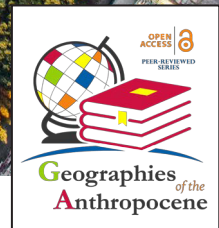


GLOBAL THREATS IN THE ANTHROPOCENE: FROM COVID-19 TO THE FUTURE

Leonardo Mercatanti - Stefano Montes (Editors)

Foreword by Paul Stoller

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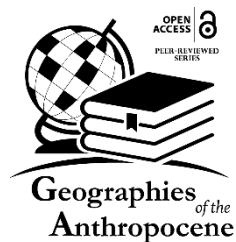


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Leonardo Mercatanti

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Editors



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Geography, Geoethics, Philosophy, Socio-Anthropology, Sociology of Environment and Territory, Psychology, Economics, Environmental Humanities and cognate disciplines.

Geoethics focuses on how scientists (natural and social), arts and humanities scholars working in tandem can become more aware of their ethical responsibilities to guide society on matters related to public safety in the face of natural hazards, sustainable use of resources, climate change and protection of the environment. Furthermore, the integrated and multiple perspectives of the Environmental Humanities, can help to more fully understand the cultures of, and the cultures which frame the Anthropocene. Indeed, the focus of Geoethics and Environmental Humanities research, that is, the analysis of the way humans think and act for the purpose of advising and suggesting appropriate behaviors where human activities interact with the geosphere, is dialectically linked to the complex concept of Anthropocene.

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The choice of digital Open Access format is coherent with the flexible structure of the series, in order to facilitate the direct accessibility and usability by both authors and readers.

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8. Citizen, Geoscientist and Associated Terra-former

*Martin Bohle*¹

Abstract

This essay focuses on the specific societal responsibility of geoscientists. The experiences with the COVID-19 health pandemic of the years 2020/2021 provide a lens to situate geosciences/earth-sciences in contemporary societies. The pandemic illustrates the essence of any possible Anthropocene, namely, less a geological epoch than a *'future World'*. Contemporary humans operate a planetary technosphere to secure their daily living. Nowadays, the technosphere is part of the Earth System. That feature is at the origin of the Anthropocene. Geoscientific knowledge is a corpus of insights about the functioning of the abiotic systems of planet Earth. It enables contemporary technologies and cultures; hence, it co-shapes the technosphere. Likewise, geoscience knowledge enables people to evaluate anthropogenic changes in societal contexts, even as mere consumers of resources. Furthermore, citizens need insight into how the Earth System works to make informed decisions. Therefore, the societal responsibility of geoscientists is central because geoscientific expertise is crucial for making anthropogenic change occur. Geoscientists help achieve anthropogenic change and make the change global. Therefore, they are (like) assistant terra-formers. Subsequently, geoscientists should assume the responsibility that comes with their role as agents of technology-driven change. That is the essence of [geo]ethics and being a citizen.

Keywords: geosciences, geoethics, Anthropocene, pandemic, social-ecological systems

1. An Introduction to Contexts and Notions

The notion of *'pandemic'* is more than a name for a widespread disease outbreak. In the following, I consider *'the modern way of life'* to be a pandemic. Subsequently, I illustrate the societal relevance of geosciences.

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Before addressing this topic, the notions, respectively, the concepts of ‘pandemic’, ‘globalisation’ and ‘Anthropocene’ are examined for overlapping meanings.

Starting with semantics, the word ‘pandemic’ stems from ancient Greek meaning ‘all’ (*pan*) and ‘people’ (*demos*). Hence, a ‘pandemic’ is something familiar to the citizens of every single *polis*. Borrowing the concept and notion from classical Greek culture, a ‘polis’ is an entity of shared political, legal, legal, religious, and social institutions and practices. Hence, ‘citizenry’ may be a modern synonym.

Understanding the word ‘pandemic’ as a health term is an example of various meanings. Other meanings are found, for example, in biology or political sciences. To illustrate, Martin Filler writes in the New York Review of Books² (2009, Sept. 24), “*globalisation, the most thoroughgoing socioeconomic upheaval since the Industrial Revolution, which has set off a pandemic of retrogressive nationalism, regional separatism, and religious extremism*”. This quote also reveals pandemics mainly as cultural phenomena rather than natural events.

