](#) event. Dr Avin spoke on a panel about Perceptions of risk and harm from AI and personal data use: insights from the World Risk Poll while Dr Beard participated in the panel Do look up: What can circus artists teach us about risk?
- 5 December: Lalitha Sundaram and Tom Hobson presented at a session on 'Biotechnology & Governance' panel "From Horizon-Scanning to Regulation: Synthetic Biology Governance Research at CSER and Beyond" as part of the [7th Cambridge-UTokyo Joint Symposium](#)
- 8 December: Luke Kemp provided an opening keynote to a meeting of the National Academies of Science and Medicine's Geographical and Geospatial Sciences Committee on [Cascading Failures, Compounding Risks, and Social Instability](#)
- 8 December: Clarissa Rios Rojas participated in a plenary session on [How Can Science Reboot Multilateralism and Global Security?](#) at the World Science Forum

2.2 Policy Engagement

Clarissa Rios Rojas continued her high level engagement with UN institutions and technical support for their emerging work on existential risks as part of Our Common Agenda and the Declaration for Future Generations. Paul Ingram also continued engaging directly with international diplomacy aimed at resolving the conflict in Ukraine and averting any potential use of nuclear technologies (both the use of weapons and the misuse of civilisation technologies).

- 20 August: Clarissa Rios Rojas participated in the UN roundtable for drafting an [initial document](#) that will feed the UN Declaration for Future Generations
- 31 August: Clarissa Rios Rojas was [invited to support](#) the UN-BWC capacity building efforts in Latin America
- 9 September: SJ Beard co-authored a [submission of evidence](#) to the White House Office of Science and Technology's Request for Input to a Five-Year Plan for Research on Climate Intervention
- 1 October: Haydn Belfield is appointed to the Advisory Board of the new group [Labour for the Long Term](#) and Luke Kemp spoke at their launch event at Labour Party Conference
- 3 November: Paul Ingram gave a talk to the APPG on Future Generations and 10 members of the Ukrainian Parliament: scenarios for nuclear use in the war over Ukraine
- 8 November: Paul Ingram gave a talk to the country and project director two-day training session on X-risks, escalation and the threat of nuclear use in the war run by the International Federation of Red Cross / Crescent
- Haydn Belfield engaged extensively with the UK Government on AI regulation in the civilian and military domains.

2.3 Public Engagement

Once more, this period saw many high-profile media engagements, including Paul Ingram's ongoing commentary and analysis of the war in Ukraine, and Lara Mani and Luke Kemp explaining their high-profile research on climate change and volcanic risk. This term, CSER researchers were featured by the BBC World Service, Times Radio, TalkTV, GBTV, Al Jazeera, TRT World News, *The Sun*, the MIT Technology Review, *Geographical Magazine*, Voices of War, and Challenging Climate podcasts. Lara Mani also co-created a video on children's experiences of volcanic risk with the UWI Seismic Research Centre.

- 21-24 August: Paul Ingram appeared on Times Radio, TalkTV, GBTV, Al Jazeera, and TRT World News to discuss the unfolding crisis at the Zaporizhzhia Nuclear plant due to Russia's war in Ukraine
- 9 September: Paul Ingram appeared on The [Newsmakers: Could Ukraine's Zaporizhzhia be the next Fukushima?](#) On TRT World News
- Paul Ingram appeared on Strait Talk: Turkey's Ukraine balancing and mediation efforts on TRT World News
- 17 September: Shahar Avin appeared on [The Inside View](#) podcast to discuss AI Governance
- 18 September: Paul Ingram appeared on [The Voices of War](#) podcast to discuss the threat of nuclear war and hopes for disarmament
- 23 September: Haydn Belfield published ['The Rival AI Deployment Problem: a Pre-deployment Agreement as the least-bad response'](#) on the Effective Altruism Forum

- 28 September: Lara Mani appeared on the BBC World Service programme [Newsday](#) to discuss her research
- 12 October: Paul Ingram published an article in *The Sun* [COUNTDOWN TO CHAOS: Five chilling signs that would show Putin is preparing nuke strike on Ukraine as UK spies infiltrate Kremlin war machine](#)
- 17 October: Luke Kemp was interviewed for the MIT Technology Review's article [Inside effective altruism, where the far future counts a lot more than the present](#)
- 23 October: Paul Ingram appeared on TRT World News to discuss [What is behind Russian fears of a radiological attack?](#)
- 24 October: Haydn Belfield published 'Lord Martin Rees: an appreciation' on the Effective Altruism Forum
- 27 October: Lara Mani was quoted by an article in *Geographical Magazine*, [Are we prepared for a major volcanic eruption?](#)
- 7 November: Lara Mani co-produced a video with children from the island of St Vincent on volcanic risk with the UWI Seismic Research Centre, [Volcano Inna Me Backyard](#) as part of her communications evaluation project
- 15 November: Luke Kemp appeared on the Challenging Climate podcast to discuss [defining, evaluating, and managing catastrophic climate risk](#)
- 21 November: Haydn Belfield spoke at a Westminster Forum event on Identifying and unlocking the economic and social benefits of AI.

