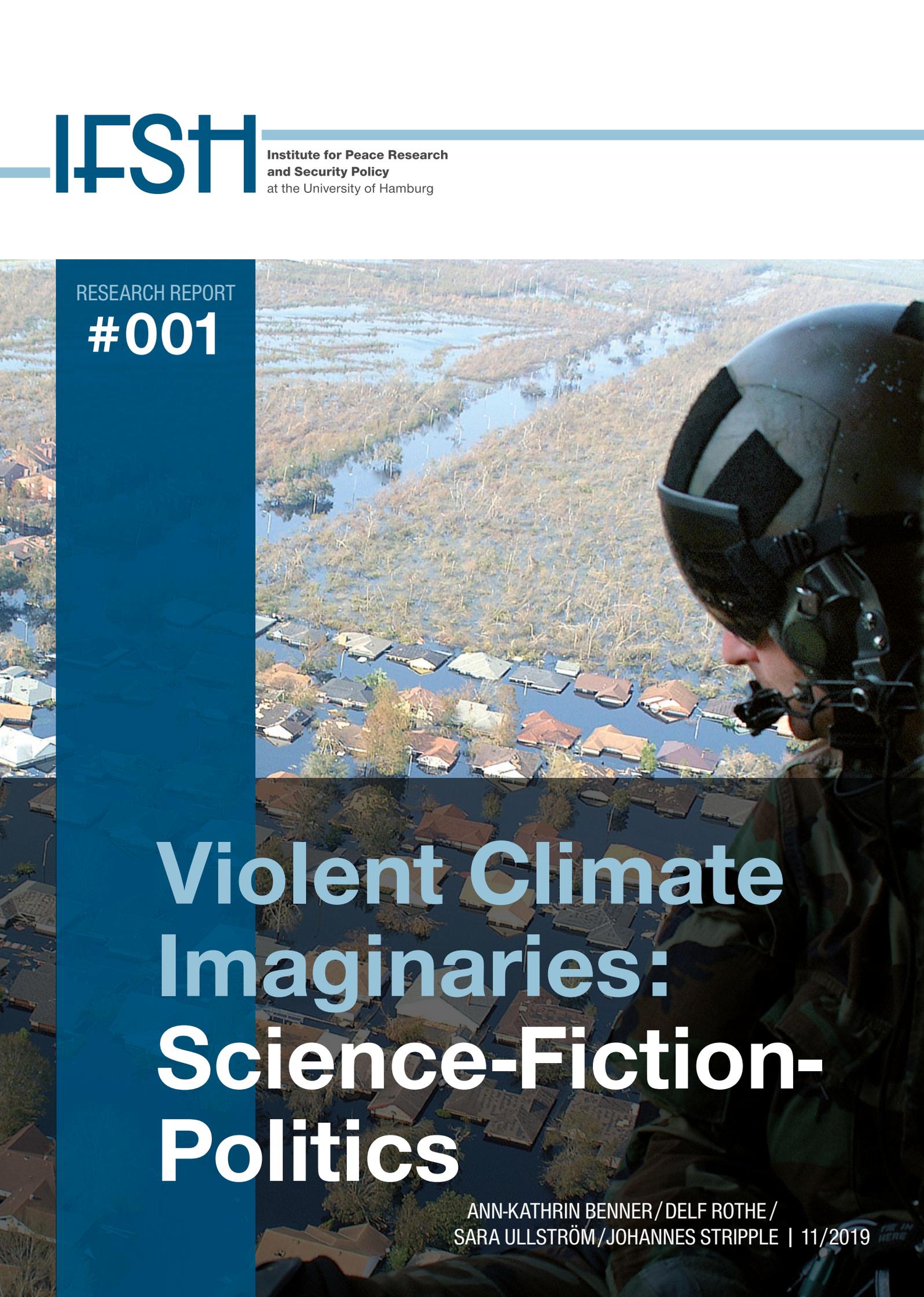


RESEARCH REPORT

#001

An aerial photograph of a residential area completely inundated with floodwater. The houses are surrounded by water, and many trees are partially submerged. In the foreground on the right, a soldier wearing a black helmet and tactical gear is looking out over the flooded landscape. The overall scene conveys a sense of the impact of violent climate events.

Violent Climate Imaginarities: Science-Fiction- Politics

ANN-KATHRIN BENNER / DELF ROTHE /
SARA ULLSTRÖM / JOHANNES STRIPPLE | 11/2019

Table of Contents

Abstract	4
Funding	4
Introduction	5
The Futurology of Climate Change	7
Dimensions of Violence	8
Future Climate Imaginaries	10
Desiring Past Futures	14
Modes of Future-Making	16
Modeling Violent Futures	16
Writing Violent Futures	20
Visualizing Violent Futures	23
Explaining the Circulation of Climate Imaginaries	28
Conclusion	30
Endnotes	33
References	34
About the Authors	40

Abstract

There are many ways in which climate futures can be envisioned, such as global and regional climate models, scenarios of future emission trajectories, or pathways and visions of societal transformation. All these anticipatory practices aim to make the climatic future knowable in the present. In so doing, they quite often envision a climatic future that is inherently violent: a future marked by disasters, wars, mass migration, turmoil, and terror. This working paper seeks to explain the popularity and tenacity of such violent imaginaries of (future) climate change in scientific research, popular culture, and political discourse. For this, it asks two interrelated questions: First, how do violent imaginaries of future climate change come about? Second, why and how do these imaginaries circulate and proliferate? To answer these questions, the paper provides a discussion of the concept of “violence” and elaborates how different forms of it are featured in imaginaries of future climate change. On this basis, the paper then traces three different modes of future-making that together produce and reproduce violent climate imaginaries: modeling the future, writing the future, and visualizing the future. Finally, the paper proposes and discusses several factors that could help explaining the circulation of violent climate imaginaries between the fields of science, fiction, and politics. These factors include the existence of an interdiscourse that bridges different specialized discourses, the broader political economy of imaginaries, interpersonal relations between actors in different fields, and the coproduction of dominant imaginaries with broader technological developments.

Keywords: anticipation; climate change; future; knowledge politics; violence

Funding

This research was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – grant no 335616337 – as well as by a seed grant from the Lund-Hamburg Funding program 2018.

Introduction

There are many ways in which climate futures can be envisioned, such as global and regional climate models, scenarios of future emission trajectories, or pathways and visions of societal transformation (Yusoff and Gabrys 2011). In recent years, artistic representations of a climate-changed world have increasingly emerged in terms of for instance art installations, literature, and film (see Nikoleris et al. 2017, 2019). In literary fiction, an increasing body of works speculates about the future implications of climate change.

Anticipatory practices aim to make the climatic future knowable. At the same time, climate change at the same time fundamentally alters the stories we tell about the future. The grand narratives of liberal modernity, with their promise of unlimited growth and prosperity, have collapsed. After the “death of utopia” (Gray 2007), global warming is now radically limiting the horizons of the future. As Ghosh (2016) has argued, there remains a “crisis of imagination” throughout most of the political and cultural sphere. The human imagination, it seems, fails to grasp the sheer magnitude of the transformation that our species has set in motion. If the anticipated effects of climate change seem incredible, they become harder to depict in documentary work or realist-oriented fiction – and even within Integrated Assessment Models of climate futures. There is thus a general insufficiency – in audience, representation, and mode – in current climate imaginaries.

A crucial sign of this crisis of imagination is how violence is featured in many social imaginaries of (future) climate change. Either climate change is depicted as an apocalyptic threat that will bring natural disasters, unrest, disease, and war upon humanity (Methmann and Rothe 2012), or alternatively it is imagined as a gradual process that allows for a smooth and nonviolent transformation toward a post-carbon future. Slow and creeping forms of violence that are less visible and harder to narrate than major disasters or global ecological breakdown are seldom part of our collective imagination of climate futures. Mahony and Beck discuss the question of why certain imaginaries of the future become dominant and stick around “even after they may have been thoroughly debunked or deconstructed” (2019). We hold that violent imaginaries of climate change that envision the future in catastrophic terms are particularly “sticky.” For example, the alarmist warnings of a coming flood of climate migrants have long been debunked by scholarship that demonstrates the complexity of climate change-migration interlinkages (Boas et al. 2019). Nevertheless, such imaginaries still dominate large parts of the public and political discourse.

Yet, violent imaginaries of future climate change are not only particularly “sticky” they are also highly mobile – traveling between the fields of science, popular culture, and politics. In the 1970s, for example, the publication of the Club of Rome’s “Limits to Growth” not only impacted on national and international environmental agendas but also found its way into popular culture. Artistic and literary representations of the environmental apocalypse, on the contrary, have found resonance in policy debates on the security implications of climate change (Rothe 2016; Stripple 2017).

This working paper builds on a workshop that took place at the Institute of Peace Research and Security Policy at the University of Hamburg (IFSH) in February 2019.¹ Dwelling on the discussions at the workshop and the work done by its participants, it seeks to explain both the tenacity and mobility of violent imaginaries of climate change.

For this, it poses two interrelated questions: First, how do violent imaginaries of future climate change come about? This question addresses the practices and methods of anticipating future climate change as well as the actors and institutions behind them. Second, turning to the mechanisms of their circulation, it is asked: Why and how do these imaginaries circulate and proliferate? The working paper contributes to the existing literature on discourses and imaginaries of climate change in several ways. First, it offers a theoretical discussion of different types of violence in future imaginaries of climate change. Second, it analyzes how violent climate imaginaries are produced through different forms of future-making. Third, it develops a typology of preliminary circulation mechanisms that could help explain why some imaginaries of climate change become circulated while others do not.

To meet these goals, the initial part of the working paper introduces, first, the notion of “climate imaginaries” and discusses how different forms of violence become articulated in traveling imaginaries of climate change. Then, second, it proposes a typology of three different forms of future-making: writing climate futures, modeling climate futures, and visualizing climate futures. Each of these three forms of future-making is enacted within a distinct “anticipatory regime” (Granjou et al. 2017) – that is, networks of actors, practices, technologies, institutions, and ideas that together render an uncertain future “knowable” in the present (Yusoff and Gabrys 2011). The third part of the paper briefly elaborates on the political implications of the climate imaginaries produced through these forms of future-making, and discusses how they travel between

the fields of science, fiction, and politics. The fourth and final section concludes by outlining the contours of an emerging research field on violent imaginaries of climate change.

