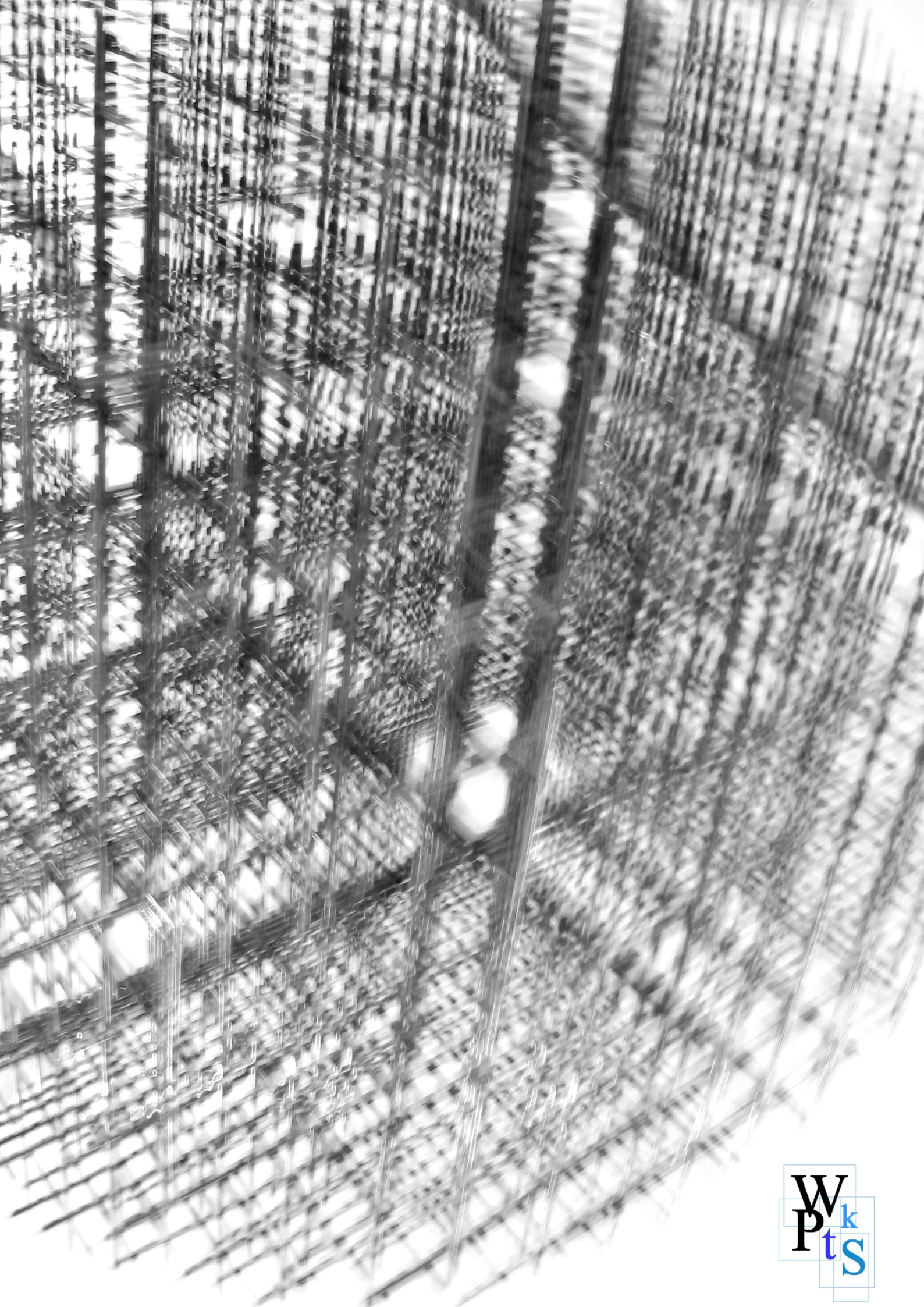


Working Papers Cultural and Sociotechnical Studies

Volume 13 (8)
no 08/2026
DOI https://doi.org/10.18716/ojs/wpkts/2026.14040

www.wpkts.de
(ISSN 1866-3877)

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Foreword

Working Papers Cultural and Sociotechnical Studies series is a forum for exchanging with early career researchers who have situated their seminar papers, theses or research papers within a primarily cultural and sociotechnical framework.