2.4 Events

In this period, we hosted a public lecture by Aarathi Krishnan (Senior Advisor for Strategic Foresight at the UN Development Programme), three workshops (on volcanic risk, creative communications, and the Science Policy Interface), and three seminars. Researchers are taking full advantage of the return to fully in-person events and many of these events have led to further collaboration and research initiatives.

- 7 September: Lara Mani hosted a workshop on [global impacts from volcanic eruptions: how can we best prepare?](#)
- 8 September: Lara Mani and Paul Ingram hosted a workshop on [creative communication to address global catastrophic risks](#)
- 10–11 October: Clarissa Rios Rojas hosted a [two-day in-person workshop](#) for members of the Science Policy Interface for Global Catastrophic Risk
- 11 October: CSER hosted a public lecture and panel with Aarathi Krishnan [Grey Mirror – is uncertainty about the future an opportunity for greater equality?](#)
- 20 October: Freya Jephcott and Charlotte Hammer hosted a seminar on "[Fight For the Living!](#)" [Advocacy & Activism in Public Health](#) as part of their Hidden Epidemics project
- 21 October: CSER hosted a seminar from Matt Boyd on Island Resilience and Global Catastrophic/Existential Risks
- 31 October: CSER hosted a [seminar](#) from Professor Hideaki Shiroyama on challenges for complex risk governance – managing interdisciplinary communication and stakeholder communication

3. Publications

CSER Research Affiliate Tom Cernev has published a paper in *Progress in Disaster Science* about the effects of the crossing Planetary Boundaries and Global Catastrophic Risk events on Disaster Risk Reduction efforts, international development targets, and any future international development target iterations.

[Global sustainability targets: Planetary boundary, global catastrophic risk, and disaster risk reduction considerations in Progress in Disaster Science 23 November 2022 by Tom Cernev.](#)

The effects of the crossing Planetary Boundaries and Global Catastrophic Risk (GCR) events on Disaster Risk Reduction (DRR) efforts, international development targets, and any future international development target iterations are not well understood. However, the crossing of Planetary Boundaries, and GCR events could have significant and adverse effects on the global development gains, capability building, resilience, and adaptability that has been achieved as a result of decades of international development work. A background to the Sustainable Development Goals (SDGs) and the Sendai Framework, GCR, and Planetary Boundaries is first presented. This is followed by an analysis of the possible futures that the world could take considering the aforementioned items. The scenario analysis develops and explores futures for humanity and the Earth for different levels of GCR, and different extents to which the Planetary Boundaries may or may not have been passed. Through this, distinct scenarios are developed: Earth Under

Table 5
Scenario effects on SDG implementation.

SDG	Scenario				Classification
	1 Earth Under Uncertainty	2 Global Collapse	3 Stable Earth	4 Earth Under Threat	
1 No Poverty	M	N-A	A	M	Social
2 Zero Hunger	M	N-A	A	M	Social
3 Good Health and Well-Being	M	N-A	A	M	Social
4 Quality Education	A	N-A	A	A	Social
5 Gender Equality	A	N-A	A	A	Social
6 Clean Water and Sanitation	M	N-A	A	N-A	Social
7 Affordable and Clean Energy	A	N-A	A	A	Economic
8 Decent Work and Economic Growth	A	N-A	A	A	Economic
9 Industry, Innovation and Infrastructure	A	N-A	A	A	Economic
10 Reduced Inequalities	M	N-A	A	A	Social
11 Sustainable Cities and Communities	A	N-A	A	N-A	Economic
12 Responsible Consumption and Production	A	N-A	A	N-A	Economic
13 Climate Action	M	N-A	A	N-A	Environmental
14 Life Below Water	M	N-A	A	N-A	Environmental
15 Life on Land	M	N-A	A	N-A	Environmental
16 Peace, Justice and Strong Institutions	A	N-A	A	M	Political
17 Partnerships for the Goals	A	N-A	A	M	Political

A table from Tom Cernev's paper which featured in *Progress in Disaster Science*.

Uncertainty, Global Collapse, Stable Earth, and Earth Under Threat. The implementation and success of international targets is inhibited to varying degrees across these possible futures. Furthermore, it is evident that without direct action, the first and last aforementioned scenarios are on a pathway towards that of the Global Collapse scenario. Reactive and preventive policy suggestions are formulated from the scenario analysis, with a recommendation that both types should be developed, adopted, and implemented. Prioritisation should be to preventive policy as there is a lower resource cost. To ensure DRR continues and can be further developed, the Planetary Boundaries, and GCR considerations, should be integrated into both the international development goals and accompanying frameworks that follow on post-2030 from the SDGs, and Sendai Framework.