The Futurology of Climate Change

The concept of “imaginaries” refers to the way in which human societies make sense of their environment and their own place in the world. Imaginaries of the future reduce the complexity of (social) reality and provide orientation by knitting past events into coherent historical narratives. Social imaginaries can be defined as semiotic systems that give meaning to events, and shape practices and lived experiences (Nikoleris and Chertkovskaya 2019; see also, Jessop 2004; Taylor 2003). Three important qualifications help to further sharpen the concept of imaginaries. First, imaginaries have to be distinguished from individually held beliefs or assumptions. Social imaginaries are intersubjectively shared by a given community, and thus historically and geographically contextual (Taylor 2003). They are produced and reproduced through the common set of symbols, emblematic images, stories, legends, myths, or powerful icons shared by a given discursive community (McQueen 2018: 52).

Second, imaginaries are not opposed to but rather crucially interlinked with other forms of “world-making,” for example through scientific research. As Jasanoff and Kim (2015) argue, imaginaries are coproduced with scientific and technological developments. This means that, on the one hand, scientific findings – for example on future climate change – influence and shape how humans imagine their environment. On the other, social imaginaries also find their way into technical and scientific developments. For example, intelligent machines existed as a social imaginary long before artificial intelligence became technically feasible due to increased computing power, cloud computing, and other related developments (that were in part driven by the social imaginaries of AI in the past). Third, the notion of the imaginary does not follow a naïve idealism – imaginaries of climate change are not mere mental or linguistics products existing independent of the external world. Rather, as Yusoff and Gabrys stress, the imagination is “a site of interplay between material and perceptual worlds, where concepts cohere, forces pull and attract, and things, discourses, subjects, and objects are framed, contested, and brought into being” (2011: 517).

Following these theoretical assumptions, climate imaginaries can be understood as collectively shared sets of beliefs, narratives, and storylines that make sense of the uncertain future state of Planet Earth. Climate imaginaries, then, are “idealized visions of the future” (Levy and Spicer 2013: 662-663) that define which futures are thinkable and desirable, and thus also shape the political choices made in the present (Jasanoff 2015). Imaginaries hence provide tools for envisioning not only alternative futures, but also ways of how to get there from where we are now. As the future in the Anthropocene is highly uncertain and crucially dependent on the human action taken in the coming decades, there is a multiplicity of competing climate imaginaries. These range from more optimistic imaginaries of a post-fossil fuel world, in which dangerous climate change has been successfully mitigated, to dystopian imaginaries of climate breakdown and accompanying civilizational collapse.

DIMENSIONS OF VIOLENCE

As outlined in the introduction, social imaginaries of future climate change often envision the latter as a violent process – for example as a source of war and societal collapse. However, as Nikoleris and Chertkovskaya (2019) argue, violence is not a unique feature of dystopian future imaginaries as it can – in more subtle ways – also be part of more utopian visions of the future. However, violence is itself a highly contested concept. Any further theorization of violent imaginaries of climate change thus has to be clear about the notion of violence even being employed.

In the described futurology of climate change, in which social imaginaries are produced, reproduced, and circulated, violence can occur at various levels. On the one hand, violence can be the subject of social imaginaries. This is the case if social imaginaries envision the future in predominantly violent terms – as in dystopian visions of the future. On the other hand, social imaginaries can also be a source or medium of violence themselves. Imaginaries become part of knowledge struggles about the appropriate representation of the future. These knowledge struggles are inherently political – and thus linked to power and violence – as they are about the question of who defines what is to be taken for granted within a given society. Dominant imaginaries of societal futures suppress or marginalize alternative imaginaries and knowledges – a process that post- and decolonial scholars call “epistemic violence” (Spivak 1988). O’Lear (2016), for example, demonstrates how the reliance on Global Circulation Models (GCMs) by the Intergovernmental Panel on Climate Change (IPCC) narrowed

down the imaginative scope of global climate politics. The resulting techno-scientific notion of climate change “reduces climate to measurable, quantifiable observations about environmental systems” (O’Lear 2016: 5). This, according to O’Lear, fostered technocratic approaches to monitoring and managing greenhouse gas emissions at the level of the United Nations, while silencing more radical ideas about rethinking society and restructuring economic systems (ibid: 8).

Works that discuss the relationship between climate change and violence often draw on a re-reading of Galtung’s (1969) seminal work on structural violence. Galtung prominently distinguished between personal and structural forms of violence. Personal violence comes closest to the common understanding of violence, and refers to any action by a human being that has a direct and personal negative effect on another person’s physical and/or mental wellbeing. Structural violence, on the contrary, is an impersonal form of violence that results from unequal power relations and structural injustices. Whenever systemic conditions impede the actual realization of people’s theoretical potential, one can speak of a form of structural violence. Galtung’s impersonal notion of violence allows us to relate the concept of violence to climate change. In fact, an increasing number of scholars are now discussing climate change – present and future – as a form of structural violence (Bonds 2016; Hobbs-Morgan 2017; Solnit 2014). Climate change, in this sense, is an impersonal force that increases human suffering and limits the life chances and potentials of many populations across the globe. Considering that the exposure to environmental risks is highly unequally distributed and depends on the race, gender, class, and geographic location of affected populations, a structural notion of violence directly links up with questions of inequality and climate justice (Davies 2019: 1539).

At the same time, however, Galtung’s notion of violence runs into a number of problems when it is confronted with the complex spatio-temporality of climate change and the Anthropocene (Hobbs-Morgan 2017: 81). When Galtung developed his notion of structural violence he was referring to populations suffering from the violence of repressive regimes, colonial powers, or economic programs of international organizations. Due to the complexity of causes and effects, of responsibilities and agencies, that marks climate change and its impacts, the differentiation between personal and structural violence is becoming increasingly difficult to maintain. Climate change is both fast and slow, personal and structural, human-made and more-than-human. Furthermore, Galtung’s structuralist perspective leaves little room for notions of agency, thus implicitly

turning victims of structural violence into anonymous masses deprived of any agency. Thus, while concepts such as Galtung's are helpful in structuring the forms of violence encountered in future imaginaries of climate change, they are at the same time challenged and transcended by imaginaries of climate change.

With his notion of slow violence, Rob Nixon (2011) updates Galtung's idea of structural violence for times of environmental change. With Galtung he shares the "concern with social justice, hidden agency, and certain forms of violence that are imperceptible" (ibid: 10). Nixon then adds an explicit temporal focus to this definition "to keep front and center the representational challenges and imaginative dilemmas posed not just by imperceptible violence but by imperceptible change whereby violence is decoupled from its original causes by the workings of time" (ibid: 11). The representational challenges mentioned by Nixon in this quote are crucial for the subject of violent climate imaginaries. The slow, delayed, and often invisible effects of climate change are much harder to be narrated than spectacular, sudden forms of violence – and thus the former seldom find their ways into collective imaginaries of the future.

FUTURE CLIMATE IMAGINARIES

Equipped with this differentiated notion of violence, one can take a closer look at dominant future imaginaries of climate change. According to Levy and Spicer (2013), there are four major competing climate imaginaries: climate apocalypse, fossil fuels forever, techno-market, and sustainable lifestyles. In the following, we will briefly outline these future imaginaries and discuss their respective relations to violence.

One of the most salient and powerful climate imaginaries is what Alison McQueen describes as the "apocalyptic imaginary" (2018: 54). The latter draws on the metaphoric and pictorial world of the Judeo-Christian apocalypse (Fagan 2017; Methmann and Rothe 2012; Skrimshire 2010). It revolves around the belief in an ecological collapse caused by anthropogenic climate change, to be followed by societal breakdown. In pictorial terms, it paints the image of a dysfunctional and chaotic world. In climate change discourse, the apocalyptic imaginary opposes other collective imaginaries of global warming as an incremental and slow process of change. The apocalyptic imaginary creates a sense of urgency to mobilize for decisive and immediate political action in the present.

In the case of the apocalyptic imaginary, the relationship to forms of violence is immediately given and clear. Early Judeo-Christian apocalyptic texts were written at times when the respective communities of faith were experiencing increased bodily suffering and repression. In this situation, apocalyptic texts gave meaning to the increased suffering of believers – in that it reinterpreted the experience of violence as divine punishment for the original sin of human beings. Furthermore, and this is crucial, these texts carried the promise of humanity’s collective salvation (and thus the freedom from all violence) in the aftermath of the Last Judgment. The social imaginary of the climate apocalypse draws on these original texts and reinterprets them in relation to a looming climate catastrophe (Methmann and Rothe 2012). In this imaginary, a future humankind will face direct and personal forms of violence as the so-called secondary impacts of climate change – that is, violent conflict, mass migration, political turmoil, human insecurity, and similar, brought about by climate-related extreme events and disasters (e.g. Burke et al. 2009). This future imaginary of a world of mass-scale climate violence is often used by Western policymakers or members of civil society to mobilize for decisive climate action in the present.

The “fossil fuels forever” imaginary depicts a world in which fossil fuels continue to be seen as a core source of economic prosperity and wellbeing. As Nikoleris and Chertkovskaya (2019) argue, there are two forms of violence that undergird this future imaginary – both of which would become manifest in the process of future pipeline construction. On the one hand, there is the structural and slow violence caused by the fossil fuel economy, which maximizes profits while externalizing costs (Bonds 2016). The slow violence of the petroleum age becomes manifest and visible, for example, in the polluted landscapes around coal and oil extraction sites, or the detrimental effects of global warming on livelihoods in developing countries (Nixon 2011). On the other hand, “disputes along the pipeline” (Barry 2013) also come with direct forms of violence against protesters – and thus those that actively resist the imaginary of infinite fossil fuel-based growth. Both forms of violence of the extractivist age are already manifest in the present. One can trace these forms of violence back to early European colonialism and the exploitation and destruction of indigenous peoples’ environments (Yusoff 2018). In the fossil fuels forever imaginary, however, these forms are not only extended into the future but further intensified. For as conventional oil and coal sources will be depleted in the foreseeable future, the fossil fuel industry will increasingly rely on unconventional sources like fracked natural gas, tar sands oil, and methane hydrate. These unconventional sources have an even bigger negative environmental impact than conventional fossil fuels, and bear huge

potential for local protest and conflict – thus potentially requiring repressive measures to be ensured.

