1 Introduction: Research on climate change and security in Hamburg

Michael Brzoska and Jürgen Scheffran

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Climate Change, Security Risks, and Violent Conflicts

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1 Introduction: Research on climate change and security in Hamburg

Michael Brzoska and Jürgen Scheffran

The papers in this collection present a sample of the research conducted from 2013 to 2018 within the context of the second phase of the Cluster of Excellence "Integrated Climate System Analysis and Prediction" (CLISAP). This research focused on issues related to security in a broad sense, from the study of determinants of local conflict to conditions of human security in the Anthropocene. Within CLISAP, research on these topics was organized in the C4 research area and was affiliated with the research group Climate Change and Security (CLISEC) at the University of Hamburg, led by Jürgen Scheffran. Research was also conducted in various departments at the University of Hamburg, the Institute for Peace Research and Security Policy (IFSH) at the University of Hamburg, and the Climate Service Center (GERICS) in Hamburg. Several researchers who had worked in CLISEC continued to be affiliated with the research group following their departure to other institutions.[1]

The Hamburg group has become one of a handful of centers conducting research on security-related aspects of climate change worldwide. Between 2013 and mid-2019, a total of more than 200 books, book chapters, research reports and journal articles were published by researchers affiliated with C4/CLISEC, including in such journals as Nature, Science, Journal of Peace Research and Political Geography. Some of these publications are among the most quoted articles in the field. Researchers from Hamburg were present at major international conferences where work on climate change and security was presented and discussed. In addition, they organized more than two dozen such conferences themselves and contributed to a number of authoritative books and reports on the security consequences of climate change. The chapters in this book (mostly based on previously published research) are intended to provide a single source from which to learn more about the activities of researchers affiliated with C4/CLISEC, although they cannot document the full breadth of CLISAP's achievements.

[1] A list of researchers and their fields of research can be found at http://www.clisec.uni-hamburg.de, last accessed 3 March 2020.

The beginnings of security-related research on climate change in Hamburg

Hamburg's international reputation as a leading location for research on climate change and security was secured within a fairly short period of time, beginning in earnest in 2008, following the establishment of CLISAP. Interest in this field has a longer tradition, however, with discussions on joint research between climate and social scientists having taken place since the 1990s, stimulated by increasing recognition of the potential scale of the consequences of climate change for peace, security and conflict. Among those who emphasized the potential impact on society were Hartmut Grassl, Director of the Max Planck Institute for Meteorology in Hamburg, Hans von Storch, Director of the Institute for Coastal Research, Martin Claussen, then working at the Potsdam Institute for Climate Impact Research (PIK), and Dieter Lutz, Director of the IFSH.

Two of these climate scientists, Hans von Storch and Martin Claussen (the latter of whom was then Director of the Max Planck Institute for Meteorology in Hamburg), saw an opportunity to stimulate research on climate change and security when they led the planning of a proposal for a Cluster of Excellence on climate research for a major research program in Germany in the mid-2000s. The German government had decided to fund a limited number of large Clusters of Excellence that aimed to bring together researchers from universities and research institutes to produce challenging and innovative research. With its strong tradition in meteorology and other climate-related sciences, Hamburg was a natural choice as the proposed Cluster of Excellence's location. It was clear to the leaders of the proposal drafting process, however, that the chances of receiving funding would increase if the scope of the research were expanded beyond traditional climate science to include social scientists. Research on peace, conflict and security emerged as a potential topic.

In addition to the personal interests of some in the core group, the intense public debate on climate change and security in the second half of the 2000s had a major impact (Schäfer, Scheffran, and Penniket 2016). By late 2006, when the application for the CLISAP Cluster of Excellence was being prepared, a lively public discussion on the consequences of climate change for future violent conflict was on its way. Among its roots was widespread public dissatisfaction with the climate mitigation efforts of many governments. In particular, the US government, led by President George W. Bush, saw no need to undertake measures against global warming and indeed was skeptical about the idea of man-made climate changes as such, thus contradicting the clear majority view among climate experts, as expressed in assessment reports by the Intergovernmental Panel on Climate Change (IPCC). Prominent individuals in the US (such as former Vice President Al Gore) and members of other gov-

ernments (in particular the UK government) increasingly stressed the dangers of future large-scale violence as a likely consequence of the lack of adequate measures against climate change. They were supported, primarily in the US, by many former (and a few active) high-ranking military officers, whose interviews and reports stressing the traditional security implications of climate change were in turn used by activist groups as authoritative support for climate mitigation actions. In 2007 in Germany, the Advisory Council on Global Environmental Change (WBGU) published a groundbreaking report on the security risks of climate change.