An article in NPJ Science of Food, co-authored by Catherine Richards and Asaf Tzachor, explores the role that digital twins could play in transforming agricultural production systems, curbing greenhouse gas emissions, food waste and malnutrition. The paper considers the, as yet unrealized, promise of these advanced virtualization technologies across six typical agrifood supply chain steps and emphasizes key implementation barriers.

[Transforming agrifood production systems and supply chains with digital twins in NPJ Science and Food](#) 10 October by [Asaf Tzachor](#), [Catherine Richards](#), Scott Jeen.

Digital twins can transform agricultural production systems and supply chains, curbing greenhouse gas emissions, food waste and malnutrition. However, the potential of these advanced virtualization technologies is yet to be realized. Here, we consider the promise of digital twins across six typical agrifood supply chain steps and emphasize key implementation barriers.

Luke Kemp and Eric Cline co-wrote a chapter on lessons from the

systemic collapse of civilizations around the Eastern Mediterranean at the end of the Bronze Age. The chapter applies the concepts of resilience theory and systemic risk to this historical collapse and argue that it was a case of synchronous failures driven by both long-term trends in interconnectedness and inequality, as well as external shocks such as climate change, warfare (including due to hostile migration), rebellion, and earthquakes.

[Systemic Risk and Resilience: The Bronze Age Collapse and Recovery](#) in 'Perspectives on Public Policy in Societal-Environmental Crises' 20 October 2022 by [Luke Kemp](#), Eric Cline.

In this chapter we apply the concepts of resilience theory and systemic risk to the Bronze Age Collapse. We contend that this was a case of synchronous failures driven by both long-term trends in interconnectedness and inequality, as well as external shocks such as climate change, warfare (including from hostile migration), rebellion, and earthquakes. This set off a chain reaction as the loss of key cities destabilised the trade-network and undermined state revenue, leading to further rebellion, migration, and warfare. Eventually, enough cities were destroyed to undermine the economic, cultural, and political fabric that held the Bronze Age together. Many states recovered and displayed resilience through the Bronze Age systems collapse. No two states were alike in their resilience. The Neo-Assyrians persisted by moving from a strategy of trade to conquest. The surviving Hittites in northern Syria, in contrast, relied on the modularity of their semi-feudal structure. Systemic risk and resilience are helpful lens for viewing the Bronze Age collapse and recovery, as well as taking lessons for the modern globalised world. It at least provides historical grounds for believing that synchronous failures can happen and can be lethal to states.

Alex McLaughlin published a review of *Moralizing Hope* by Daniel Moellendorf, in which he argues that the book “leaves us with a

clear frame for viewing the moral problems associated with climate change” but that “Moellendorf could do more to unpack his account of hope-makers, particularly in relation to how we might expect change to occur in the messy context of climate politics.”

Book review: *Moralizing Hope* by Daniel Moellendorf in *Ethics, Policy, and Environment* 30 September 2022 by [Alex McLaughlin](#).

If we are to have a chance of limiting climate change to 1.5C, the production of energy through fossil fuels must be rapidly reduced and then ceased altogether. The problem is that urgent poverty alleviation requires that many are able to increase their energy use, since ‘[s]ignificant human development gains are reliably accompanied by dramatic increases in per-capita energy consumption’ (p. 2). This is the reality that frames Darrel Moellendorf’s excellent new book, *Mobilizing Hope*. There is, in his view, no avoiding what follows. The central task for the coming decades is ‘to decarbonize the global economy and to expand immensely the production and consumption of energy so as to fuel poverty alleviation programmes globally’ (p. 7). That is a daunting task. *Mobilizing Hope*’s important contribution to it is to reveal and, where possible, resolve the many moral tensions that climate change policy has to navigate.

Luke Kemp and other authors of [Climate Endgame](#) have contributed to academic discussion around this important paper. This has included publishing replies to Ilan Kelman on the foundations for studying catastrophic climate risks and Matthew G. Burgess, Roger Pielke, and Justin Ritchie on whether catastrophic climate risks are neglected, plausible, and safe to study.

Reply to Burgess et al: *Catastrophic climate risks are neglected, plausible, and safe to study* in *PNAS* 10 October 2022 by [Luke Kemp](#), Chi Xu, Joanna Depledge, and Timothy M. Lenton.

We thank Burgess et al. for their contribution, “Catastrophic climate risks should be neither understated or overstated,” in response to “Climate Endgame”. We agree that studying catastrophic climate scenarios and extreme risk mitigation is imperative.

Reply to Kelman: *The foundations for studying catastrophic climate risks* in *PNAS* 10 October 2022 by [Luke Kemp](#), Chi Xu, Joanna Depledge, Timothy M. Lenton

We appreciate Dr Kelman’s contribution “Connecting Disciplines and Decades” in response to “Climate Endgame”. We naturally agree with Dr Kelman that exploring catastrophic climate scenarios is vital, neglected, and possible.



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