The global COVID-19 pandemic, developing from early 2020 onward, illustrates the property ‘cultural phenomena’ of pandemics: how the coronavirus originated in society (markets), how the disease spread (meetings, travel), or how to contain outbreaks (social distancing) - each of these particularities was mainly cultural. The same can be said of the experiences on how to develop, produce, and distribute vaccines. How COVID-19 has spread through all (*pan*) people (*demos*) of the World to affect any citizenry (*polis*) made it a perfect tracer of human interactions in a World of a globalised division of labour and planet-wide supply-chains.

Provocatively phrased, the coronavirus traced the ‘*anthropos*’ (human) across the globe. That could happen because the human population, the ‘*Anthropocene-maker*’, provided an excellent host-environment by the mere number of individuals, a technosphere for the swift exchange of persons, goods and information, and lifestyles tuned for multiple encounters with different people. In that sense, human practices, behaviour and lifestyles are pandemics. Therefore, being ‘pandemic’ is the essence of the ‘*Anthropocene*’.

Contemporary humankind, which currently numbers nearly almost eight billion people, needs a globalised ‘polis’ to supply food, goods and security for a decent life. Under the given circumstances, namely the mere number of

² [*] <https://www.merriam-webster.com/dictionary/pandemic>; consulted 15th March 2021.

people, the affluence of several and the poverty of many, globalisation is not a question *'of whether'*. It is a question of *'how'*. How food and goods are produced and distributed through a global (industrial and agricultural) technosphere is a concern of all people. Hence, *'globalisation'* is the *'pandemic'* event of contemporary times, and both notions can be considered somewhat synonymous.

Over the last centuries, the human population growth has wiped out any alternative to a pandemic or globalised society, the Anthropocene. Unfortunately, the recent past left an unpleasant legacy for now and the future. The way raw materials and natural resources were used in the recent past (and are used today) has caused global change. Climate change is just the best-known example. Anthropogenic global change, such as climate change, affects all people; therefore, it is a pandemic *'par excellence'*.

The neologism *'Anthropocene'* did not appear within the geoscientific community (Finney, 2014). As far as geoscientists are concerned, acknowledging that the Holocene has ended (Waters *et al.*, 2016) also means recognising that the human pandemics have reached geological records (Zalasiewicz *et al.*, 2019). The notion of *'Anthropocene'* provoked sceptical reactions because it obscures the responsibility of historical actors and contexts (e.g. Sayre, 2012; Palsson *et al.*, 2013; Haraway, 2015; Lövbrand *et al.*, 2015; Walton & Shaw, 2015; Autin, 2016; Clark & Yusoff, 2017). However, *mutatis mutandis*, the neologism *'Anthropocene'* stands as an abbreviation of the expected outcomes of humankind's current development path, i.e. for humankind's imminent future.

2. The COVID-19 Pandemic, a Rehearsal

The COVID-19 health pandemic offers three rehearsals; about social-ecological systems, performativity, and regime shifts.

2.1. Social-ecological Systems

A pandemic is a social-ecological system, a specific network of natural and cultural processes. Complex-adaptive dynamics characterise such systems and make their management challenging (Lenton & Van Oijen, 2002; Preiser *et al.*, 2018).

The economic and technical characteristics of affluent societies cause massive interactions between the (human) World and Nature. Natural

processes and cultural practices combined with subsequent impacts at a planetary scale (Rosol *et al.*, 2017; Dyer-Witheford, 2018; Lewis & Maslin, 2018). The COVID-19 health pandemic covered distances in days when the bubonic plague of the 14th century needed years. The biological characteristics of the virus do combine with features of a globalised economy. These features include the mobility of individuals, a planetary network of hegemonic cultures, global transport of goods, and worldwide exchange of information. For example, the incubation period of the disease, i.e., when infected individuals can spread the disease and show no symptoms, is long compared to the typical timescale of multiple interactions between people in space, time, and social distances. These experiences of the COVID-19 health pandemic show how apparent '*local events*' swiftly reach remote places through agile supply-chains and networks.

2.2. Performativity

Performativity is essential for collective sense-making and action. That is, language can function as a form of social action and have the effect of change (Herrmann-Pillath, 2020).