These activities received a further push when the Nobel Peace Prize was awarded to Al Gore and the IPCC in 2007. This raised much public attention due to the Peace Prize Committee's identification of a direct, strong connection between climate change and future armed conflict in their justification – a connection which the Nobel laureates also highlighted in their acceptance speeches.[2] Nevertheless, many in the relevant academic communities were skeptical about the empirical justification of such statements. The same was true for other strong assertions along these lines, such as UN Secretary-General Ban Ki-Moon's claim that the war in Darfur, which began in 2003, was the first climate change war.[3] Despite indications in the relevant academic literature that climate change did in fact increase the likelihood of future violent conflict, the number of academic studies investigating the link between climate change and violence was low. Public discourses had clearly run ahead of scientific evidence.

These discrepancies provided even more reason to intensify research on the security implications of climate change. Hamburg seemed like a good place to pursue this aim, not only because of its leading role in climate research but also because it was home to important research centers on peace and conflict in Germany: the Institute of Peace Research and Security Policy (IFSH), in operation since 1971, and the then newly founded Carl Friedrich von Weizsäcker-Centre for Natural Science and Peace Research (ZNF).

The first phase of research: CLISAP-1

The first researcher to be approached as a possible contributor in this direction was Martin Kalinowski, recently appointed director of the ZNF. Kalinowski in turn invited a number of affiliates of the ZNF to join their efforts. In the end, he and Michael Brzoska wrote a section of the proposal for a Cluster of Excellence, in consultation with interested colleagues and the core group, entitled "Interactions between humans and

[2] Cf. https://www.nobelprize.org/nobel_prizes/peace/laureates/2007/press.html, last accessed 3 March 2020.

[3] Cf. https://www.un.org/sg/en/content/sg/articles/2007-06-16/climate-culprit-darfur, last accessed 3 March 2020.

the climate: Security aspects." The proposal set out an ambitious research program with three components:

- A systemic analysis of the mechanisms and dynamics linking climate change, local conflict and collective violence in identified or potential climatological and climate change–related security "hotspots", as well as the wider effects of such conflict on regional and international security.
- A critical overview of climate change and security discourses, with the primary objective of providing an inventory and critical analysis of linkages and feedbacks suggested in empirical work (including historical), theoretical frameworks and the security policy discourse.
- Analysis of the recursive effects of climate change and the use of energy resources, based on global energy scenarios as proposed in response to climate change effects and their national and international security.

CLISAP was selected as a Cluster of Excellence, and work began in 2008. Perhaps the most important effect of the available funding was the opportunity to establish a Junior Research Group (JRG) on Climate Change and Security (CLISEC). Jürgen Scheffran from the University of Illinois, who had worked on several of the topics listed in the CLISAP proposal, was recruited in 2008 to lead the group. One of his first activities was to organize a large international conference in 2009, which brought together a number of leading researchers on topics related to violence, conflict and peace in the context of climate change and which resulted in the publication of a large volume of contributions by both conference attendees and additional experts (Scheffran, Brzoska, Brauch, Link, and Schilling 2012). The conference served the further function of signaling that researchers from Hamburg were set to join the international debate on climate change and security.