A perspective on technology and culture from the humanities and social sciences is characterized, among other things, by viewing the relationship between technical artifacts and the social contexts in which they are embedded as interdependent—constitutive to both sides equally. This characteristic of perspectives on technology and culture is captured in the title of this series, which suggests that technology is shaped by sociocultural contexts and, in turn, leaves its own mark on society. As ambiguities emerge between the diverse contexts of research, development, manufacturing, embedding, and usage, it is evident that varying focal points and orientations influence the relationship between the social and technology. In highly differentiated societies, the relationship between the social and technology is marked by specific dynamics of disembedding and reembedding.

These dynamics can be appropriately deciphered through a combination of reconstructive and deconstructive strategies. Therefore, the series includes historical as well as artistic approaches to technical artifacts.

The series *Working Papers Cultural and Sociotechnical Studies* provides a forum for low-threshold exchange with colleagues and is open to artists, scientists, and students from all universities, disciplines, and institutes for the publication of their research and qualification papers. The thematic framework is intentionally broad and can be approached through various forms of presentation, ranging from essays to research outlines and articles.

The series has been published since 2008. Each issue can be accessed online (www.wpkts.de) as a PDF document.

The publishers

June 2026

Entangled Threats: What the Warnings of the 1980s Mean for Existential-Risk Research

Elli Danae Vartziotis

National and Kapodistrian University of Athens/ Department of History and Philosophy of Science (PhD candidate) / elvartz@phs.uoa.gr

Keywords

Existential Risk, Sociology of Risk, Climate Change, Nuclear Winter, Artificial Intelligence

Abstract

Contemporary research on existential threats often treats artificial intelligence, climate change and nuclear war as distinct risks to be compared and ranked. This working paper asks what the history of catastrophic warning can contribute to such research. Drawing on Matthias Dörries's studies of the "nuclear winter" theory (1983) and of German physicists' warning of a "climate catastrophe" (1986), and on concepts from the sociology of risk and technology and from science and technology studies, it develops four questions: who defines a threat and with which tools; how threats and proposed technological responses become connected; how catastrophic knowledge changes as it circulates between research, institutions and the public; and what it means to warn responsibly about an uncertain future. These questions are then related to current debates on artificial intelligence, which is framed both as a possible existential threat and as a means of addressing other threats, while its energy demand has become part of debates about nuclear power. The paper argues that existential threats should be studied not only as separate hazards to be ranked but also as interconnected, historically situated sociotechnical problems.

Foreword

This paper develops a contribution to the session "History of Science, STS, and Existential Threats: Research Challenges" at the ESST Research Workshop, Institute for Mediterranean Studies (IMS), Rethymno, Crete, on 12 May 2026. The session discussed articles by Matthias Dörries with researchers of the PHEPoC-STS(Lab) and the NKUA Observatory for Research on Existential Threats. I thank the workshop organizers and the session participants for the discussion.

1 Introduction

Contemporary research on existential threats often discusses artificial intelligence, climate change, nuclear war and engineered pandemics as distinct categories of risk, sometimes assigning each a probability of existential catastrophe (e.g. Ord 2020). Such comparisons can be useful, but they can also leave the histories, institutions and scientific practices through which risks are identified and evaluated out of view. The ways scientists have understood and warned about large-scale catastrophe have a longer history.

Matthias Dörries's studies of nuclear winter and climate catastrophe show how scientific disciplines, research institutions, political circumstances and public communication shaped two prominent warnings of the 1980s (Dörries 2011, 2014). Rather than offering a new reconstruction of those episodes, I use his historical analyses to ask what they can contribute to the study of existential threats today, particularly debates about artificial intelligence. Four questions guide the discussion: who defines a threat and with which tools; how different threats and proposed responses become connected; how catastrophic knowledge changes as it moves between research, institutions and the public; and what it means to warn responsibly about an uncertain future.

Bringing these histories into conversation with contemporary existential-risk research raises questions about how threats are defined, studied and communicated, and what

becomes less visible when they are investigated and evaluated as separate categories. The historical cases suggest the importance of examining the scientific practices, institutions and technological choices that connect them.

The discussion draws on Dörries's historical research, alongside the work of Badash (2009) and Weingart et al. (2000), and on concepts from the sociology of risk and technology and from science and technology studies (STS). It also uses selected sources from contemporary debates on existential risk, AI and energy. It is a historically informed perspective rather than a systematic comparison of past and present. Its purpose is to identify questions that the historical cases raise for contemporary research, not to suggest that the warnings of the 1980s and present-day existential-risk assessments are equivalent.

Section 2 introduces the sociological concepts used in the paper. Section 3 presents the two warnings of the 1980s. Sections 4 to 7 take up the four questions in turn, and Section 8 concludes.