Today's globalised societies give technology-mediated sense-making processes a prominent place. The notions of communication, news or media label these processes. Media drive people's response to the pandemic in places other than '*hot spots*.' Many people, if not most, lack hands-on experience with the COVID-19 disease. For example, people do not witness the disease among the people they are dealing with daily. The disease is acknowledged to be present, although it is not physically visible. The number of infected people is minor compared to the total population, less than 10% in the larger countries most affected³. The pandemic is '*internalised*' primarily by the media and later by voluntary or coerced social practices. Such experiences also characterise the understanding of climate change and related shifts in extreme weather events. Most people in affluent societies learn about extreme weather conditions from media reports.

³ 10% are reached in same small European countries like Czechia or Slovakia (<https://ourworldindata.org/coronavirus>; accessed 02 March 2021).

2.3. Regime Shifts

Tipping points and hysteresis are critical features of regime shifts and difficult to handle (Rocha *et al.*, 2018; Lenton *et al.*, 2019).

The development of the COVID-19 pandemic does not fit the typical pace of social response. The societal mechanisms of knowledge exchange and cooperation development seem ill-suited to handle the geographical spreading and exponential growth (and decay) of infections. Used to proportion relations of inputs and outputs, institution and governments have been overwhelmed to make sense of the events and act accordingly. Such experiences should be relevant for the (incoming) Anthropocene.

3. The Societal Contexts of the Geosciences

Geosciences are an amalgam of basic and applied research fields and practices, mainly using natural sciences and engineering disciplines. (Bohle & Bilham, 2019). Together, they nurture a body of trusted knowledge about natural processes that can inform how humans could act within the Earth System (Steffen *et al.*, 2011; Ogden *et al.*, 2013; Redman & Miller, 2015; Lenton & Latour, 2018). Therefore, contemporary geoscience knowledge is of very high operational value for the functioning of modern societies. For example, no anthropogenic climate change would happen without geoscientists finding coal, oil and minerals, or forecasting weather conditions for shipping commodities worldwide, estimating natural hazards to infrastructures, or the stability of foundations of buildings.

3.1. The Soft Underbelly of the Geosciences

Responsible science is a public good (Murphy *et al.*, 2015; Blok, 2018). Although such findings are still being questioned to some extent, they have taken root in today's societies (United Nations, 2013) and are operationalised (Schneider *et al.*, 2019).

Professional associations of geoscientists acknowledge the implications of geoscience expertise for addressing global societal challenges (e.g., Montanari *et al.*, 2020). However, geoscience knowledge alone does not guide how people should act. Other knowledge areas are required, including social sciences and humanities (Peppoloni *et al.*, 2019; Marone & Bohle, 2020).

Specifically, the question of '*what ought to be done*' is dealt with by ethics. In the specific circumstances of geosciences, the question may be dealt with through an adjusted form of professional ethics. Nevertheless, even without specific indications of acting ethically as a geoscientist, professional expertise comes with responsibilities towards other people and communities because science shall serve society (Bernal, 1939). Such responsibility can be understood either as a professional duty or as an obligation of a citizen.

Depending on the ethical framework a person uses, views will differ regarding '*what ought to be done*'. However, many people would expect that knowledge should be shared to prevent avoidable harm. Many people also would expect that scientific knowledge is available to those who need it. For the following discussion, we do not need to refine such '*folk wisdom*'. Instead, many people would likely expect geoscience knowledge to be shared with them because they live on Earth; day-in-day-out. Therefore, they will expect '*we ought to get informed about how the Earth System functions*'.

3.2. Geoethics within Geosciences

Like many other scientific communities, geoscientists recently strengthened their professional, ethical frameworks. It is an ongoing debate whether suchlike '*geoethics*' should be a kind of augmented code of conduct for geoscientists (Peppoloni *et al.*, 2019), a kind of branding (Bohle & Marone, 2021), or a broader philosophical framework (Peppoloni & Di Capua, 2020).