Another prominent climate imaginary is that of “green tech.” This imaginary envisions a future in which a technology-driven transformation of the world economy allows us to combat climate change without any major sacrifices in terms of lifestyle. Green tech is an optimistic future imaginary that dwells on the current discourse of ecological modernization and the hope of innovations in the realm of renewable energy, genetic modification (for example of climate-resilient crops), or carbon-dioxide-removal technologies. The green-tech imaginary does not know any violence. Eco-modernists reject alarmist projections of the future just as they do calls for forceful state intervention to steer the socioeconomic transition toward decarbonization. Hence, what is interesting in our view is how (legitimate and illegitimate) forms of violence are rendered invisible and written out of the green-tech future imaginary.

Rendering the violence of socioeconomic transformations invisible can then itself be seen as a form of epistemic violence. Many green-tech and environmental-development projects across the world are inherently violent. Examples include the construction of large-scale dams, or conflicts and displacement related to the mining of cobalt and lithium required for the production of batteries for electric cars. Many futuristic eco-modernist projects, such as the construction of a hybrid “forest city” in Malaysia by Chinese investors, are highly contested and marked by their huge potential for social conflict (Moser 2018). Furthermore, eco-modernist solutions to the environmental crisis rely heavily on digital technologies including AI, the internet of things, big data, and smart cities. What is written out of the green-tech imaginary of the future are thus all forms of surveillance and risks to privacy and individual freedom inherent in smart city projects such as Sidewalk Labs – a highly disputed urban innovation company owned by Alphabet (Google’s parent company).

A final dominant climate imaginary is that of “sustainable livelihoods.” This revolves around the notion of degrowth, and propagates minimalism and restraint – thus offering an optimistic, or more hopeful, outlook on the future while at the same time rejecting the technological optimism of green tech. Degrowth can in this sense be understood as the “downscaling of biophysical throughput, deaccumulation and anti-productivism, and aimed at bringing together the alternatives not tied in these” (Chertkovskaya and Paulsson 2016). The current Fridays for Future movement, in which millions of students across the globe

have begun to call for more ambitious climate action, is very much influenced by this imaginary. While the students on the one hand address policymakers as the ones that have the power to initiate structural change, they on the other stress the necessity of individual restraint and lifestyle changes. Although the sustainable livelihoods scenario is a decidedly anti-violent one, violence still plays an important role – as something which the imaginary aims to combat (Nikoleris and Chertkovskaya 2019). In this imaginary, climate change and its violent ramifications are mitigated through voluntary action and self-reflective behavioral change, made possible through a consensual rearticulation of wellbeing and “the good life.” The daily lives of future humans in the sustainable livelihoods imaginary differ considerably from ours today. Future humans, in this imaginary, are less materialistic and live simpler lives, in line with a radical reinterpretation of what constitutes a good life. Conservative political commentators, however, often frame the sustainable livelihoods imaginary as a threat to freedom and prosperity (Levy and Spicer 2013).

In sum, several features of the relations between violence and future imaginaries become apparent in these four discussed ideal-types. First, future imaginaries of climate change often focus on large-scale direct violence (such as climate-induced conflicts) occurring as a result of abrupt climate change. On the contrary, slow forms of violence – which are less visible, and manifest at the local level – are silenced. Furthermore, in all discussed imaginaries violence is featured as illegitimate and thus something to be avoided. This follows a Western liberal notion of violence that ignores the phenomenon being a legitimate part of social struggles – for example indigenous ones against the further destruction of their lifeworlds. Finally, future imaginaries of climate change exhibit forms of epistemic violence themselves. As imaginaries of the future define the horizons of the thinkable, they delimit and shape the possibilities for political action in the present. Thus the dominance of a certain future imaginary, for example apocalyptic climate change, might foreclose potential alternate pathways into the future, and could thereby hinder the realization of certain people’s potential. This preliminary analysis of violent imaginaries of climate change demonstrates the importance of questions of representation and legitimation. Who defines what counts as violence, and what not? Who defines which forms of violence are deemed legitimate, and which not? These questions cannot be answered a priori, but have to be considered in any study of future climate change imaginaries.

DESIRING PAST FUTURES

As shown above, violent climate imaginaries are part of a “futurology of climate change” (Baldwin et al. 2014). They are produced by and circulated through anticipatory assemblages that seek to render an uncertain future calculable, imaginable, and thus tangible. However, in trying to project the future, anticipatory assemblages crucially rely on knowledges and discourses of the past. One key element of the current politics of the future in the discourse on climate change and the Anthropocene is the desire of certain actors to project (failed) political projects of the past into the future. This invocation of past futures takes two different forms: On the one hand, there are political projects whose future imaginaries are simply extensions of the present modernist project. Boyd (2019), for example, scrutinizes how discourses on loss and damage (Boyd et al. 2017) – that is, the compensation for the future losses of those that are most hit by climate change – are shaped by imaginaries such as eco-modernism or sustainable development. The fossil fuels forever imaginary outlined earlier would be another example of how the future is imagined as an extension of the modernist present.

On the other hand, there are utopian as well as dystopian – violent as well as anti-violent – imaginaries that dwell on premodern political ideas and project them into the future. It is important to study the orders cocreated by these updates of (pre)modernity, and to scrutinize how they intensify or transform the violence that they inherit. Following Hentschel (2019), one could understand contemporary right-wing discourses as a form of desiring past futures. Assembling an eclectic mix of ideological sources – from German philosophers, to Mahatma Gandhi, to Greenpeace – contemporary right-wing thinkers challenge the – in their view – unemotional, technocratic, and unpassionate nature of politics today. Romancing about the return to a premodern world of grand political emotions, such thinkers seek to “rewild” the political. In so doing they draw on metaphors and icons of natural disasters, which represent the untamed, the wild, and the uncontrollable; in short, the emotions that the New Right is seeking to revitalize.

One particularly prominent image of this desire is that of the volcano. Being a powerful icon of revolutionary upheaval, the volcano symbolizes a violent rupture that does away with existing elites in an extension of human capabilities. The cynicism of evoking a destructive force reveals an uncanny view of power, in which masculinity is supposedly rediscovered vis-à-vis civilizations that render men soft. “Becoming barbarian,” in the words of Donovan (2016) – whose

writings represent an emerging misogynic, anti-gay, discriminatory, masculinist counterculture – becomes desirable.

The case of right-wing thought and its invocation of natural wilderness is a good example of the crucial role of myth in the creation of future imaginaries. In this case, it is the myth of a pristine state of nature lying at the heart of the political – one that in the minds of New Right thinkers has been suppressed by the political bureaucrats and technocrats of the modern age. Essebo (2019) inquires further into the role of myth in climate policy – or better, in the Donald Trump administration’s “nonresponse response” to climate change. Political myth, according to Essebo, is a condensed narrative that mobilizes knowledge of the past to make sense of the present and future. It draws on a plot that has a clear beginning and end, and offers both an explanation of the causes of a given problem as well as a potential solution to it (Essebo 2018). Importantly, a myth cannot be proven wrong: myths naturalize behavior so that they have the “power of the obvious,” where truth or lie are not relevant categories anymore. Myths alleviate fear by offering a kind of salvific promise: those who welcome an identified path and follow it will be alright (while those who do not will experience the very troubles that they fear). Essebo shows how Trump uses different political myths to translate the abstract fears surrounding future threats such as climate change into concrete ones related to poverty or unemployment. In this imaginary, climate change is reframed as an issue of the wealthy, liberal elite, while the real threats to American workers – such as Chinese dominance of the global market – remain ignored. Harnessing the power myth, Trump has successfully convinced his followers that they will be fine if they simply follow his path into the future.



Figure 1. The volcano as political symbol in the French Revolution (Desperret, 1833)

Modes of Future-Making

How are imaginaries of climate futures produced? Clearly, social imaginaries do not emerge in a vacuum – they are context-dependent and historically contingent. Dominant social imaginaries differ from country to country, and change over time. Social imaginaries are related to political power, but they are not solely shaped by political or societal elites. Social imaginaries do not evolve in isolation from nor in opposition to scientific findings. However, they are also not entirely determined by scientific and technological progress. They are influenced by popular culture, art, and literature (Farzin 2017). They are produced and reproduced by the mass media – and increasingly through social media and online networks (Arlt et al. 2017; Walter et al. 2019). They are embedded in the aforementioned futurology of climate change, but at the same time dwell on knowledges of the past – including myths and traditional knowledge. In the following, we provide a preliminary cartography of this futurology of climate change by distinguishing between three ideal-types of future-making. These can be understood as sets of practices through which imaginaries of future climate change are produced: modeling violent futures, writing violent futures, and visualizing violent futures.² These sets of practices cut across established societal fields and disciplinary boundaries. In fact, they often bring actors from heterogeneous backgrounds together – as we will see in the following sections.

MODELING VIOLENT FUTURES

Social imaginaries of climate change evolve in close relation to other technological and scientific developments. A perfect example of this coproduction of science and technology on the one hand and climate imaginaries on the other is that of computer modeling (Edwards 2010). Already in the early twentieth century meteorologists developed numerical models to develop weather forecasts. Such models used mathematic equations to simulate the fluid dynamics of the atmosphere, but could only provide local, short-term forecasts. This changed with the advancement in computer technologies occurring in the aftermath of World War II, as well as with scientific advancements such as the emergence of chaos theory in the 1960s. Embedded in the Cold War rivalry of the two global superpowers, geoscientists soon began to use computer modeling techniques to project the future dynamics of global systems – including population growth, agriculture, and global food systems, and, since the 1980s, manmade climate change. From the very beginning, imaginaries of a violent future were inherently linked to the development of these models.



*Figure 2. IBM Console used by Meteorologist in 1965
(US Weather Bureau, 1965)*

For example, the prominent “Limits to Growth” study of the Club of Rome (Meadows et al. 1972) is often quoted as the first authorized source of apocalyptic imaginaries of environmental change (Stripple 2019). The bleak scenarios produced by the report, two of which predict civilizational collapse before the end of the twenty-first century, were based on a computer model developed by MIT researchers called “World 3.” The researchers used a supercomputer to simulate a global resource system based on (data on) five factors: population growth, agricultural production, resource depletion, industrial output, and pollution.³ The Club of Rome report in the following years became a major source of inspiration for many pop culture and literary imaginaries of ecological collapse. At the same time, however, the computer simulation was itself based on future imaginaries – in particular the prophecies of Thomas Robert Malthus, an eighteenth-century mathematician and professor of History and Political Economy at the East India Company’s college in Haileybury, Hertfordshire. Malthus had prominently argued that unchecked population growth enabled through the consumption of nonrenewable resources would lead to resource

scarcities, famines, and ultimately social turmoil and chaos. This Malthusian narrative crucially informed the development of the World 3 model, and the selection of data that was used to feed it.