Of the three topics listed in the CLISAP-1 proposal, the first received the most attention during CLISAP's 2008–2013 funding period. The main reason for this was the productivity of the core CLISEC group. Jürgen Scheffran, his first post-doc Peter Michael Link, and PhD student Janpeter Schilling were soon joined by a number of other PhD students and post-docs. As suggested in the CLISAP-1 proposal, they focused on the identification of hotspots of climate security (Scheffran and Battaglini 2011) on the one hand and the analysis of systematic interactions between climate-related and conflict-related factors on the other. They substantially advanced both empirical and conceptual knowledge of hotspots, which led them to pursue a system-oriented approach rather than attempting to find simple indicators for geographical labelling. Beyond what had been suggested in the CLISAP-1 proposal, they developed a four-sector system-of-systems approach, which is discussed further in Jürgen Scheffran's and Jasmin Link's contribution to this volume. First published in Science in 2012 (Scheffran, Brzoska, Kominek, Link, and Schilling 2012), this approach has

guided much of the group's work. In addition, Scheffran and his collaborators began to formalize ideas and concepts in agent-based models.

Much of the work concerning the second topic was carried out by Angela Oels (2013), Michael Brzoska (2009) and associates. The main focus of the work was a critical assessment of various conceptions of the "securitization" of climate change, which included analysis of views and discourses on climate change by central security actors.

The third topic received comparatively little attention, although some relevant work was carried out by Clifford Singer, a guest researcher from the University of Illinois at the ZNF over several summers (Singer and von Brevern 2011). This was mainly due to the departure from the ZNF of Martin Kalinowski, who had led this part of CLISAP's work. Jürgen Scheffran, Michael Link, and others contributed to research on energy landscapes and energy transition (Scheffran and Froese 2016; Link and Scheffran 2017; Link, Böhner, and Scheffran 2018; Shaaban 2017, 2018).

Issues and research in CLISAP-2

Before CLISAP-1 came to an end, discussions on extending the work to a second phase of CLISAP-2 began. Under the leadership of Brzoska and Scheffran, a group of interested researchers discussed possible options. It was agreed that they would build on the achievements of CLISAP-1 while including additional important aspects:

- Continuation of the analysis of climate-conflict linkages with a focus on identified or potential climate-change related security hotspots, with a major (but not exclusive) regional focus on northern Africa and the Mediterranean region.
- Research on the security implications of climate-related migration, one objective of which was to assess, primarily through case studies, both the role of environmental factors in causing migration and the consequences of migration, which are or can be viewed as climate induced in receiving regions.
- The implications, for international security, of different strategies for coping with climate change, including energy policy and geo-engineering, along with a critical analysis of their changing justifications and relevance for climate policy.

The research objectives of CLISAP-2 have largely been achieved. Before briefly introducing the individual contributions to this volume, the following list highlights a few overarching themes resulting from research in the C4/CLISEC context, primarily using examples of work not included in this collection.

There has been continued work on the development of an integrative conceptual framework to systematize and explain types of social responses to climate change. Building on the foundation of the systemic circular model for analyzing the complex

connections between climate change and human security, including societal stability, violent conflict and cooperation, further research has been conducted to address the complexity of pathways and interactions. Using a variety of methods – including qualitative and quantitative approaches, conceptual and theoretical analysis, agent-based modelling and social network analysis participating researchers have gleaned numerous new insights. Case studies in a variety of regions, including parts of Latin America, Pakistan, southern Africa, and the Mediterranean and North Africa (Link, Brücher, Claussen, Link, and Scheffran 2015; Ide, Link, Scheffran, and Schilling 2016; Scheffran 2016; Solomon et al. 2018; Bukari, Sow, and Scheffran 2018) provided the foundation for this work.

This research has reinforced the view that simple models that assume a direct relationship between climate change and violent conflict are not in line with the empirical reality of the past few decades. The variance of the results of linear statistical studies can be explained by the importance of a range of factors and conditions that shape the social effects of climate-related environmental changes, including vulnerability and adaptive capacity. These increase the propensity for violent conflict and societal instability in some constellations, and for cooperation and social innovation in others. A central condition is the degree of vulnerability to climate change on the one hand and of human security on the other. Where vulnerabilities combine, they also tend to re-enforce each other in cycles of violence (Scheffran, Ide, and Schilling 2014; Ide and Scheffran 2014), although they may be contained by environmental peacebuilding and cooperation (Ide 2018).