Predating these recent debates, '*The Cape Town Declaration on Geoethics*' was agreed in 2016 and published in many languages (Peppoloni, 2018). It outlines an '*agent-centric virtue-ethics*' for professional geoscientists. It promotes responsible and knowledge-based action (Di Capua *et al.*, 2017). The declaration emphasises: "*Raising the (geo)ethical awareness and competences of the members of the geoscience community is essential, also to increase trust and credibility among the public.*"

In this established context, the question arises of what should be expected from the geoscientists in the Anthropocene. Namely, should geoscientists, like medical caregivers in times of a health pandemic, be called to heal '*the pains of the Anthropocene*'? Are they called, even by '*folk wisdom*', to make a dedicated contribution? My response is affirmative because the

social contexts of their disciplines empower geoscientists to make a unique contribution (Bohle & Bilham, 2019).

Hence, the societal prospects of the Anthropocene call upon the members of the geoscience community. Hamilton (2017; p. 150, emphasise in the original) states about the actions of citizens in the Anthropocene that *'they fall on a scale of care and neglect'* because *"[w]hen humans formed an independent relation with the Earth, we were left to choose between a path of care and a path of neglect."* Therefore, geoethical behaviour may be a choice in the Holocene, but it is an obligation in the Anthropocene.

3.3. Normative Geoethical Preferences

Geoethics is a specific tool designed for geoscientists (Bohle *et al.*, 2019). Citizens require a more general tool that embeds the specificities of geoethics into a broader framework. The work of Kohlberg and Jonas, namely the moral adequacy of the societal organisation (Kohlberg, 1981) and the imperative of responsibility for those who use technologies (Jonas, 1984), provide an option to that end.

Geoethics and the work of Kohlberg and Jonas combine into a framework of six *'normative preferences'* (Marone & Bohle, 2020). The axis of the framework is *'agent-centricity'*. The spokes are a human agent who is *'virtuous'* and *'responsible'* and whose actions are *'knowledge-based'*, *'inclusive'* and *'applying universal rights'*. Described in that manner, geoethics for citizens can be designed (Bohle, 2021) with geoscientific knowledge (e.g. earth science literacy or geo-literacy) being an essential part of the knowledge base (Wyssession *et al.*, 2012; Stewart and Nield, 2013).

The call to be *'virtuous and responsible'* and act *'knowledge-based, inclusive and applying universal rights'* is ambitious. It seems even more ambitious if the concerned human agent must decide under given circumstances *'what ought to be done'* because only a set of unranked *'preferences'* is outlined instead to describe obligations. The pluralism of (ethically sound) outcomes is a characteristic of geoethical thinking to take account of the diversity of the World (and Nature), to call for inclusion, and to empower the human agent to cope with both diversity and inclusion (Peppoloni *et al.*, 2019).

Mutatis mutandis, lucky those who faced virtuous and responsible agents in the COVID-19 pandemic and witnessed acts that were knowledge-based, inclusive and applying universal rights.

4. Anthropogenic Global Change

4.1. Past and Present

Humanity changed natural environments to acquire resources in any prehistoric and historical epoch (Ellis, 2015; Fuentes, 2017; Ruddiman *et al.*, 2020). The history of hydraulic constructions highlights it (Viollet, 2000; Wilkinson *et al.*, 2015).

In the last century, the socioeconomic practices of humanity have intervened in Earth's natural systems much more extensively than ever before (Barnosky *et al.*, 2012; Steffen *et al.*, 2015). The increasing number of people living on Earth and the wasteful use of resources in wealthy regions culminate in global anthropogenic change (Steffen *et al.*, 2011; Zalasiewicz *et al.*, 2014; Kunnas, 2017). Therefore, the notion of '*Anthropocene*' should be used, including recognising the societal processes that lead to it (Dryzek & Pickering, 2019). The notion of '*Anthropocene*' (i.e. anthropogenic global changes) describes humans controlling the appropriation of biotic and abiotic resources from natural environments on a planetary scale through hegemonic systems of cultural values, decisions and lifestyles (Redman & Miller, 2015; Herrmann-Pillath, 2018; Wright *et al.*, 2018). That is the essence of this notion, although its onset may be placed several centuries ago (Lewis & Maslin, 2018).