A further example of the intimate relationship between computer modeling and social imaginaries of the future is the discourse on the climatic effects of a global thermonuclear war (Scheffran 2019a). In the 1980s, researchers in the United States and the Soviet Union were using computer models to simulate the atmospheric impact of multiple nuclear explosions. Concretely, they used global circulation models to simulate how soot particles – released through the firestorms of nuclear explosions – would change the Earth’s radiation balance and thus cool down the global climate. Researchers used global circulation models to anticipate how particles would circulate through the global atmosphere. The models used to simulate the circulation of radioactive fallout or soot crucially fed into the development of the first global circulation models simulating anthropogenic climate change (Dörries 2011).

Yet, even beyond this technical level there was an important effect of nuclear war research on social imaginaries of climate change. Thus the “nuclear winter” metaphor had tremendous resonance in public and political discourse, and thereby helped popularize the idea of manmade climate change among a broader audience (Edwards 2010: 380). The nuclear winter story was featured prominently in popular culture as well – for example in the 1983 TV movie *The Day After*. As Scheffran (2019b) argues, it was this apocalyptic imaginary that would be later rearticulated in discourses on climate change and its security implications. For example, Schwartz and Randall (2003) published a report on *An Abrupt Climate Change Scenario and Its Implications for United States National Security*. In the report, which was commissioned by the US Department of Defense, the two futurologists describe the scenario of an abrupt global cooling caused by the collapse of the Gulf Stream. Only one year later, *The Day after Tomorrow* – a Hollywood disaster movie based on the same global cooling scenario – would be screened in cinemas across the globe (see Hobbs-Morgan 2017). The links between nuclear winter research and climate change are a perfect example of the coproduction of technical and scientific developments and social imaginaries. Long before research began to use computer models to simulate the climatic effects of nuclear weapons, the “nuclear winter” existed as an imaginary in literary fiction. The idea was first expressed in Paul Anderson and F. N. Waldrop’s postwar story “*Tomorrow’s Children*” (1947), later followed up on by Anderson in his 1961 novel *Twilight World* (Bartter 1988).

More recently, researchers have begun to apply computer models to investigate the potential links between climate change and conflict (as well as other potential security threats, including migration). For this, they increasingly rely on integrated models that seek to model the complex interaction between physical and social systems – for example regional climate change and social systems in potential conflict regions. Furthermore, agent-based models are used to simulate social systems not on the basis of general system laws but of modeling other individual choices by their constituting actors. Yet scientific projections of future climatic states not only depend on formal techniques like modeling but are also informed by powerful metaphors – including those of the “tipping point” or the “risk cascade” (Scheffran 2019b). Such metaphors are required to cope with and reduce the uncertainties involved in computer models of complex dynamic systems, such as the Earth system. Both metaphors express the idea that feedback loops between critical parts of the Earth system, such as permafrost in the Arctic or tropical rainforests, might push the Earth system onto an irreversible pathway toward catastrophic climate change (Steffen et al. 2018). In these scenarios, instability is a qualitative change of state due to certain events, where there is no return to the previous state – such as when “peace turns into war.”

A second powerful collective symbol is that of the “threat multiplier” in research on the security implications of climate change (Ningelgen 2018; Scheffran et al. 2014). Since scholars in Peace and Conflict Studies hardly ever scrutinize climate change as a potential resource for developing cooperative structures in political settings prone to conflict, this line of research implies violence in both the scenarios that it depicts and the episteme it evokes. Interestingly, whenever the exact relationship between climate change and conflict remains uncertain and complex (see Scheffran et al. 2012), empirical studies of the climate-conflict link turn to the concept of the threat multiplier (Rothe 2016; Scheffran 2019a). In short, this metaphorical concept expresses the idea that, due to the complexities of social and ecological systems (and their interaction), climate change does not itself represent a direct cause of conflict or other insecurities. However, it could make other existing conflicts and insecurities worse – hence being a threat multiplier.

Another crucial link between future imaginaries and computer models is the field of energy policy. Aykut (2019) proposes the notion of “predictive assemblage” to grasp the combination of heterogeneous techniques of future-making and related knowledges. Within these assemblages, climate imaginaries – ranging

from dystopian to business-as-usual and techno-optimistic imaginaries – are developed through scenario techniques. By translating these imaginaries into computer models they would, however, become black-boxed. Models, according to Aykut, are a way of creating a certain semiotics about what needs to be done, and how. They require a specific literacy, and require staff trained in interpreting them. This skillset is highly exclusive. At the same time, they co-constitute public policies as well as enable and legitimize new types of intervention. By making strategic choices, for example regarding energy demand, the models would exclude other, more radical imaginaries, such as on a decentralized energy production. These choices tend to stabilize existing sociotechnical regimes, reinforce cognitive lock-ins, and privilege certain people to consider and co-implement particular future imaginaries. Violence is thus not only a part of the imaginary produced by the models (e.g. on apocalyptic futures) but also inherent to the model itself – as it excludes certain political demands and ideas, and thereby limits the horizons of the possible in the present.

WRITING VIOLENT FUTURES

In a recent study, Galafassi et al. (2018) concluded that popular culture and art – particularly narrative, visual, and performative art – is a powerful way of fostering a shared understanding of the challenges posed by climate change, as well as of promoting transformative climate action as a component of social learning. As artistic imaginaries make climate change culturally meaningful and enable emotional encounters, they allow people to connect with climate futures on a personal and affective level.

Within the field of literature, an increasing body of novels is dealing with speculative climate change futures. These writers imagine future worlds in which we are living with, or mitigating, climate change. While many of these represent dystopian and often violent futures, others paint more optimistic scenarios – by imagining alternative societies in which we find new, innovative ways of living in a warming and carbon-constrained world. The ability of literature to plant something into the reader’s imagination is a powerful tool. In fact, at least since the summer of 2018, there seems to have been a major shift in the dominant imaginaries of climate change in many Western societies. That summer, when wildfires, extreme heat, droughts, and flash floods were all plaguing the Northern Hemisphere, is often recognized as the “end of denial” vis-à-vis climate change. And yet, even if there seems to be emerging societal consent about the severity of climate change, there has been little alteration in the actual politics of climate

change. Global emissions are still on the rise. In many countries – including major greenhouse gas emitters such as the US, Brazil, or Italy – climate-skeptic politicians have been elected into office.

A closer look at the contemporary state of literature could help explaining these discrepancies between public perception of and political action on climate change. Ghosh prominently diagnosed, as noted, a fundamental crisis of imagination in current climate change discourses. Thus even if we no longer deny climate change, it seems that we still do not have the ability to change anything – because of a lack of a future vision, a lack of imagination. As Tenngart (2019), referencing Astrid Lindgren, argues: the crisis of imagination is probably also one of literature.

One symptom of this lack of imagination in contemporary literature is the way in which violence is featured in the growing literary field of “climate fiction” (Goodbody and Johns-Putra 2018). Writers often fall back on anthropocentric and antagonistic notions of violence. In such a plot, subjects are easy to tell from objects. There are heroes, antiheroes, and victims. Humanity is opposed to nature. Complex and nonlinear temporalities are forced into a linear flow of time, in which the past, present, and future exist as clearly demarcated states. Narrating systemic and distributed forms of agency, however, is a challenge for writers: How do we tell stories when there are no enemies to fight? This makes particular forms of violence that do not have a clearly identifiable actor – including, as outlined earlier, structural and slow violence – difficult to narrate in climate fiction (see also Hobbs-Morgan 2017). As Raven notes, a narrative (in fiction or cinema) is not simply a story or a plot – “a story (or plot) is a sequence of events in time and space, while a narrative is a subjective account of that sequence of events” (Raven 2016: 51). Accounts of violence have, hence, to be fitted in into a linear sequence of events experienced and narrated from a particular subject position. Furthermore, (Western/Anglophone) narratology lacks the tools to tell stories that depart from the established hero versus antihero actor scheme (Raven 2019). The structural and slow violence of climate change, however, are embedded in complex and nonlinear causal chains, in which no single “perpetrator” or driver can be identified. Traditional Western narratology, then, fails to deal with this complexity, because it would necessarily have to break it down into a subjective experience or perspective of it (Raven 2019). A good example is “The Carbon Diaries: 2015” by Saci Lloyd, which has been described as a soft-dystopian novel of the near-future that narrates the everyday and mundane effects of climate change (Farzin 2018). What is needed

are thus new kinds of narrative – ones that break with the established actor schemes and linear temporalities of Western narratology – and a new literacy on the part of both the author and the audience to write and read such narratives (Raven 2019). Examples can be found in non-Western indigenous fiction, where narratives are told from the perspective of nonhuman actors such as forests or rivers.

The crisis of imagination diagnosed by Gosh (2016), thus, is to some extent the result of structural shortcomings of writing as a method and the weakness of some inherited narration conventions. It is wrong to expect that fiction can show us the way out of the current climate political stalemate. Fiction is not able to change the world, nor people's minds. Just as with other narrative forms such as scenarios, prototypes, and predictive models, fiction does not outline actual futures but "speculative and subjective depictions of possibilities yet to be realised" (Raven and Elahi 2015: 51). Future imaginaries constructed in contemporary fiction can, however, provide us with a conceptual infrastructure in which other imaginaries might dwell, and thus enable novel forms of political action. Tenngart (2019) discusses a genre that might offer such positive conceptual infrastructures: the "climate romance." With its emphasis on self-identification, norm-setting, clear projections, as well as a positive outlook ("happy ending") on the future, the climate romance could have an interesting function in providing hope and in guiding social and political action. While utopian narratives are not necessarily meant to be realizable, they provide moral and ethical direction for social projects and things that we aspire to (Raven 2015). An example of a climate romance can be found in Kim Stanley Robinson's novel *New York 2140*. On the one hand, his narration of a future New York submerged underwater depicts a clearly undesirable future state of the Earth in which attempts to mitigate climate change have failed. On the other, it is surprisingly utopian – providing a positive outlook on the ability to develop adaptive capacities and rearticulate practices of daily life in order to cope with a changing climate (see Brady 2019).