An AI assistant (Claude, Anthropic) was used to propose structural revisions and edit language, that I then revised. The four questions, their interpretation and the analysis are my own and were first presented orally in May 2026. I reviewed and revised all text and take full responsibility for the content.

2 Catastrophic risk as a sociotechnical problem

The sociology of risk offers a vocabulary for these questions. In 1986, the same year the term *Klimakatastrophe* entered German debate, Ulrich Beck published *Risikogesellschaft* (Beck 1986). Beck argued that modernization produces hazards that are often imperceptible to the senses and become socially visible mainly through scientific knowledge. He summarized the shift as a move from the statement "I am hungry!" to "I am afraid!" (Beck 1992: 49, quoted in Dörries 2014: 187). Dörries (2014: 187) sees Beck's book as the intellectual analysis of German debates of the 1980s. In later work Beck described the rules, institutions and capacities through which risks are identified

and assessed as "relations of definition" (Beck 2008: 8): the question of who is able to declare something a risk, and on what grounds. The social amplification of risk framework adds that signals about risk are intensified or weakened as they pass through "amplification stations" such as scientists, institutions and the media (Kasperson et al. 1988: 181).

Science and technology studies add two concepts. The idiom of co-production describes how knowledge about the natural world and arrangements of social order are mutually constituted, rather than one simply following from the other (Jasanoff 2004). Sociotechnical imaginaries are collectively held visions of desirable futures attained through science and technology (Jasanoff & Kim 2015).

These concepts are used here as orienting tools rather than as a single theoretical framework. Each helps to sharpen one of the four questions that follow.

3 Two warnings of the 1980s

In December 1983 five scientists, Richard Turco, Owen Brian Toon, Thomas Ackerman, James Pollack and Carl Sagan, known by their initials as TTAPS, published in *Science* the results of models of the atmospheric effects of a nuclear war (Turco et al. 1983). Earlier studies had already examined the atmospheric effects of nuclear explosions (Dörries 2011: 199, 204), but TTAPS brought particular attention to smoke from burning cities and industrial sites and its potential consequences for global climate. They concluded that this smoke could block sunlight and lower surface temperatures across large parts of the globe for months. Sagan brought the finding to a wider public the same year, including in *Foreign Affairs* under the title "Nuclear War and Climatic Catastrophe" (Sagan 1983). Because the theory could not be tested directly, the scientific and political controversy continued through the 1980s without definitive closure (Badash 2009; Dörries 2011).

Early in 1986 the working group on energy (*Arbeitskreis Energie*, AKE) of the German Physical Society issued a public warning of an "impending climate catastrophe," calling

for drastic and immediate cuts in emissions of trace gases (AKE 1986, translated in Weingart et al. 2000: 268). The warning followed the 1985 Villach conference, where meteorologists had called for government action on rising temperatures. It appeared amid intense debate over nuclear energy and weapons in West Germany, and the Chernobyl accident in April 1986 further intensified the catastrophic discourse (Dörries 2014: 184–185). In August, *Der Spiegel* placed "Die *Klima-Katastrophe"* on its cover, above an image of Cologne Cathedral standing in the sea (Der Spiegel 1986). The term moved between scientific, political and media discussions, acquiring meanings beyond those initially intended by the physicists (Weingart et al. 2000; Dörries 2014).

As Dörries shows, both episodes involved scientists publicly warning about large-scale future consequences that could not be directly observed and whose assessment depended substantially on scientific models and projections. This makes them useful historical points of comparison for contemporary debates about possible future catastrophes, while the differences between the cases remain important.

4 Who names a risk shapes how it is understood

A first question raised by Dörries's work concerns the backgrounds of those who identify and investigate catastrophic risks. Neither warning came exclusively from the specialists one might initially expect. The term "climate catastrophe" was introduced by physicists working on energy issues, for whom the future of nuclear energy was an important concern (Weingart et al. 2000; Dörries 2014: 184–185). Nuclear winter emerged from a collaboration among scientists trained in planetary research, atmospheric chemistry and modeling, with different experiences of military and civilian research. Several had studied the atmospheres of Mars and Venus; Toon's doctoral thesis, for example, was titled "Climatic Change on Mars and Earth" (Toon 1975; Dörries 2011: 210–214).

Dörries traces how these trajectories shaped the questions and methods brought to nuclear winter research. Planetary and atmospheric scientists applied aerosol and cli-

mate models to nuclear war, drawing attention to its possible effects on global temperature. The term "nuclear winter" itself helped direct scientific and public attention toward this parameter (Dörries 2011: 223). In the German case, the physicists' climate warning was also bound up with their argument for nuclear power (Dörries 2014: 185). The point is not that disciplinary background determines a scientist's position, but that research questions and methods develop within particular professional and institutional settings. Read through Beck's (2008) concept of relations of definition, these cases draw attention to the authority of particular scientific communities to identify catastrophic threats, and to the role of their methods and concerns in shaping how those threats are understood.