Contemporary societies bind the entire globe into a social-ecological system through global supply chains and all-embracing division of labour. They make extensive use of geosciences in economic, social and cultural activities. The social (sub)systems of the Earth System are profoundly linked to the physical and biological (sub)systems of the Earth (Krausmann *et al.*, 2013, 2017; Gill & Bullough, 2017; Rosol *et al.*, 2017; Reyers *et al.*, 2018). Likewise, production systems and consumption patterns combine human activities and the geosphere through cycles of matter, energy and information. Greenhouse gas emissions are the most prominent example. Other examples include the nitrogen cycle or the global agricultural system (Zhang *et al.*, 2015; Campbell *et al.*, 2017; Morsetto, 2019).

Artisans, technicians, architects and engineers use geoscientific knowledge to change natural environments or create artefacts. Mineral extraction, the laying of building foundations, or the management of floodplains are examples. Large infrastructures such as coastal defences, hydroelectric power stations or urban dwellings are physical manifestations of how people act on Earth. The philosophical frameworks for justifying infrastructures, production systems or consumption patterns vary over time

(Ellis, 2011; Fressoz, 2012; Purdy, 2015). Neither large infrastructures nor production systems or consumption patterns can be erected without a profound geoscientific culture that includes scientific understanding, technological know-how and social justifications (Moore, 1996; Peppoloni & Di Capua, 2012; Frodeman, 2014; Haff, 2014; Stewart & Gill, 2017).

Artists, poets or philosophers of many times and cultures refer to the Earth as they reflect on human identity. Perhaps the earliest (known) reference for such thoughts is the Gilgamesh epic of the third millennium BC (George, 2000). Modern geoscientific knowledge seeps into contemporary thought and action (Moore, 1996; Peppoloni & Di Capua, 2012), often occurring without being identified (Bohle *et al.*, 2017). It is rarely presented as openly as in the metaphorical title of the book by geochemists Langmuir and Broecker (2012), *'How to Build a Habitable Planet'*.

4.2. A Scenario

Beyond today, what could it mean to live in the Anthropocene of the years 2050, 2100 or beyond? Comprehensive studies on geo-societal development paths are still to come, building on integrated climate assessments (Kowarsch & Jabbour, 2017) and sketching scenarios (Schemel *et al.*, 2019). Within holistic approaches, the present (*'status quo'*), the future (*'scriptum futurum'*) and the means (*'medias res'*) can be described, metaphorically:

- About *'status quo'*: For many citizens, *'The Future'*, with capital *'F'*, is the trek towards *'about-the-same'*. The aeon-old view, *nihil sub sole novum* (nothing new under the sun), provides a stable reference frame for many. But what to do when this frame seems to fade, like when living the COVID-19 pandemic? Then, *'The Unknown'* frames the practices, and *'The Counter-Intuitive'* consolidates into new ways of doing.

- About *'scriptum futurum'*: By the middle of the 21st-century, people overcame several socio-ecological pandemics. Collaborative governance of the *'Technosphere'* starts to emerge, and the number of healthy years of life increases again. By the end of the 21st-century, the human population stabilised at just under 11 billion people. Circular supply chains favour the participatory handling of social-ecological problems. People living on the coasts (and in other inhospitable areas) are being relocated.

- About *'medias res'*: As citizens, that is, as practitioners of community life, people innovate their practices. People with the minds of

artists, explorers, and scientists face *'The Unknown'* and *'The Counter-Intuitive'*. They are resources for nurturing entrepreneurial citizenries.

What is the place of geoscientists in such a scenario? Their skills are required to make the future. Therefore, what to expect from them, as citizens and professionals?

5. Discussion

This essay illustrates the responsibilities of geoscientists in contemporary societies because of the body of expertise they can offer. The COVID-19 health pandemic of the early 2020s provides a lens for this perspective.

A pandemic (ancient Greek *'pan'*, *'demos'*) is a phenomenon that affects all people and any state (ancient Greek *'polis'*). A modern concept of *'demos'* and *'polis'* is that of *'citizenry'*, which means people who share political, legal, religious and social institutions and practices. Hence, a pandemic is a phenomenon that affects every citizenry. Anthropocene has a similar connotation when understood to describe outcomes concerning everyone (and not origins).