Among the numerous empirical studies (often involving extensive field research) within C4/CLISEC on particular links in the overall nexus between climate-rated environmental change and human security, only a few can be mentioned here. To identify subnational hotspots of climate change and violence in Kenya and Uganda, Ide, Schilling, Link, Scheffran, Ngaruiya, and Weinzierl (2014) analyzed the spatial distribution of factors commonly associated with high exposure and vulnerability to climate change and a high risk of violent conflict onset. They developed a composite risk index to identify regions of joint vulnerability to violent conflict and environmental change. While northern Uganda and Western Kenya were found to be particularly vulnerable, the analysis reveals the weaknesses of the existing data, especially with respect to land degradation and reporting conflict events. To explain the local occurrence of livestock raiding between pastoral groups under different climatic conditions in northern Kenya, Schilling, Akuno, Scheffran, and Weinzierl (2014) developed the RAST (Resource Abundance and Scarcity Threshold) hypothesis. Field research suggests that in regular years with sufficient rain, raiding is mostly conducted before and during the rainy seasons because animals are healthier, they can travel greater distances and raiders can find cover for their attacks. When rains partly or completely fail and a certain

threshold of resource scarcity is reached, however, raids are conducted under less favorable conditions. Another empirical highlight was the study of rural–urban interactions under ecological stress (Rodriguez Lopez, Rosso, Scheffran, and Delgado 2015; Rodriguez Lopez, Heider, and Scheffran 2017; Heider, Rodriguez Lopez, García Avilés, and Balbo 2018) and the environmental benefits of urban land use in Chinese cities (Song, Chang, Yang, and Scheffran 2016).

Water scarcity was a particularly active research field. Extensive research was conducted on local situations in Namibia (Schnegg 2016; Schnegg, Bollig, and Linke 2016) and regional aspects in Israel/Palestine (Fröhlich 2012; Ide and Fröhlich 2015). To analyze the conditions for conflict and cooperation between upstream and downstream countries under climate change and population growth, a framework of water security was applied in a global comparative analysis of river basins (Link, Scheffran, and Ide 2016). Further contributions focused on the development of a river flow model applied to the Elbe and Nile river basins (Alwardt 2016) and the analysis of water use in river basins worldwide (Link, Scheffran, and Ide 2016).

The use of agent-based modelling (ABM) was a particular methodological specialty in CLISEC (Bendor and Scheffran 2019). Outcomes critically depend on the marginal cost of the relevant action pathways, making improved water use efficiency and cooperation a preferable option compared to violent conflict in the long run. China's Pearl River Delta has served as a case study for the impact of flood risks, allowing for analysis (based on multiple indicators of exposition, sensitivity, and adaptive capacity) of the vulnerability of populated urban areas to various climate impacts, such as variation in temperature and rainfall variability, rising sea levels and extreme weather events (Yang, Scheffran, Qin, and You 2015). ABM was used to assess household responses to GIS-based rainfall and flood scenarios, demonstrating the importance of flood warnings for the reduction of flood losses and investment in protective measures (Yang, Scheffran et al. 2018), and to simulate individual responses to environmental stresses in urban Areas (Yang, Hoffmann et al. 2018). Other studies in China examine the effect of bioenergy on food security in the energy landscapes of Jiangsu Province (Shu, Schneider, and Scheffran 2015; Shu 2016), using a model approach that was extended to energy landscapes in northern Germany (Scheffran, Link, Shaaban, Süsser, and Yang 2017; Link, Böhner, Held, and Scheffran 2018; Link, Scheffran, and Shu 2018). A study of climate vulnerability and farming adaptation in Pakistan's Punjab province combined field research, statistical analysis, and assessment of agent-based decision making and interactions among agents. Novel farm-level data from three distinct agro-ecological zones were gathered to analyze farmers' awareness of climatic changes and their adaptive capacities. Key results showed the need to address barriers to the adoption of advanced adaptation measures and different types of institutional services (Abid, Scheffran, Schneider, and Ashfaq 2015; Abid, Schilling, Scheffran, and Zulfiqar

2016; Abid, Ngaruiya, Scheffran, and Zulfiqar 2017) and land use options (Scheffran, Link, Shaaban, Süsser, and Yang 2017). A workshop on ABM supported by CLISAP was conducted in March 2017, in preparation for a special issue on the subject.