Writing as a practice not only comprises literary accounts of the future, as Islar (2019) reminds us. Islar analyzes violent climate imaginaries of the Himalaya region in the climate change impact reports of the intergovernmental think tank International Centre for Integrated Mountain Development (ICIMOD). The Himalayas, often referred to as the "water towers of Asia," are of crucial importance as a water and energy source for the village communities in Nepal, and particularly vulnerable to climate change (Islar et al. 2017). Because of its complex topography, there is extensive uncertainty in climate models regarding

the concrete impacts on the mountains. Policy reports, including those of the ICIMOD, thus often draw on the technocratic language of “risk” (centered around notions of probability and vulnerability) to render the uncertain futures of the Himalaya calculable in the present. Media coverage of the region, on the contrary, breaks with the technical tone of this “riskification” (Corry 2012) and instead resorts to a discourse of securitization, presenting climate impacts on the Himalaya as an acute, exceptional threat with potentially global ramifications.

Such forms of writing climatic futures are, according to Islar, problematic for at least three reasons: First, such depictions of climate change undermine the credibility of scientists, because often hypotheses are transformed into catastrophic/dystopic scenarios before they have even been confirmed. Second, the securitizing language of these scenarios is violent in itself, thus rendering extraordinary responses more plausible in the public eye. Third, when facts are translated into sensational stories and fiction, we need to think about whose storylines are being reproduced and circulated, and indeed whose narratives are being excluded. Islar’s study is thus an excellent example of how writing conventions and styles in different fields – here, science and mass media – shape and change traveling imaginaries of climate futures.

VISUALIZING VIOLENT FUTURES

As observed by McQueen (2018: 54), in his seminal work on the social imaginary Taylor has surprisingly “little to say about the visual dimensions of imaginaries.” Drawing on the work of Buck-Morss (2002), McQueen proposes an “imagistic” understanding of imaginary – one that accounts for the crucial role of icons, symbols, images, and visual metaphors in the construction of meaning in our world. In her work on the apocalypse as social imaginary, this allows her to trace how Christian apocalyptic symbols and icons become re-appropriated and reproduced in contemporary popular culture or political discourse.

For the study of violent climate imaginaries, the visual dimension of these is equally important. As works on the “image politics of climate change” (Schneider and Nocke 2014) have shown, images and other visual artefacts are crucial for the discursive framing of environmental problems such as climate change. One reason for this is that climate change, at least for the majority of people living in Western countries, is not a manifest but a future issue. Furthermore, even in regions where the impacts of global warming can already be felt today, one cannot see or perceive climate change itself. What can be felt and perceived is

only the local weather; climate change, however, is a statistical weather trend that unfolds globally over a longer period (usually three decades or more). Climate change can, thus, only be sensed by proxy. Technical images including diagrams, charts, and figures – such as the prominent “hockey-stick graph” (Mann et al. 1999) – render this long-term trend visible.

The results of scenario exercises and computer models are also often presented in visual rather than textual form. Data visualization has become an important subfield within climate science. Increasingly, animated short clips or GIFs are being used to communicate the findings of climate scientists. The media and NGOs often use proxy images, for examples ones of natural disasters and other humanitarian emergencies, to visually represent (future) climate change. In these publications we often see images of “climate victims” – women and children in crisis situations such as floods or droughts. Pictures of “climate refugees” – people of color wading through the water – are supposed to give the abstract phenomenon of climate change a “human face” (Methmann 2014; Methmann and Rothe 2014). In popular culture, movies such as *The Day after Tomorrow* draw on powerful visual metaphors – such as the previously mentioned reference to nuclear winter – and Christian apocalyptic symbols to narrate a story of apocalyptic climate change. Cartoons, comics, and other pop culture artefacts are used to explain the issue to a broader lay audience (Manzo 2012). These images and other visual or pop culture artefacts do not simply depict climate change in a neutral and objective way but rather they frame it in particular ones. Especially in the visual discourse on the Anthropocene, aerial images of human-shaped landscapes – for example in mining areas – are taken as visualizations of humanity’s footprint on the planet (Demos 2017). Visual scholars such as Demos have criticized these monumental landscape images for aestheticizing and thus normalizing the effects of petrocapiatalism (Demos 2015). The violence of these practices of extraction remains invisible in these images. Deformed and degraded landscapes appear as beautiful patterns and forms.

As Bleiker (2015) argues, images affect what we can see, think, and say about an issue (such as climate change). The visual representation of the climatic future is thus intrinsically political and linked to questions of power (Schneider and Nocke 2014). While some visual framings of climate change become dominant – think here of the emblematic image of the starving polar bear – other forms of climate visibility become hidden.

To study the violent imaginaries of climate change, thus, requires taking a closer look at the visual dimension thereof. Images of violence, suffering, or existential threats are much more likely to invoke a certain emotive reaction on the part of the viewer than mere textual descriptions would. While this might be obvious in the case of disaster movies such as *The Day after Tomorrow*, it even holds true for technical images of climate change too. Several works have, for example, shown how the use of colors (red) creates a sense of risk and urgency in climate figures – such as the IPCC’s prominent “burning ambers” figure (Liverman 2009). Another important characteristic of images besides the ability to transfer emotions is their supposed objective truth claim. Photographic pictures and satellite images purportedly depict the empirical reality on the ground in a direct and undistorted manner – “seeing is believing” (Shim 2013). Hence, visual artefacts can play an important role in the securitization of future issues such as climate change – by presenting the existence of existential threats (climate migration, conflict, etc.) in an apparently objective manner (Rothe 2017).

Brüggemann (2019) examines the social construction of climate futures in the mass media. By studying images of future climate change in German mass media publications since the 1980s, he observes the collective imaginary thereof. In the 1980s/1990s the predominant visual framing of climate change in the media was that of a drowning world. Under the headline “Die Klima-Katastrophe” (“The Climate Catastrophe”), a 1986 front cover from the German magazine *Der Spiegel* for example featured a montage showing the Cologne Cathedral drowning in water.

This image not only creates a sense of urgency, but – together with the headline – furthermore gives the abstract – and at that time largely unknown – phenomenon of climate change concrete form. On an emotional level, the image invokes fear and a sense of personal attachment – by showing the destruction of one of Germany’s most prominent cultural icons. Brüggemann then compares this image to a more recent one from 2015 (see Figure 4 below). The issue is entitled “Der verheizte Planet,” which in German has a double-meaning – “the burned planet” as well as the “the used-up planet.”

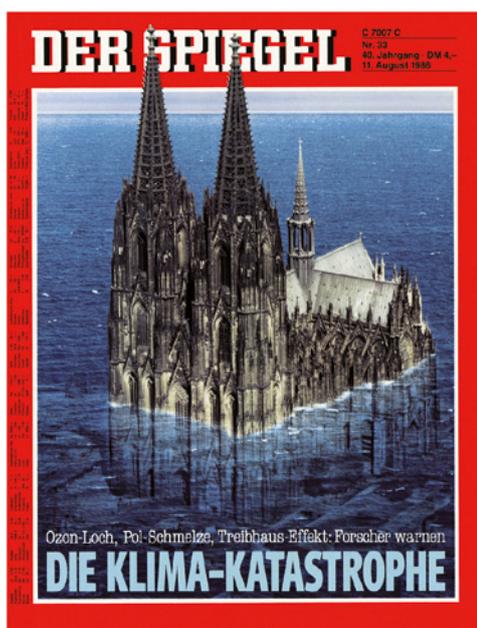
The front cover shows a space image of the Earth – the Blue Marble – in flames. Although equally catastrophist as the image of the drowning Cathedral, this one of the planet in flames sends a more ambivalent message – one that links the existential threat to the planet to the need for and possibility of collective action (DeLoughrey 2015: 262). The view of the planet from space – through the so-

called planetary gaze – portrays simultaneously the beauty and the fragility of the Earth. It constructs a moral responsibility too: humankind has set the planet on fire. It is in fact the only species that could do so, just as it is the only one that can view the planet from the outside. Thus, it also has a moral and political duty to save the planet through collective action.

Linné (2019) paints an even more nuanced – and ambivalent – picture of the relationship between future images, violence, and climate change. He explores how veganism constitutes itself as a nonviolent political movement centered around demands such as animal rights and climate justice. Linné shows how vegan political actors use horrific images of future food to express and illustrate a twofold form of violence within the present food system. On the one hand, industrialized agriculture is built on a system of violence that treats living beings as mere commodities (Linné, 2016). On the other, meat consumption is a significant contributor to global warming – which again poses a threat to many nonhuman species on the planet. Thus, veganism in the West is very much built on the idea of nonviolence. However, while activism around veganism addresses violence and is at the same time performed in nonviolent ways (e.g. being there in solidarity rather than blocking or using violence), the veganism movement is

Figure 3. A 1986 front cover from *Der Spiegel* (1986)

Figure 4. A 2015 front cover from *Der Spiegel* (2015)



in fact to a large extent based on communicating violence. Prominent examples are pictures or videos secretly taken in factory farms that show suffering animals. These images have a strong emotional appeal, and are meant to wake the broader public up to the violence of the capitalist food system. As Linné demonstrates by showing images of the political struggles occurring around the production of cow's milk in New Zealand in 2015 (Figure 5) or via the example of the Animal Save Movement, an international network of activists documenting animals arriving in trucks at slaughterhouses (the pictures then being posted online), forms of violence – for example epistemic – are apparent in several depictions of vegan food futures.

Figure 5. Image from the SAFE (Save Animals from Exploitation) Campaign "The Dark Side of the New Zealand Dairy Industry" (Medium 2015).



Explaining the Circulation of Climate Imaginaries

In the previous two sections of the working paper we have outlined the concept of violent climate imaginaries and described the different knowledge practices and techniques through which they are produced. In the remaining part of the paper we now take a closer look at the politics of climate imaginaries, and discuss the question of how and why they travel and circulate between different knowledge domains and social fields. The first part of this question addresses the mechanisms and channels of circulation, translation, and transfer that allow certain imaginaries to spread in the first place. The second part of the question, meanwhile, is related to issues of power and agency: Why do some imaginaries spread, while others do not?