This history suggests a question for contemporary existential-risk research: how do the disciplines, methods and institutional aims of researchers shape which threats are studied and how they are compared? Toby Ord, writing from philosophy, estimates the chance of existential catastrophe from unaligned AI over the next century at about one in ten, compared with about one in a thousand each for climate change and nuclear war (Ord 2020: 167). Kemp and colleagues, approaching the problem through climate and risk research, argue that catastrophic climate scenarios have received insufficient attention (Kemp et al. 2022). Their different assessments do not by themselves show that discipline explains the disagreement; they involve different questions and forms of analysis. Read together, these approaches raise questions about how different research communities define catastrophic outcomes, select problems for investigation and assess what remains uncertain.

5 Catastrophic risks come entangled

A second question concerns how different threats and proposed responses become connected. Dörries's work challenges histories that keep nuclear and climate concerns apart. His 2011 article shows how research on the consequences of nuclear weapons drew on, and contributed to, the development of atmospheric and climate science. His 2014 article examines a different connection: the use of a climate-catastrophe warning

in arguments over nuclear energy. Read through Jasanoff's (2004) concept of co-production, these histories invite attention to how scientific knowledge about catastrophic threats develops alongside institutional arrangements, political priorities and technological responses.

In one direction, nuclear energy was proposed as a response to climate change. The AKE physicists regarded it as a means of reducing carbon dioxide emissions. By speaking of "catastrophe," they placed their argument in direct competition with warnings about nuclear catastrophe made by opponents of nuclear power (Dörries 2014: 185). Two decades later James Hansen, a prominent advocate of stronger action on climate change, also supported a new generation of nuclear reactors (Hansen 2009; Dörries 2014: 194).

In another direction, Cold War research provided institutions, funding and modeling practices that became important to the study of climate. Numerical weather prediction and climate modeling developed in close relationship with postwar computing and military research (Edwards 2010). As Dörries (2011: 204, 223) shows, nuclear winter researchers drew on tools and questions developed in this setting, while their findings helped focus attention on the global climatic consequences of human action. These links concern nuclear weapons research and climate science, and should not be confused with the separate political argument for civilian nuclear energy.

Artificial intelligence offers a contemporary case in which these relationships deserve renewed attention. AI researchers and industry figures have called for the risk of extinction from AI to be treated as a global priority alongside pandemics and nuclear war (CAIS 2023). At the same time, expanding data-center electricity demand, to which AI contributes, is becoming part of debates about energy supply. The International Energy Agency projects that global electricity demand from data centers will more than double by 2030 (IEA 2025). In September 2024 Microsoft agreed to purchase electricity from a planned restart of a reactor at the Three Mile Island site, where a different reactor suffered the 1979 accident (Constellation 2024).

These developments do not show that today's circumstances simply repeat those of the 1980s. They do suggest the value of asking how AI's energy requirements are linked to the promotion of particular energy infrastructures. Jasanoff and Kim's (2009) work on sociotechnical imaginaries offers one possible approach to investigating how AI and nuclear energy are being linked to particular visions of technological development and desirable futures. There is a further tension specific to the AI case: AI is discussed both as a possible existential threat and as a tool for responding to environmental problems, while its own material and energy requirements raise additional environmental concerns. Extending Dörries's historical perspective to this setting means examining these relationships together, rather than placing AI, climate change and nuclear technologies in separate accounts of risk.

6 How catastrophic knowledge changes as it circulates

A third question concerns how catastrophic knowledge changes as it moves between research, institutions and the public. The framing of catastrophe does not begin in the media. This is already central to Dörries's analysis. He shows how researchers' choices, institutional pressures and public communication shaped the warnings of the 1980s before and after they reached wider audiences (Dörries 2011, 2014). Weingart et al. (2000) similarly examine the distinct discourses that developed across science, politics and the mass media. The social amplification of risk framework offers a related vocabulary: signals about risk are intensified or weakened at each station they pass through, and scientists and their institutions are among these stations, not only journalists (Kasperson et al. 1988).

Dörries notes that the AKE physicists' 1986 warning included speculative temperature and sea-level scenarios without adequately acknowledging the uncertainties of climate research at the time (2014: 185). In the nuclear winter case, the phrase itself emerged in response to NASA's reluctance to use "nuclear war" in scientific publication titles; the alternative proved especially memorable (Badash 2001: 87; Dörries 2011: 198).