Other innovative methodological approaches were also used in the context of CLISAP/C4, including the approaches set out by Ide (2017). Social network analysis was used to identify local barriers to climate adaptation and to assess the adaptive capacities of stakeholder networks in rural areas of Loitoktok in southern Kenya (Ngaruiya and Scheffran 2013, 2016). The analysis incorporates data gathered in field research on revolving fund network schemes to address climate change and proposes a collaborative network to coordinate community actions to exploit "beneficial climate change opportunities" that strengthen the adaptive capacity to sustain livelihoods.

Environmental migration has been a major research field in C4/CLISEC, both in terms of critical analysis of its securitization and in terms of its role in climate adaptation. In addition to original research, activities included participation in a COST project on climate change and migration and the organization of various academic conferences and workshops in Hamburg. Research has included both empirical and conceptual/theoretical work highlighting the importance of the social, economic and political embeddedness of the consequences of migration. Migration is often viewed in both the academic literature and the policy world as an important link between climate change and human insecurity, including armed violence, but this is disputed (Nash 2015; Rothe 2016). Beyond a few cases, empirical evidence for cases of violence resulting from climate-driven migration is lacking (Brzoska and Fröhlich 2016). One important explanation is that of migration as a climate change adaptation strategy which is often supported through remittances and knowledge in migrant networks (Scheffran, Marmer, and Sow 2012; Gioli, Khan, Bisht, and Scheffran 2014; Sow, Marmer, and Scheffran 2016). A particularly controversial example of the link between climate change, migration, and violence is Syria, on which Christiane Fröhlich has published major contributions, summarized in her chapter in this volume (see also Fröhlich 2017; Selby, Dahi, Fröhlich, and Hulme 2017). Extending theoretical frameworks from critical security studies, researchers affiliated with C4 have analyzed the social and political foundations of the fear of large-scale migration and its political implications (Rothe 2016). Dominant conceptions of social risk and security result in perceptions of migration, including climate-related migration, which are used to justify exceptional measures designed to limit the flow of migrants.

An integrative approach has also marked work on the gender aspects of climate change, security risks, migration, and violent conflict, which thus far have not been considered in either traditional threat-centered or newer opportunity-centered approaches to environmental-related migration. Activities include a number of workshops, the establishment of an international network of experts and field research

focusing on the gendered aspects of adaptation in out-migration areas (Fröhlich and Gioli 2015). In northern Pakistan and Nepal, it was found that circular labor migration is deeply gendered, with shifting practices of adaptation being taken up predominantly by women (which complements the narrative of the so-called "feminization of agriculture"). While this has been described as bringing women to the "frontline of adaptation" it has also had negative repercussions in terms of health, drudgery and domestic violence (Gioli et al. 2014).

Grounding research in an integrative framework implies a need for multi- and interdisciplinary approaches. The C4 has benefited from the use of a variety of disciplinary approaches and methods. Participating researchers have also used their results from work on the effects of climate change on human security in related contributions to their academic fields. A historical perspective has focused on Africa and genocide research, bringing together two communities (research on the consequences of climate change and genocide studies) that had previously had little contact. An environmental perspective promises new insights into genocide, for instance in Africa, adding new dimensions to the analysis of how environmental change contributes to large-scale violence (Zimmerer 2015).

A particular focus of the work of ethnographers and social geographers related to C4 has been the perception of climate change in local settings in various regions (Gurgieser et al. 2015). Thomas Friedrich, for instance, examines how scientific knowledge about climate change is integrated into local knowledge about nature and the weather on the Philippine island of Palawan (Friedrich 2018). The results reveal that climate change is "localized" by local political, NGO and expert groups. Both its causes and possible mitigation strategies are located in the region, and local environmentalism is perceived and practiced as an appropriate response to climate change, which is treated as yet another natural hazard.

With respect to climate-related policies and their discursive foundations, two aspects have received particular attention. One is geo-engineering (Brzoska, Link, Maas, and Scheffran 2012; Link, Brzoska, Maas, Neuneck, and Scheffran 2013; Maas and Scheffran 2012), the other migration policy (Baldwin, Methmann, and Rothe 2014; Nash 2018). Overall, researchers from the group have attempted to link empirical research with a critical theoretical perspective, working with concepts such as complexity, tipping points, cascades, and risk multipliers (Scheffran 2016), resilience (Boas and Rothe 2016; Schilling et al. 2017; Balbo et al. 2016), and the Anthropocene and sustainability transitions (Brauch, Oswald Spring, Grin, and Scheffran 2016).