There are several competing concepts that could help to answer this overarching question. A first is that of “interdiscourse” (Link 2013). Interdiscourses can be understood as a repertoire of collectively shared symbols, metaphors, icons, and narratives within a given discursive community (Farzin 2019). These collectively shared symbols enable and facilitate communication between specialized discourses and lay audiences. Farzin (2019) proposes to understand the genre of “climate fiction” as interdiscourse. By providing a set of powerful symbols and by turning complex scientific findings into simpler storylines, climate fiction serves as a translation device between expert and lay knowledge. At the same time, it is bound by the very (economic and discursive) structures through which it circulates. Interestingly, novels such as *New York 2140* not only use scientific knowledge (e.g. the image of “dithering”) and turn it into a fictional narrative, but these narrative themselves then inform social theory once more as that knowledge becomes rearticulated by philosophers and social thinkers – including, for example, Wark (2016) and Haraway (2016).

Other collective symbols popularize metaphors such as the “tipping point,” “risk cascade,” or “threat multiplier” to break down the complexity of climate change-human security interlinkages (Scheffran 2019a; Rothe 2016). Stripple (2019) discusses the notion of “planetary boundaries” (Rockström et al. 2009), which has become the most powerful concept in the apocalyptic imaginary of climate change. In principle this imaginary is a discourse on limits, one which drives us to constantly search for the “safe level”: the limit to what the Earth system can ultimately deal with. Yet powerful visual images – including icons

such as the drowning Cologne Cathedral or the burning Earth – are also part of the interdiscourse. These dwell on and rearticulate powerful Christian icons of the biblical flood or the Last Judgment.

Farzin's (2019) take on the interdiscourse as a medium of traveling imaginaries points toward a first circulation mechanism of violent climate imaginaries: translation. Following this argument, climate imaginaries circulate most successfully when they link up with the dominant interdiscursive concepts, symbols, icons, and metaphors. Interdiscourse allows imaginaries to be translated from one specialized discourse to another, and to be communicated to broader audiences.

A second explanation of the circulation of certain imaginaries is the broader political economy of imaginaries (Stripple 2019). As previously outlined by Scheffran et al. (2012), there is a high degree of disagreement within the research community on climate-security linkages. As global problems such as conflict and economic crisis are connected in complex ways with both each other and a range of other factors, of which climate change is but one, it is very difficult to statistically unpack the exact relationship between the latter phenomenon and violence. In light of this complexity, the question arises of why certain imaginaries of violent climate change – for example the idea of “climate wars” or of a looming “climate refugee crisis” – have become so prominent and circulated so widely even beyond the field of academia. According to Stripple (2019), the answer lies at least partly in the broader political economy of such imaginaries. Dissecting this would require studying the actor networks as well as the economic structures in which such imaginaries emerge and circulate. With regard to the imaginaries themselves, crucial questions would involve: What different changes in policy, spending, or organization do they argue for? Who benefits, and who does not? Which actors might have political and economic interests in circulating certain imaginaries? Asking these questions might also allow us to explain why climate-skeptic imaginaries that conceive of climate change as a major liberal conspiracy – or “fake news” – have become so dominant in large parts of the US.

A third explanatory factor besides discursive translation and economic interests is the personal relations between actors of different fields. The militarization of the geosciences during the Cold War created novel actor networks and collaborations between (natural) scientists, military actors, and strategic thinkers (Rothe 2017). Institutions like RAND or MIT served as knowledge brokers to mediate between these fields. After the end of the Cold War, these actor networks

existing at the science-policy interface prevailed and became important drivers in the emerging debate on environmental security in the 1990s. Such networks have remained influential until today. For example, Scheffran (2019a, 2019b) points to the close cooperation of researchers and strategic thinkers within the field of geoengineering. One prominent figure in this debate is Lowell Wood, an astrophysicist and former advisor to Ronald Reagan; he is an advocate for defense-oriented, anti-climate change measures such as solar radiation management and space mirrors.⁴

Finally, as outlined in more detail above the circulation of imaginaries can be explained by their coproduction in tandem with important technological developments. Social imaginaries become inscribed into technologies such as computer models or satellite remote sensing (Aykut 2019; Rothe 2017). Black-boxed within computer models, data visualizations, maps, scenarios, or other similar techniques, certain imaginaries circulate more easily – and at the same time become harder to contest too.

Conclusion

This research report has explored violent climate imaginaries at the intersection of science, fiction, and politics, particularly dwelling on the question of how they are produced and circulated within and between different fields. As we have shown, there are a multitude of approaches to and ways of understanding violence in such climate imaginaries. While often being an evident feature of dystopian climate futures (e.g. manifested in relation to climate-induced migration, starvation, natural disasters, etc.), violence is also part of more utopian visions of climate futures too – both as something to resist (e.g. the “sustainable livelihoods” imaginary) and as something rendered invisible (e.g. the “green-tech” imaginary). Based on a discussion of different types of violence, we have been able to show that the dominant imaginaries tend to focus on the large-scale violence triggered by climate change. Slower, less visible forms of violence in relation to climate change, ones that are often felt by people in the non-Western world, are often silenced in these dominant imaginaries of the climatic future.

In terms of the production of imaginaries, we have proposed a typology of three different modes of future-making: modeling, writing, and visualizing violent climate futures. The first refers to numerical and calculative practices of anticipating future climates. Through computer models, probabilistic risk

assessments, or quantitative scenarios, the future becomes something that can be calculated and have numerical degrees of probability attached to it. Writing the future, on the contrary, refers to narrative practices in which the future is turned into a plausible storyline. Visualizing violent futures, meanwhile, refers to the power of images and other visuals – charts, figures, maps, or artwork – to render the future visible in the present. These three modes of future-making are, however, crucially interlinked. Computer models and other calculations are not neutral representations of reality but are imbued with interpretations and subjective beliefs that cohere with dominant narrative forms. Images are both the outcome of modeling practices and a source of inspiration for narrative accounts of the climatic future. Together, they shape our collective imaginations of future climate change. The resulting climate imaginaries turn the distant and abstract into something close, personal, and relatable.

However, as shown in this paper, not all future imaginaries of climate change are equally influential. Their ability to shape political and personal choices in the present depend on their circulation between different knowledge domains and social fields. In this paper, four factors enabling imaginaries to circulate have been discussed: (1) the translation between discourse (expert knowledge) and interdiscourse (lay knowledge); (2) political economic processes; (3) actor network relationships; and, (4) technological coproduction. In the circulation of imaginaries, collectively shared symbols and narratives such as “tipping points” and “planetary boundaries” are key – in the sense of constructing and communicating meaning, both of the world as we know it today and of more uncertain futures. The notion of planetary boundaries, for instance, draws on a discourse on limits. It is particularly powerful as part of an apocalyptic imaginary telling us that if we do not manage to keep within the limits of the planet itself, hence within a “safe level” of altering the climate, we will inevitably encounter an increasingly violent and dystopian future.

The concept of violence in relation to climate change imaginaries is not, however, unproblematic. It might in fact be more relevant or useful to talk about injustices, rather than violence. The latter is normally something that we have respect for, but not necessarily something that we think about when talking about climate change events or effects. Injustice on the other hand – discussed in relation to a number of topics such as loss and damage, climate risks, vulnerability, and adaptation – is a persistent issue in the political discourse of climate change. In a world where climate change is already causing violent events that disproportionately affect the most vulnerable to (but least responsible for) climate change, there is a need

to increasingly turn attention to the injustices inherent in the broader political economy of climate change.

This calls for further exploring questions of who benefits from certain imaginaries, and who does not. Or, more precisely, the issue of how the political economy of violent climate imaginaries affects structures of injustice and inequality. A further reservation concerns the Eurocentrism that undergirds the concept of (political) violence itself. The modernist notion of violence does not translate easily into other cultures, and in many non-Western languages there is not even an appropriate word to denote it. Nixon's (2011) slow violence or non-anthropocentric concepts of violence could help to overcome this Western-centrism, but they seldom find their way into popular imaginaries of climate change. Popular culture, literature, and media discourses are still dominated by spectacular forms of violence such as war, societal collapse, or catastrophic disaster.

Finally, further reflection on the legitimacy of violence in representations of climate change is needed: Is nonviolence a universal normative goal? Could certain forms of violence be legitimized in a situation of unchecked global warming? What is the role of state violence, given the responsibility of states to protect their citizens from physical harm? Questions like these are of the utmost political importance in the current situation of social protest and civil action against current climate legislation becoming more radicalized, and with the division of societies over matters of ecology and climate change seeming to be further reinforced.

Endnotes

- 1 This workshop occurred as part of a larger cooperation scheme between the Universities of Hamburg and Lund, and brought together scholars from the fields of Sociology, Political Science, Peace and Security Studies, Criminology, Human Geography, Literature Studies, and Sustainability Science. We would like to thank Alina Viehoff for her support in the organization of the workshop and Annika Reinke for supporting the production of this paper.
- 2 It is important to note that the discussed modes of future-making are analytical ideal-types that necessarily overlap in empirical reality.
- 3 See: <https://www.sciencealert.com/how-mit-computer-predicted-end-civilisation-almost-50-years-ago-world1-world3-club-rome-limits-growth> (accessed 6 June 2019).
- 4 See, for example, “Can geoengineering save the world?” Rolling Stone, 4 October 2011.