These are different examples of how a scientific warning can be shaped before it reaches the news media.

The media then contributed further transformations. The *Spiegel* cover of August 1986 turned a gradual and uncertain process into an image of its catastrophic endpoint. In 1987 the German Physical Society and German Meteorological Society used the less dramatic term "climate changes" (*Klimaänderungen*) in a joint statement, but "climate catastrophe" had already taken hold (DPG & DMG 1987; Dörries 2014: 185–186). As Dörries argues, dramatic representations could attract attention while diverting it from the ongoing processes and political choices that scientists wanted to address.

The implication for contemporary existential-risk research is not that every choice of emphasis amounts to distortion. Scientific work necessarily selects problems, variables and uncertainties. Rather, it is important to examine those choices and how they change as findings become institutional statements and public warnings. For research that presents AI as a response to environmental problems, for example, a relevant question is which benefits, limitations and material costs are discussed in scientific publications themselves, before considering how those findings are communicated elsewhere.

7 Warning is not the same as pessimism

A fourth question concerns what it means to warn responsibly about an uncertain future. Dörries's historical analysis shows that warnings about future catastrophe have long faced accusations of alarmism. In 1972 John Maddox, editor of *Nature*, began *The Doomsday Syndrome* by observing that "prophets of doom have multiplied remarkably in the past few years" (Maddox 1972: 3, quoted in Dörries 2014: 190). Among his targets were Rachel Carson, Paul Ehrlich and Barry Commoner. He objected to uncertain findings being presented in frightening language and defended a more optimistic view of scientific and technological progress (Dörries 2014: 190). Maddox's critique can be read as boundary-work in Gieryn's (1983) sense: an effort to separate

legitimate science from what he presented as fear-driven speculation, and so to decide who could speak for science about the future.

A different criticism appears in social-science discussions of catastrophe language. Hulme (2009) questions the consequences of particular ways of framing climate change, while Swyngedouw (2010) argues that apocalyptic discourse can narrow political debate. These criticisms should not be equated with Maddox's defense of technological optimism. They instead raise questions about whether the language of catastrophe helps make alternatives visible or discourages disagreement about how to respond.

Dörries examines this tension through James Hansen, who argued that excessive scientific caution could itself be dangerous, while increasingly presenting climate catastrophe as an urgent public concern (Hansen 2007: 32, cited in Dörries 2014: 197). Hansen's appeal to future generations was especially clear when he described Earth as "an intergenerational commons" (Hansen 2009: 270, quoted in Dörries 2014: 196). Dörries does not simply endorse Hansen's rhetoric: he also questions what happens when a possible catastrophe is presented as a foregone conclusion. At the same time, he cautions against dismissing warnings as irresponsible fear-mongering and draws on Joanna Bourke's observation that fear and hope can be part of reasoning about the future (Bourke 2003: 126, cited in Dörries 2014: 197).

For contemporary existential-risk research, the question is therefore not whether to warn or remain optimistic. Warning can express the belief that action may still prevent or reduce harm, but its political effects are not guaranteed. What matters is how researchers communicate uncertainty, explain possible responses and leave room for discussion about what should be done. In this sense, the history of catastrophic warnings offers a way to examine the responsibilities attached to present-day claims about existential threats, without either dismissing such claims as alarmist or accepting them without scrutiny.

8 Conclusion

Dörries's histories of nuclear winter and climate catastrophe show that catastrophic warnings cannot be understood apart from the scientists, institutions, research tools and political settings in which they emerge. They also demonstrate that nuclear and climate concerns have long been connected, and that warnings can change meaning as they move between scientific and public settings. These historical findings are Dörries's. Building on these findings, this paper argues that a historically informed approach to existential threats can reveal connections between scientific practices, institutional priorities and technological responses that may remain less visible when risks are studied as separate categories.

Four questions follow. Who defines a threat, and how do disciplinary and institutional settings shape that definition, in Beck's terms its relations of definition? How do risks and proposed technological responses become connected, and which sociotechnical imaginaries sustain those connections? How do scientific assessments become public warnings, and what is amplified or lost at each step? Finally, how can researchers communicate the possibility of catastrophe while preserving uncertainty and space for political choice?

AI makes these questions especially relevant because it is presented as both a possible threat and a means of addressing other threats, while depending on material and energy infrastructures that create problems of their own. Examining how these relationships operate requires further research. The historical comparison suggests why existential threats should be studied not only as separate hazards to be ranked, but also as historically situated sociotechnical problems of knowledge, technology and politics.

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