Summaries, reflections, and future directions: Contributions to this volume

Research on climate change and security will continue in Hamburg. Prior to the end of CLSAP-2, a new focus was established with a project funded by the German Research Foundation on governance in the Anthropocene, led by Delf Rothe, who has also contributed to this volume. In addition, work on climate change and security is part of the new Cluster of Excellence in Hamburg on research into climate change and its consequences, CLICCS (Climate, Climatic Change, and Society).

The contributions in this volume provide an important foundation for this ongoing effort but also indicate future directions with respect to both the scope of the topics relevant to the study of the relationship between climate change and security and conceptual reconsiderations of security in a changing world.

A systematic overview of the risks and threats of climate change is provided by Jürgen Scheffran in Chapter 2. He embeds his analysis in a wide-ranging investigation into the interaction of the components of the climate system, particularly focusing on those interactions and feedback loops that render climate change a risk factor in multiple social settings and that make it a threat to security. As outlined above, a number of themes have been central both to the debate on climate change and security and to the Hamburg group in particular. This volume contains contributions on the issues of energy, water, and migration.

In Chapter 3, Martina Neuburger, Rafaela Rau, and Tobias Schmitt write about Agrofuel expansion and black resistance in Brazil. Increasing global energy consumption and the worldwide discourse on renewable energy has encouraged the Brazilian government to promote the expansion of sugar cane and ethanol production in the country. In their case studies, the authors analyze the displacement of alternative rural livelihoods through the expansion of sugar cane plantations in the region of Pompéu (Minas Gerais) by working out underlying power relations between the relevant actors – which are mostly embedded in Brazil's colonial history – as well as shifting property rights on land and water. In addition, they demonstrate the dominance of development and climate change discourses that legitimize the violation of traditional property rights and negate alternative development models.

Janpeter Schilling and Louise Werland present a challenge to the belief that the negative effects and conflict implications of wind energy projects are negligible by analyzing the implications of wind energy for local communities in northern Kenya. Specifically, the paper explores how the recently completed wind park in Marsabit County affects the local population's vulnerability to climate change and how the project continues to influence existing and new conflict dynamics.

In his contribution "Roadmap to Energy Security in Egypt," Mostafa Shaaban outlines a new approach to dynamic temporal and spatial sustainability assessments

that involves modeling future pathways of greenhouse gas emissions and technologies for electricity planning. His focus is on alternative energy pathways and a sustainable electricity supply mix as part of an energy strategy until the year 2100. For this purpose, he models the decision-making processes of multiple actors in the energy sector by integrating three methodologies: multi-criteria decision analysis (MCDA), spatial Geographic Information System (GIS) data analysis and agent-based modelling (ABM).

"Water Allocation in Transboundary River Systems in Times of Climate Change," by P. Michael Link, presents a theoretical framework for the assessment of water conflict and cooperation in times of climate change. Challenges arise when a river is shared by more than one country, as their respective governments must agree on how to allocate the river water among them. While cooperative arrangements have dominated in the past, climate change adds uncertainty to water availability in many transboundary river systems, making it hard or impossible for some countries to comply with existing treaties and to achieve societal stability. The chapter presents the Nile River Basin as a case study.

Liang Emlyn Yang's "Managing Water-Related Vulnerability and Resilience of Urban Communities in the Pearl River Delta, China" addresses the climate-related water risks faced by coastal cities, which are also dealing with increasing populations and property intensity. The chapter analyses the vulnerability and resilience of coastal urban communities in South China, integrating a reanalysis dataset and model projections with literature results on long-term climate changes. It also reviews strategies and priorities for resilience building.

The CLISEC group's work on water-related issues has been enriched by the long-term historical perspectives on changing environments provided by CLISAP visiting researcher Andrea L. Balbo and a number of co-authors in Chapter 8. The contribution summarizes work on the challenges and opportunities confronting historical irrigated agricultural systems in Ricote (Murcia, Spain). Historical irrigated agricultural systems in the Mediterranean region have a long record of sustainability and adaptation to changing climatic, environmental, and social conditions but currently face challenges that may threaten their persistence over the next decades.