References

- Arlt, Dorothee, Hoppe, Imke, Schmitt, Josephine B., de Silva-Schmidt, Fenja, & Brüggemann, Michael** (2017). Climate Engagement in a Digital Age: Exploring the Drivers of Participation in Climate Discourse Online in the Context of COP21. *Environmental Communication*, 49(3): 1-15.
- Aykut, Stefan C.** (2019). Reassembling Energy Policy. Models, Scenarios and Policy Change in Germany and France, forthcoming in *Science & Technology Studies*. Available at <https://sciencetechnologystudies.journal.fi/forthcoming/view/index> (accessed 11 December 2019).
- Baldwin, Andrew, Methmann, Chris & Rothe, Delf** (2014). Securitizing 'Climate Refugees': The Futurology of Climate-Induced Migration. *Critical Studies on Security*, 2(2): 121-130.
- Barry, Andrew** (2013). *Material Politics: Disputes Along the Pipeline*. Sussex: Wiley Blackwell.
- Bartter, Martha A.** (1988). *The Way to Ground Zero: The Atomic Bomb in American Science Fiction*. New York: Greenwood.
- Bleiker, Roland** (2015). Pluralist Methods for Visual Global Politics. *Millennium: Journal of International Studies*, 43(3): 872-890.
- Boas, Ingrid; Dahm, Ruben; Wrathall, David** (2019). Grounding Big Data on Climate-Induced Human Mobility. *Geographical Review*. Published online first 3 April 2019.
- Bonds, Emily** (2016). Upending Climate Violence Research. Fossil Fuel Corporations and the Structural Violence of Climate Change. *Human Ecology Review*, 22(2): 3-24.
- Boyd, Emily, James, Rachel A., Jones, Richard G., Young, Hannah R., & Otto, Friederike E. L.** (2017). A Typology of Loss and Damage Perspectives. *Nature Climate Change*, 7(10): 723-729.
- Brady, Amy** (2019). The Climate Crisis Is Mind-Boggling. That's Why We Need Science Fiction. In *These Times*, published online 17 June 2019, available at <http://inthesetimes.com/article/21907/climate-change-science-fiction-collective-action> (accessed 5 July 2019).
- Brüggemann, Michael** (2019). The Social Construction of Climate Futures – A Research Project from the Hamburg Cluster of Excellence CliCCs. Unpublished Talk, Hamburg, 12 February 2019.
- Buck-Morss, Susan** (2002). *Dreamworld and Catastrophe: The Passing of Mass Utopia in East and West*. Boston, MA: MIT Press.
- Burke, Marshall B., Miguel, Edward, Satyanath, Shanker, Dykema John A., & Lobell, David B.** (2009). Warming Increases the Risk of Civil War in Africa. *Proceedings of the National Academy of Sciences*, 49: 20670-20674.
- Chertovskaya, Ekaterina, & Paulsson, Alexander** (2016). The Growthocene: Thinking Through What Degrowth is Criticizing. ENTITLE blog, 19 February 2016. Available at <https://entitleblog.org/2016/02/19/the-growthocene-thinking-through-what-degrowth-is-criticising/> (accessed 1 July 2019).
- Corry, Olaf** (2012). Securitisation and 'Riskification': Second-order Security and the Politics of Climate Change. *Millennium: Journal of International Studies*, 40(2): 235-258.
- Davies, Thom** (2019). Slow Violence and Toxic Geographies: 'Out of Sight' to Whom? *Environment and Planning C: Politics and Space*, published online first 10 April 2019.
- DeLoughrey, Elizabeth** (2015). Satellite Planetarity and the Ends of the Earth. *Public Culture*, 26 (2 (73)): 257-280.

- Demos, T. J.** (2017). *Against the Anthropocene*. Berlin: Sternberg Press.
- Demos, T. J.** (2015). *Capitalocene Violence*, available at https://www.fotomuseum.ch/en/explore/still-searching/articles/27014_capitalocene_violence (accessed 27 June 2019).
- Der Spiegel** (1986). Die Klima-Katastrophe. *Der SPIEGEL*. 11.08.1986, Nr. 33. Accessed 25th November 2019, from <https://www.spiegel.de/spiegel/print/d-13519133.html>.
- Der Spiegel** (2015). Der verheizte Planet. Wie die Gier nach Wachstum unser Klima zerstört. *Der SPIEGEL*. 21.2.2015, Nr. 9. Available at <https://www.spiegel.de/spiegel/print/index-2015-9.html> (accessed 25 November 2019).
- Desperret, Auguste** (1833). Third Eruption of the Volcano of 1789 (Troisième éruption du volcan de 1789), Lithograph, First published in „La Caricature“, June 1833. License: University of Pittsburgh Libraries. Available at <https://www.clevelandart.org/exhibitions/last-days-pompeii-decadence-apocalypse-resurrection> (accessed 25 November 2019).
- Dilts, Andrew** (2012). Revisiting Johan Galtung’s Concept of Structural Violence. *New Political Science*, 34: 191–194.
- Donovan, Jack** (2016). *Becoming a Barbarian*. Cascadia: Dissonant Hum.
- Dörries, Matthias** (2011). The Politics of Atmospheric Sciences: “Nuclear Winter” and Global Climate Change. *Osiris* 26 (2011): 198-223.
- Edwards, Paul N.** (2010). *A Vast Machine: Computer Models, Climate Data and the Politics of Global Warming*. Cambridge London: MIT Press.
- Essebo, Maja** (2018). A Mythical Place: A Conversation on the Earthly Aspects of Myth. *Progress in Human Geography*, 43(3): 5515-530.
- Essebo, Maja** (2019). Fear & Fervour: Naturalising Trump’s Non-Response Response to Climate Change. Unpublished Talk, Hamburg, 11 February 2019.
- Fagan, Madeleine** (2017). Who’s afraid of the Ecological Apocalypse? Climate Change and the Production of the Ethical Subject. *The British Journal of Politics and International Relations*, 19(2): 225-244.
- Farzin, Sina** (2017). Schmetterlingseffekte. Wissenschaft, Utopie und Dystopie in I am Legend. In: Lim, Il-Tschung; Richter, Daniel (eds.), *Kino und Krise: Kultursoziologische Beiträge zur Krisenreflexion im Film* Wiesbaden: Springer VS 50-70.
- Farzin, Sina** (2018). Saci Lloyd’s *The Carbon Diaries 2015* (2008) – Coming-of-Age Cli-Fi. In: Goodbody, Axel; Johns-Putra, Adeline (eds.), *Cli-Fi: A Companion*. Oxford: Peter Lang.
- Farzin, Sina** (2019). Travelling Imaginaries – Climate Change Utopias and Social Theory. Unpublished Talk, Hamburg, 12 February 2019.
- Gasparatos, Alexandros, Doll, Christopher N. H., Esteban, Miguel, Ahmed, Abubakari, & Olang, Tabitha A.** (2017). Renewable Energy and Biodiversity: Implications for Transitioning to a Green Economy. *Renewable and Sustainable Energy Reviews*, 70: 161-184.
- Gosh, Amithav** (2016). *The Great Derangement: Climate Change and the Unthinkable*. Chicago: The University of Chicago Press.
- Galafassi, Diego, Kagan, Sacha, Milkoreit, Manjana, Heras, María, Bilodeau, Chantal, Bourke, Sadhbh J., Merrie, Andrew, Guerrero, Leonie, Pétrusdóttir, Guðrún, & Tábara, Joan D.** (2018). ‘Raising the Temperature’: The Arts on a Warming Planet. *Current Opinion in Environmental Sustainability*, 31: 71-79.

Galtung, Johan (1969). Violence, Peace and Peace Research. *Journal of Peace Research*, 6(3): 167-191.

Granjou, Céline, Walker, Jeremy, & Salazar, Juan (2017). The Politics of Anticipation: On Knowing and Governing Environmental Futures. *Futures*, 92: 5-11.

Gray, John (2007). *Black mass: Apocalyptic Religion and the Death of Utopia*. New York: Farrar, Straus and Giroux.

Goodbody, Axel, & Johns-Putra, Adeline (eds.) (2018). *Cli-Fi: A Companion*. Oxford: Peter Lang.

Haraway, Donna J. (2008). *When Species meet*. Minneapolis: University of Minnesota Press.

Haraway, Donna J. (2016). *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press.

Hentschel, Christine (2019). *Wild Energies Against Apocalypse: Volcanic Metaphors in Contemporary Rightwing Thought*. Unpublished Talk, Hamburg, 11 February 2019.

Hobbs-Morgan, Chase (2017). Climate Change, Violence, and Film. *Political Theory*, 45(1): 76-96.

Islar, Mine, Brogaard, Sara & Lemberg-Pedersen, Martin (2017). Feasibility of Energy Justice: Exploring National and Local Efforts for Energy Development in Nepal. *Energy Policy*, 105: 668-676.

Islar, Mine (2019). *Violent Imaginaries of the Future: Examples from Climate Impact Reports of Himalayas*. Unpublished Talk, Hamburg 11 February 2019.

Jasanoff, Sheila (2015). Future Imperfect: Science, Technology and the Imaginations of Modernity, in: Jasanoff, Sheila, & Kim, Sang Hyun (ed.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Chicago: The University of Chicago Press.

Jasanoff, Sheila, & Kim, Sang Hyun (eds.) (2015). *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Chicago: The University of Chicago Press.

Jessop, Bob (2004). Critical Semiotic Analysis and Cultural Political Economy. *Critical Discourse Studies*, 1(2): 159-174.

Levy, David L., & Spicer, André (2013). Contested Imaginaries and the Cultural Political Economy of Climate Change. *Organization*, 20(5): 659-678.

Link, Jürgen (2013). Diskurs, Interdiskurs, Kollektivsymbolik: Am Beispiel der aktuellen Krise der Normalität. *Journal of Discourse Studies/Zeitschrift für Diskursforschung*, 1(1): 7-23.

Linné, Tobias (2016). Cows on Facebook and Instagram: Interspecies Intimacy in the Social Media Spaces of the Swedish Dairy Industry. *Television & New Media*, 17(8): 719-733.

Linné, Tobias (2019). *Violent and non-violent Food Imaginaries in Popular Culture*. Unpublished Talk, Hamburg, 11 February 2019.

Liverman, Diana M. (2009). Conventions of Climate Change: Constructions of Danger and the Dispossession of the Atmosphere. *Journal of Historical Geography*, 35(2): 279-296.

Mahony, Martin & Beck, Silke (2019). *Infrastructures of the Imagination: Uncertainty and the Politics of Prefiguration*. Steps Centre: Pathways to Sustainability, 1 October 2019. Available at: <https://steps-centre.org/blog/infrastructures-of-the-imagination-uncertainty-and-the-politics-of-prefiguration/> (accessed 26 November 2019).