The Anthropocene will be a single World of several billion people and societal and economic practices that cumulate in planetary impact. The resulting change of Earth, i.e. the resulting terraforming, is pandemic in its consequences for Nature and the World. Anthropogenic climate change serves as an example. The feature *'single World'* also applies if the power and practices of an affluent minority coerce a specific (kind of) Anthropocene.

Today, human citizenries operate a technosphere of planetary dimensions. This feature is the basis of any Anthropocene, although the kind of technosphere is a choice and not a fatality. Geoscientific know-how was, is and will be an empowering factor to use technologies on an increasingly geographical scale. Examples of this feature are many, such as the transcontinental railways of the 19th century, the global networks of fibre optic cables across the oceans, or the global just-in-time transport of commodities and goods. Geoscientific know-how was (and is) necessary to build, deploy and operate these structures, which affects all people.

How societies maintain a technosphere depend on several factors. Among them, hegemonic cultural views of citizens on appropriate technologies, underlying scientific knowledge, economic conditions and available resources. Together, these factors determine which anthropogenic

change, i.e. what kind of terra-forming, seems desirable. At this point in the social-ecological processes, the role of geoethical thinking facilitates sense-making and action. The geoethical '*normative preferences*' illustrate how to guide the processes for sense-making, decision-making and action.

The irreversible alterations of the planetary social-ecological system, which happened in the recent historical past, imply that '*being pandemic*' is the characteristic of contemporary humankind's practices. Nevertheless, various realisations of a future Anthropocene are (still) possible. Options for different geosocial futures deem available given the generic features of the Earth System, such as: (i) being a network of complex-adaptive social-ecological systems; (ii) that human sense-making drives systemic feedback loops; and (iii) that the threats of a pandemic can outstrip the societal processes for mounting coordinated response. The COVID-19 pandemic has illustrated these features well.

6. Conclusion

How societies alter the World and Nature depends on choices, for example, about risks, preferences and opportunities. The alterations concern natural and social milieus at the local, regional and planetary scales. To these ends, geoscientists provide professional know-how. However, geoscientists deliver more than scientific and technological expertise. They also offer culture, such as insights into the development of Earth across eons and geocentric ethical thinking to guide what '*ought to be*'.

Any anthropogenic global change, that is, any (of the possible) Anthropocene(s), is the outcome of societal choices on operating the planetary social-ecological system through the technosphere. A given technosphere is a choice, not a must. Geoscientific expertise is needed to conceive, deploy and operate a given technosphere. Therefore, geoscientists co-shape the anthropogenic change of the various (sub)systems of Earth.

People need geoscientific knowledge to assess anthropogenic global change in various social contexts, whether they are merely consumers of resources. Citizens need insight into the functioning of the Earth System to make informed decisions. Therefore, the '*citizen geoscientist*' offers professional know-how and insights into philosophical questions (Hamilton, 2017; Bjornerud, 2018; Schneider-Vos, 2020).

To sum up, geoscientists help achieve both anthropogenic change and global change. In that sense, they are assistant terra-formers. Therefore, geoscientists should take on the responsibility that comes with their role as

agents of technology-driven change. They are to be held responsible (Jonas, 1984). Hence, geoscientists shall help heal the pains of the Anthropocene. That is the essence of (professional) geoethics and being a citizen. Therefore, by taking the anthropogenic global change in its societal contexts, geoscientists have a dedicated responsibility. It arises from the body of expertise they can offer.

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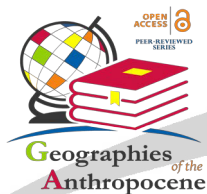
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The COVID-19 pandemic offers food for thought and an opportunity for humanities and science scholars who research our global condition to collaborate. The 21st century society is facing an unprecedented challenge right now: what can we learn from this challenge? Will everything really return to what we used to define as 'normal' at the end of the emergency? Probably not. Structural changes from political, economic, social, and environmental perspectives are already occurring, and impacting the fields of health, education, commerce, governance and travel. Concepts of social space are being redefined and rethought at various scales. Our society, unprepared for a global health emergency of this scale, has been engaged only partially in practices of mitigation and sustainability and we now realize the fragility of our planetary existence. This volume collects 14 original chapters which analyse the new scenarios that could lie ahead in the aftermath of the COVID-19 crisis in an interdisciplinary context.

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