The same case study also features in another contribution, which takes a wider perspective. The topic of Miguel Rodriguez Lopez, Katharina Heider, Andrea Balbo, and Jürgen Scheffran's contribution in Chapter 9 is urban–rural transformation. They present an innovative framework for understanding urban–rural interaction influenced by environmental changes, which focuses on the management of property rights as a central problem. The approach is illustrated with the help of two brief case studies from the southern part of Mexico City and southern Spain (Ricote).

This volume also contains two critical discussions of prevailing discourses. The first, by Christiane Fröhlich, summarizes her work on migration as a factor in the popular uprising in Syria in 2011. Syria has evolved into a "showcase study" of sorts for the often assumed but also contested linear causality between mobility following prolonged drought, floods, and other climate-related environmental changes and (violent) conflict. Fröhlich questions and critically reviews, step by step, the argument that drought-related internal migration was a significant factor in the Syrian uprising.

Chapter 11, written by Sarah Louise Nash, is a critical examination of established categories used to describe different kinds of human mobility, based on a distinction between forced and more-or-less voluntary forms of human mobility. None of these are objective, neutral representations of the world, and they generally say a lot about the speakers using these categories. The chapter provides an impetus to look beyond established categories from policymaking, to strengthen critique of these categories in academic work, and to move beyond policy-relevant research.

An important concept in the debate on the consequences of climate change is that of resilience. In Chapter 12, "Resilience in translation", Delf Rothe explains the diversity of conceptions of resilience in climate change and security discourse. Resilience has become a popular concept with Western practitioners and decision makers in development, environmental, and security policy, and the (Western) discourse on the security implications of climate change is no exception. Its usage, however, resists conceptual fixation. The chapter seeks to explain the heterogeneity and ambiguity of resilience by looking at processes of its "translation" into other languages, different discourses and concrete practices.

Linking resilience with security invites the interest of many social and political actors to address the risks and threats arising from climate change. One such group, which often views itself as being at the center of security issues, are the armed forces. In Chapter 13, Michael Brzoska investigates security actors' perception of climate change with respect to future consequences for armed forces. Based on a close reading of 53 national security documents from 38 countries published between 2001 and 2014, he develops a classification of potential future military roles and functions. He demonstrates that although climate change has become an important issue for military planning, conceptions of its implications for the future of armed forces differ widely.

Consideration of the way in which climate change is conceived of by armed forces and ministries of defense illustrates the problems associated with grasping the extent of, and qualitative changes to, security in a warming world. Jasmin S. A. Link's chapter takes a theoretical sociological approach to climate change research. She investigates how path dependence affects the connection between climate change and conflict. Sociological conflict theories are used to determine the way in which and the extent to which path dependence influences social reactions to climate change.

A lack of understanding of the extent and qualitative nature of the transformations to security inherent to climate change are also the subject of Chapter 15. Judith Hardt analyses theoretical and empirical conceptual approaches to the connection between the environment and security with respect to their function as guiding concepts in the multiple and complex challenges posed by the Anthropocene. She ultimately proposes the Critical Environmental Security Studies (CESS) approach, empirically demonstrating its application in a case study of the Environment and Security Initiative (ENVSEC), which was launched by various international organizations.

Her systematic analysis is inherently linked to the concept of the Anthropocene. Originally a geological concept, the Anthropocene has received increasing attention as a dramatic shift in the Earth's system in which humanity has become aware of the role of collective human agency as the primary planet-transforming factor. This offers a unique opportunity to address the limitations of established divisions between academic communities and of their representativeness in issues involving science and society. Nevertheless, empirical analysis on various levels reveals the polarization of the natural and Earth sciences on the one hand and the humanities and social sciences on the other. The authors of Chapter 16, Andrea L. Balbo, Delf Rothe, and Jürgen Scheffran, suggest ways forward in the development of a transdisciplinary and sustainable Anthropocene science, embracing inclusiveness, openness, curiosity, and knowledge sharing.

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