- Mann, Michael E., Bradley, Raymond S. Hughes, Malcolm K.** (1999). Northern Hemisphere Temperatures During the past Millennium: Inferences, Uncertainties, and Limitations. *Geophysical Research Letters*, 26(6): 759-762.
- Manzo, Kate** (2012). Earthworks: The Geopolitical Visions of Climate Change Cartoons. *Political Geography*, 31(8): 481-494.
- McQueen, Alison** (2018). *Political Realism in Apocalyptic Times*. Cambridge: Cambridge University Press.
- Meadows, Donella H.; Meadows, Dennis, L.; Randers, Jørgen; Behrens, William W.** (1972). *The Limits to Growth: A report for THE CLUB OF ROME'S Project on the Predicament of Mankind*. New York: Universe Books.
- Medium** (2015). NZ Dairy Industry Exposed. Available at: <https://medium.com/@CatsToGo/nz-dairy-industry-exposed-edccf8d6390f> (accessed 26 November 2019).
- Methmann, Chris** (2014). Visualising Climate-Refugees: Race, Vulnerability, and Resilience in Global Liberal Politics. *International Political Sociology*, 8(4): 416-435.
- Methmann, Chris & Rothe, Delf** (2012). Politics for the Day After Tomorrow: The logic of Apocalypse in Global Climate Governance. *Security Dialogue*, 43(4): 323-344.
- Methmann, Chris, & Rothe, Delf** (2014). Tracing the Spectre that haunts Europe: the visual construction of Climate- induced Migration in the MENA Region. *Critical Studies on Security*, 2(2): 162-179.
- Moser, Sarah.** (2018). Forest City, Malaysia, and Chinese Expansionism. *Urban Geography*, 39(6): 935-943.
- Nikoleris, Alexandra., Stripple, Johannes, & Tenngart, Paul** (2017). Narrating Climate Futures: Shared Socioeconomic Pathways and Literary Fiction. *Climatic Change*, 143: 307-19.
- Nikoleris, Alexandra, Stripple, Johannes & Tenngart, Paul** (2019). The "Anthropocene" in Popular Culture: Narrating Human Agency, Force, and Our Place on Earth, in Biermann, Frank, & Lövbrand, Eva (eds.), *Anthropocene Encounters: New Directions in Green Political Thinking*. Cambridge: Cambridge University Press, 67-84.
- Nikoleris, Alexandra & Chertkovskaya, Ekaterina** (2019). A Conversation on Imaginaries and Violence: bringing the Concepts together. Unpublished Talk, Hamburg, 11 February 2019.
- Ningelgen, Laura** (2018). The Depiction of Climate Change as a Threat Multiplier and How It Hinders Action. *E-International Relations*, 11 May 2018. Available at: <https://www.e-ir.info/2018/05/11/the-depiction-of-climate-change-as-a-threat-multiplier-and-how-it-hinders-action/> (accessed 27 June 2019).
- O'Lear, Shannon** (2016). Climate Science and Slow Violence: A View from Political Geography and STS on Mobilizing Technoscientific Ontologies of Climate Change. *Political Geography*, 52: 4-13.
- Nixon, Rob** (2011). *Slow Violence and the Environmentalism of the Poor*. Cambridge, A: Harvard University Press.
- Rockström, Johan, Steffen, Will, Noone, Kevin, Persson, Åsa, Chapin, F. Stuart, Lambin, Eric F., Lenton, Timothy M., Scheffer, Marten, Folke, Carl, Schellnhuber, Hans Joachim, Nykvist, Björn, de Wit, Cynthia A., Hughes, Terry, van der Leeuw, Sander, Rodhe, Henning, Sörlin, Sverker, Synder, Peter K., Constanza, Robert, Svedin, Uno, Falkenmark, Malin, Karlberg, Louise, Corell, Robert W., Fabry, Victoria J., Hansen, James, Walker, Brian, Liverman, Diana, Richardson, Katherine, Crutzen, Paul, Foley, Jonathan A.** (2009). A Safe Operating Space for Humanity. *Nature*, 261(7263): 472-475.

- Raven, Paul G.** (2015). Imagining the Impossible: The Shifting Role of Utopian Thought in Civic Planning, Science Fiction, and Future Studies. *Journal of Futures Studies*, 20(2): 113-122.
- Raven, Paul G.** (2016). The Rhetorics of Futurity: Scenarios, Design Fiction, Prototypes, and Other Evaporated Modalities of Science Fiction. *Foundation: The International Review of Science Fiction*, 45(123): 50-63.
- Raven, Paul G.** (2019). Trouble in Paradise: The Evolution of Utopian Modes in Science Fiction. Unpublished Talk, Hamburg, 11 February 2019.
- Raven, Paul G. & Elahi, Shirin** (2015). The New Narrative: Applying Narratology to the Shaping of Future Outputs. *Futures*, 74: 49-61.
- Rothe, Delf** (2016). *Securitizing Global Warming: A Climate of Complexity*. London/New York: Routledge.
- Rothe, Delf** (2017). Seeing Like a Satellite: The Ontological Politics of Environmental Security. *Security Dialogue*, 48(4) 334-353.
- Scheffran, Jürgen** (2019a). The Entwined Cold War Roots of Missile Defense and Climate Geoengineering. *Bulletin of the Atomic Scientists*, 75(5): 222-228.
- Scheffran, Jürgen** (2019b). Climate Extremes and Societal Stability. Unpublished Talk, Hamburg, 11 February 2019.
- Scheffran, Jürgen, Brzoska, Michael, Kominek, Jasmin, Link, P. Michael, & Schilling, Janpeter** (2012). Climate Change and Violent Conflict. *Science*, 336: 869-871.
- Scheffran, Jürgen, Ide, Tobias, & Schilling, Janpeter** (2014). Violent Climate or Climate of Violence? Concepts and Relations with Focus on Kenya and Sudan. *The International Journal of Human Rights* 18(3): 369-390.
- Schneider, Birgit, Nocke, Thomas** (2014). *Image Politics of Climate Change: Visualizations, Imaginations, Documentations*. Bielefeld: transcript.
- Schwartz, Peter & Randall, Doug** (2003). An Abrupt Climate Change Scenario and Its Implications for United States National Security. available at <https://eesc.columbia.edu/courses/v1003/readings/Pentagon.pdf> (accessed 16 December 2019).
- Shim, David** (2013). *Visual Politics and North Korea: Seeing is Believing*. London/New York: Routledge.
- Skrimshire, Stefan** (2010). Eternal Return of Apocalypse, in: Skrimshire, Stefan (ed.), *Future Ethics: Climate Change and Apocalyptic Imagination*. London/New York: Continuum, 219-240.
- Solnit, Rebecca** (2019). Call Climate Change what It Is: Violence. *The Guardian*, 7 April 2019. Available at <https://www.theguardian.com/commentisfree/2014/apr/07/climate-change-violence-occupy-earth> (accessed 1 July 2019).
- Spivak, Gayatri C.** (1988). Can the Subaltern Speak?, in: Nelson, Cary & Grossberg, Lawrence (eds.), *Marxism and the Interpretation of Culture*. Urbana: University of Illinois Press, 271-313.
- Steffen, Will, Rockström, Johan, Richardson, Katherine, Lenton, Timothy M., Folke, Carl, Liverman, Diana, Summerhayes, Colin P., Barnosky, Anthony. D., Cornell, Sarah. E., Crucifix, Michel, Donges, Jonathan. F., Fetzer, Ingo, Lade, Steven J., Scheffer, Marten, Winkelmann, Ricarda, & Schellnhuber, Hans Joachim** (2018). Trajectories of the Earth System in the Anthropocene. *Proceedings of the National Academy of Sciences* 115(33): 8252-8259.

Stripple, Johannes (2017). Environmental Security: Policy within a Violent Imaginary, in: Meadowcroft, James & Fiorini, Daniel (eds.), *A Conceptual History of Environmental Politics*. New York: MIT Press, 259-280.

Stripple, Johannes (2019). Imaginaries of Climate change and Security. Unpublished Talk, Hamburg, 12 February 2019.

Taylor, Charles (2003). *Modern Social Imaginaries*. Durham, NC: Duke University Press.

Tenngart, Paul (2019). In Search of the Climate Romance. Unpublished Talk, Hamburg, 11 February 2019.

U.S. Weather Bureau (1965). IBM 7090 console used by a meteorologist, ca. 1965. Source Image ID: wea01830, Historic NWS Collection. License: Public Domain. Available at https://commons.wikimedia.org/wiki/File:IBM_7090_console_used_by_a_meteorologist,_1965.jpg (accessed 25 November 2019).

Vervoort, Joost, Bendor, Roy, Kelliher, Aisling, Strik, Oscar, & Helfgott, Ariella (2015). Scenarios and the Art of Worldmaking. *Futures*, 74: 62-70.

Wark, McKenzie (2016). *Molecular Red: Theory for the Anthropocene*. London: Verso.

Walter, Stefanie, Lörcher, Ines, & Brüggemann, Michael (2019). Scientific Networks on Twitter: Analyzing Scientists' Interactions in the Climate Change Debate. *Public Understanding of Science*, 28(6): 696-712.

Yusoff, Kathryn, & Gabrys, Jennifer (2011). Climate Change and the Imagination. *Wiley Interdisciplinary Reviews: Climate Change (WIREs)*, 2(4): 516-534.

Yusoff, Kathryn (2018). *A Billion Black Anthropocenes or None*. Minnesota: University of Minnesota Press.

ABOUT THE AUTHORS

Ann-Kathrin Benner is a researcher within the DFG-funded project “The Knowledge Politics of Security in the Anthropocene” at the Institute for Peace Research and Security Policy at the University of Hamburg.

benner@ifsh.de

Delf Rothe is a postdoctoral researcher at the Institute for Peace Research and Security Policy at the University of Hamburg and PI of the DFG-funded project “The Knowledge Politics of Security in the Anthropocene”.

rothe@ifsh.de

Sara Ullström is a PhD student within the FORMAS-funded research project “The Take-off of Staying on the Ground” at the Lund University Centre for Sustainability Studies (LUCSUS).

sara.ullstrom@lucsus.lu.se

Johannes Stripple is an associate professor in the Department of Political Science at Lund University.

johannes.strippl@svet.lu.se

ABOUT THE INSTITUTE

The Institute for Peace Research and Security Policy (IFSH) researches the conditions for peace and security in Germany, Europe and beyond. The IFSH conducts its research independently. It is funded by the Free and Hanseatic City of Hamburg.



Hamburg | Ministry of Science,
Research and Equalities

Funded by:

Copyright Cover Foto: Public Domain

Text License: Creative Commons CC-BY-ND (Attribution/NoDerivatives/4.0 International).



IFSH – Institute for Peace Research and Security Policy at the University of Hamburg

Beim Schlump 83 20144 Hamburg Germany Phone +49 40 866077-0 ifsh@ifsh.de www.ifsh.de